Wellbore Service Tools Catalog

FIELD-PROVEN SOLUTIONS FOR OVER 100 YEARS

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Wellbore Service Tools



Introduction

For 100 years, Halliburton Wellbore Service Tools has offered worldwide completion services that incorporate the most advanced technology in tool design, materials, and delivery, including a broad portfolio of drillable and retrievable service tools and wellbore cleaning systems.

The Service Tools product line features the industry-leading CHAMP® IV and RTTS® retrievable packers and subsurface control (SSC) valves including the SSC III and SSC IV valves — subsurface safety valves that will support up to 1 million pounds of drillstring. Additionally, the Intercept® retrievable bridge plug has solved the industry challenge of engineering a reliable, gas-tight barrier that meets industry regulatory requirements.

With more than 1 million composite tools sold, Halliburton leads the industry in composite material products.

With field-proven packers and plugs, such as EZ Drill[®] that provide reliable zonal isolation, Halliburton is well suited to deliver high-performance drillable tools for wellbore isolation, stimulation, remedial cementing, and plug and abandonment operations.

Halliburton CleanWell[®] system technology specializes in mechanical wellbore cleaning solutions designed to deliver value-driven results throughout the well construction process using the latest generation of filtration services, wellbore cleanup fluids, mechanical wellbore cleaning tools, and optimized software modeling.

Whether you need a single product, a single service, or a total solution, Halliburton meets your needs and strives to exceed your expectations.



Completion Tools

Quality, Health, Safety, and Environment Program

Rather than only focus on a quality system such as ISO-9001, Halliburton has chosen to develop a business system that incorporates quality, health, safety, and environmental (QHSE) requirements in a single management system. The Halliburton Management System (HMS) defines our processes and includes quality, safety, environmental, and occupational health check points.

Health, Safety, and Environmental Policy

Halliburton recognizes the importance of meeting society's needs for health, safety, and environmental (HSE) protection. We work proactively with employees, customers, the public, governments, and others to use natural resources in an environmentally sound manner, emphasizing employee and public safety as well as the needs of future generations. We are dedicated to continuous improvement of our global HSE processes, while supplying high-quality products and services to customers. To meet these responsibilities, we manage our business according to the HSE principles.

Qualified Personnel

Halliburton service specialists and other field technical support personnel are among the most experienced in the industry. They learn from knowledgeable veterans and receive extensive training both on the job and in the classroom. We also provide special training seminars for customers to familiarize them with Halliburton equipment and operations.

Training Centers

Halliburton training centers deliver training solutions to grow the competence of our personnel in meeting customer needs. Training can also be acquired at the individual locations around the world through home study, online courses, and on-the-job training.





Retrievable Service Tools



Introduction

Halliburton is dedicated to providing top-quality equipment and service. This section contains information about our Retrievable Service Tool solutions and related accessories.

Halliburton maintains strict standards and welldocumented processes and procedures to help ensure excellence and dependability in our Retrievable Service Tools equipment.

No matter what your downhole situation, you can count on your Halliburton representative to look beyond the tool and develop a cost-effective engineered solution that can produce savings far greater than any difference in tool cost.





Completion Tools

Isolation Barrier Solutions



Isolation barrier systems are a critical component in a variety of well applications. During the well construction phase, operators are often required to isolate the well to perform various operations, such as scheduled blowout preventer (BOP) testing and repairs. When drilling and completing an entire field, operators might intermittently delay completion operations to begin drilling another well. Failure to keep a wellbore sealed can lead to a loss of well control and worse — unplanned release of hydrocarbons to the environment. This can be detrimental for operators and hazardous to the environment. Regulatory organizations and operators require a reliable, robust solution to this industry challenge.

Suspending the well to keep it stable and safe is particularly critical when performing temporary abandonment activities.

These barrier systems help address the following operational challenges:

- » BOP qualification testing and maintenance
- » Unscheduled wellhead maintenance
- » Short- to long-term well suspension
- » Casing integrity testing
- » Emergency suspension caused by weather or adverse conditions
- » Temporary barriers during batch drilling operations

Halliburton is able to meet these challenges with several temporary isolation barrier solutions, including:

- » Intercept® retrievable bridge plug
- » RTTS[®] packer combined with a subsurface control (SSC) valve
- » Model 3L[™] retrievable bridge plug



Intercept[®] Retrievable Bridge Plug

Failure to maintain a gas-tight seal in a wellbore can lead to a loss of well control and an unplanned release of hydrocarbons to the environment. This can be detrimental for operators and hazardous to the environment. Regulatory organizations and operators require a solution to this industry challenge.

The Halliburton Intercept® retrievable bridge plug is a gas-tight, wellsuspension plug ideal for dual-barrier applications and is designed to handle a wide range of well conditions. The plug solves the industry regulatory requirements of having an API 11D1/ISO 14310 V0-qualified well barrier to provide wellbore isolation. Suspending the well and keeping it stable and safe are particularly critical when performing activities, such as:

- » Blowout preventer qualification testing and maintenance
- » Wellhead maintenance
- » Short- and long-term well suspension
- » Casing testing
- » Emergency suspension because of weather or adverse conditions

The Intercept retrievable bridge plug is unique because it does not require hang weight below to set, which saves the rig time required to deploy drillpipe before running the plug. Should well operations require it, the plug can handle significant pipe weight below, saving trip time and reducing costs while enhancing safety. Additionally, the plug does not require left-hand rotation, which reduces the risk of accidental disconnection of the workstring or bottomhole assembly. When the operation is complete, the plug can be retrieved quickly and safely.

The Intercept plug can be run reliably in a variety of applications, from ultradeepwater to inland waters, and sets with simple workstring manipulation.



The ball valve can be opened and closed as often as desired without pipe rotation. The workstring can then be released from the plug, which remains in place until operations are complete. To retrieve the plug, the workstring is relatched, and the ball valve is opened to monitor pressure below. The plug is then released with right-hand rotation. The plug consists of packertype, high-performance sealing elements, bi-directional mechanical slips, and a ball valve module. When set, the Intercept retrievable bridge plug provides a reliable barrier in the casing, regardless of pressure reversals. The lower portion of the plug can be run as a conventional service-type packer without the ball valve module.

- » API 11D1/ISO 14310 V0 qualified
- » No hang weight required below
- » Ball valve module can be opened at maximum differential pressure without rotation
- Industry-proven RTTS[®] packer mechanical slips provide positive anchor for setting
- » Ability to support tensile loads up to 400,000 lb (181 440 kg)
- » Meets industry requirement for gas-tight barrier
- » Quick and easy operating procedure with no left-hand rotation required
- » Tripping tailpipe not required, saving rig time and costs



Retrievable Bridge Plug

RTTS® Packer

The RTTS® packer has been one of the most used and well-known service packers in the industry for more than 60 years. These packers have been run successfully in more than 100,000 jobs in nearly every country where oil and gas is produced. Their reputation for reliability and durability is why operators ask for RTTS packers by name — some are still in wellbores that have been working continuously for as long as 30 years. For barrier applications, the RTTS packer is run with an SSC valve to provide a trusted seal in the wellbore. This combination allows the workstring to be released and retrieved from the well while further operations are performed on the wellhead.

The RTTS packer is a full-opening, hookwall packer used for testing, treating, and squeeze operations. In most cases, the tool runs with a circulating valve assembly. The packer body includes a J-slot mechanism, mechanical slips, packer elements, and hydraulic slips. Large, heavyduty slips in the hydraulic holddown mechanism help prevent the tool from being pumped uphole.

- » Full-opening design of the packer mandrel bore allows large volumes of fluid to pump through the tool
 - Tubing-type guns and other wireline tools can be run through the packer
- » Packer can be set and relocated as many times as necessary
- » Tungsten carbide slips provide greater holding ability and improved wear resistance in high-strength casing
- » Optional integral circulating valve locks into open or closed position during squeezing or treating operations and opens easily to allow circulation above the packer





RTTS® V3 Packer

The RTTS® V3 full-opening, hookwall packer is used for well suspension, testing, and treating operations. The assembly is qualified to API 11D1/ISO 14310 Grade V3 requirements. In most cases, the tool is run with a subsurface control valve (SSC) assembly to allow for fast, reliable well suspension without having to fully recover the drillstring or bottomhole assembly (BHA). The RTTS V3 packer can be unset and retrieved by simply moving the workstring upward.

Features and Benefits

- » Full-opening design of the packer mandrel bore allows large volumes of fluid to pump through the tool
- » Tubing-conveyed perforating guns and wireline equipment can be run through the packer
- » Packer can be set and relocated as many times as necessary with simple tubing manipulation*
- » Tungsten carbide slips provide greater holding capacity and improved wear resistance in high-strength casing
- » Pressure through the tubing activates the slips in the hydraulic holddown mechanism
- » Assembly tensile strengths greater than 1 million pounds available
- » Can be run with multiple accessories, such as RTTS circulating and SSC valves, to cover multiple operations on location
- » Suspends the well without the need to recover the drilling BHA, minimizing downtime by allowing operations to continue without the need to rerun the complete drilling assembly
- » Qualified and proven to industry API and ISO standards

*Specific operational information must be considered before multiple sets are conducted.



Subsurface Control Valves

Halliburton Subsurface Control (SSC) valves provide reliable barriers for use in a variety of applications from regular blowout preventer (BOP) maintenance and integrity validation to casing and liner-top testing to longer-term applications, such as batch drilling. When combined with the strength and durability of the industry-standard RTTS® packer, SSC valves allow operators to perform workover operations as well as minimize disruptions caused by weather or wellbore containment emergencies.

Using SSC valves, operators can secure the drillstring downhole to provide more efficient abandonment of the installation. Because the drillstring is left in place, minimal effort is required to bring the well back online. Well security and personnel safety are improved, and operations can resume quickly after a workover or storm.

Solutions for a Range of Applications

The SSC valve product line includes SSC I, SSC II, SSC III, and the newest addition to the line, the SSC IV valve. Each of these valves offers specific features to suit a variety of wellbore construction scenarios.

The SSC I valve is a combination sliding sleeve and backoff joint ideal for situations in which a well needs to be closed in without pulling the complete workstring.

The SSC II valve is a ball valve and release mechanism, which allows operators to isolate a wellbore without having to fully recover the workstring. The release mechanism requires only right-hand rotation to disconnect the workstring and is re-latched by simply setting down weight. The SSC III valve is a ball valve and release mechanism that requires minimal rotation with high hangweight capability. It supports up to 1 million pounds of drillstring weight hanging off the valve.

The SSC IV valve encompasses all the benefits of the SSC III, along with a gas-tight qualification to meet the industry needs for a secure barrier during well operations.

Capabilities

SSC valves use the industry-standard RTTS packer to support workstring weight. The packer seals inside the casing (surface pipe or intermediate casing string), and the SSC valve seals the workstring ID. Because SSC valves include a release mechanism, the workstring above can be removed from the well and then reconnected when operations resume.

To take advantage of the SSC III and IV valves' high-load capabilities, special high-strength RTTS packer assemblies have been developed for use in conjunction with these valves to support the workstring weight.

By opening and closing the valve, the operator can check for pressure buildup before unsetting the packer. The SSC II, III, and IV valves can handle large volumes of drilling fluids to recondition the mud system before the packer and valve are removed and normal drilling operations resume.



Subsurface Contro (SSC) Valve



Model 3L[™] Retrievable Bridge Plug

The Model 3L[™] retrievable bridge plug consists of packertype sealing elements, mechanical slips, and a large area bypass.

The sealing elements are less susceptible to damage while running in the hole because they are not in contact with the casing. When set, the Model 3L bridge plug does not move up or down the casing, regardless of pressure reversals.

This plug can be run alone on tubing or run below the RTTS[®] or CHAMP[®] IV packer. The tool is run in the hole, set, and released from the tubing or packer. It remains in place until the tubing or packer is relatched, the bypass valve is opened, and the slips are released.

The bridge plug is retrieved when the tubing is lowered and the overshot engages the lugs on the plug-retrieving head. Torque is applied and the tubing is pulled up. It might be necessary to apply weight if pressure is trapped below the tool. As the torque is applied and the tubing is pulled up, the bypass ports open, and the mechanical slips are retracted to release the bridge plug.

- » Rugged, packer-type sealing elements and slips
- » Wide range of pressure and temperature capabilities
- » Simple operation
- » Superior zonal isolation and protection
- » Can temporarily plug the wellbore
- » Contains bypass ports that reduce swab and surge effects and relieve pressure during retrieval
- » Can be used with or without other retrievable tools
- » Easily removed



Model 3L™ Retrievable Bridge Plug



Isolation Barrier Solutions Tables

Following are the specifications tables for the Isolation Barrier Systems. The values of tensile, burst, and collapse strength are calculated with new tool conditions, Lame's formulas with von Mises Distortion Energy Theory for burst and collapse strength, and stress area calculations for tensile strength.

These ratings are guidelines only. For more information, consult your local Halliburton representative.

| Size in. | Packer Main Body OD in. (mm) | Plug ID in. (mm) | Weight lb/ft | Temperature °F (°C) | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) | API/ISO Validation |
|-------------|------------------------------------|---------------------|-----------------|----------------------------|----------------------------------|----------------------------------|------------------------------|--|-----------------------|
| 9 5/8 | 8.15 (207) | 3.00 (76.2) | 47 to 53.5 | 38 to 275 (3.3 to 135) | 8.403 (213.4) | 8.821 (224.1) | 400,000 (181 437) | 7,500 (51.71) | V0 |
| 10.3/4 | 9.125 (231.8) | 3.00 (76.2) | 60.7 to 65.7 | 38 to 275 | 9.415 (239.1) | 9.818 (249.4) | 400,000 (181 437) | 7,500 (51.71) | Vo |
| 10 3/4 | 8.85 (224.79) | 1.88 (47.75) | 85.3 | (3.3 to 135) | 8.976 (227.99) | 9.340 (237.24) | 300,000 (136 078) | 10,000 (68.95) | |
| 13 3/8 | 12.06 (306.3) | 3.00 (76.2) | 68 to 72 | 38 to 195 (3.3 to 90.6) | 12.203 (310) | 12.623 (320.6) | 400,000 (181 437) | 7,500 (51.71) | V0 |
| 13 5/8 | 12.06 (306.3) | 3.00 (76.2) | 86.5 to 88.2 | 38 to 195 (3.3 to 90.6) | 12.203 (310) | 12.623 (320.6) | 400,000 (181 437) | 7,500 (51.71) | V0 |
| 14 | 12.06 (306.3) | 3.00 (76.2) | 114 | 38 to 195 (3.3 to 90.6) | 12.203 (310) | 12.623 (320.6) | 400,000 (181 437) | 7,500 (51.71) | V0 |

Intercept[®] Retrievable Bridge Plugs

| Casing Size in. | Packer Main Body OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating* Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|------------------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|--|
| 2 3/8 | 1.81 (46) | 0.6 (15.2) | 4.60 | 1.93 (49.0) | 2.029 (51.5) | 28,700 (13 018) | 10,000 (68.95) |
| 2 7/8 | 2.22 (56.4) | 0.75 (19.1) | 6.50 | 2.372 (60.3) | 2.493 (63.3) | 38,300 (17 373) | 10,000 (68.95) |
| 2 //0 | 2.1 (53.3) | 0.6 (15.2) | 7.9 to 8.7 | 2.172 (55.2) | 2.353 (59.8) | 54,463 (24 704) | 10,000 (68.95) |
| | 2.93 (74.4) | 0.62 (15.7) | 5.70 | 3.15 (80) | 3.197 (81.2) | 63,800 (28 940) | 10,000 (68.95) |
| 3 1/2 | 2.7 (68.6) | 0.62 (15.7) | 9.2 to 10.2 | 2.842 (72.2) | 3.037 (77.1) | 63,800 (28 940) | 10,000 (68.95) |
| | 2.5 (63.5) | 0.62 (15.7) | 13.30 | 2.668 (67.8) | 2.809 (71.4) | 63,800 (28 940) | 10,000 (68.95) |
| Λ | 3.18 (80.8) | 1.12 (28.4) | 9.5 to 11.6 | 3.35 (85.1) | 3.599 (91.4) | 73,959 (33 584) | 10,000 (68.95) |
| 4 | 3.06 (77.7) | 0.875 (22.2) | 12.5 to 15.7 | 3.144 (79.9) | 3.441 (87.4) | 63,200 (28 667) | 10,000 (68.95) |
| | 3.89 (98.8) | 1.8 (45.7) | 9.50 | 3.941 (100.1) | 4.154 (105.5) | 77,077 (34 962) | 10,000 (68.95) |
| 4 1/2 | 3.75 (95.3) | 1.8 (45.7) | 11.6 to 13.5 | 3.852 (97.9) | 4.041 (102.6) | 77,077 (34 962) | 10,000 (68.95) |
| | 3.55 (90.2) | 1.8 (45.7) | 15.1 to 17.1 | 3.657 (92.9) | 3.903 (99.1) | 107,059 (48 562) | 10,000 (68.95) |
| | 4.25 (108.0) | 1.8 (45.7) | 11.5 to 13 | 4.43 (112.5) | 4.56 (115.8) | 84,649 (38 397) | 10,000 (68.95) |
| 5 | 4.06 (103.1) | 1.8 (45.7) | 15 to 18 | 4.194 (106.5) | 4.486 (113.9) | 86,026 (39 021) | 10,000 (68.95) |
| 5 | 3.89 (98.8) | 1.8 (45.7) | 21.40 | 4.031 (102.4) | 4.219 (107.2) | 77,077 (34 962) | 10,000 (68.95) |
| | 3.78 (95.3) | 1.8 (45.7) | 23.20 | 3.945 (100.2) | 4.145 (105.3) | 77,077 (34 962) | 10,000 (68.95) |

RTTS[®] Packers

| Casing Size in. | Packer Main Body OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating* Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|------------------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|--|
| | 4.55 (115.6) | 1.9 (48.3) | 13 to 20 | 4.694 (119.2) | 5.102 (129.6) | 142,344 (64 567) | 10,000 (68.95) |
| 5 1/2 | 4.4 (111.8) | 1.8 (45.7) | 20 to 23 | 4.577 (116.3) | 4.867 (123.6) | 84,649 (38 397) | 10,000 (68.95) |
| | 4.25 (107.9) | 1.9 (48.3) | 23 to 26 | 4.444 (112.9) | 4.765 (121) | 84,649 (38 397) | 10,000 (68.95) |
| 5 3/4 | 4.89 (124.2) | 1.9 (48.3) | 14 to 18 | 5.1 (129.5) | 5.365 (136.3) | 133,208 (60 423) | 10,000 (68.95) |
| 6 | 5.06 (128.5) | 1.9 (48.3) | 15 to 23 | 5.151 (130.8) | 5.599 (142.2) | 142,344 (64 567) | 10,000 (68.95) |
| 0 | 4.89 (124.2) | 1.9 (48.3) | 20 to 26 | 5.034 (127.9) | 5.388 (136.9) | 133,200 (60 419) | 10,000 (68.95) |
| 6 5/8 | 5.65 (143.5) | 2.38 (60.3) | 17 to 20 | 5.799 (147.3) | 6.551 (166.4) | 160,810 (72 943) | 10,000 (68.95) |
| 0 5/6 | 5.43 (137.9) | 1.9 (48.3) | 24 to 32 | 5.567 (141.4) | 5.98 (151.9) | 133,208 (60 423) | 10,000 (68.95) |
| 7 | 5.65 (143.5) | 2.38 (60.3) | 17 to 38 | 5.799 (147.3) | 6.551 (166.4) | 160,810 (72 943) | 10,000 (68.95) |
| | 5.25 (133.4) | 2.00 (50.8) | 49.50 | 5.384 (136.8) | 5.701 (144.8) | 133,208 (60 423) | 10,000 (68.95) |
| 7 5/8 | 6.35 (161.3) | 2.38 (60.3) | 24 to 39 | 6.509 (165.3) | 7.129 (181.1) | 160,810 (72 943) | 10,000 (68.95) |
| 7 5/6 | 6.16 (156.4) | 2.38 (60.3) | 29.7 to 45.3 | 6.43 (163.3) | 6.901 (175.3) | 158,238 (71 777) | 10,000 (68.95) |
| 7 3/4 | 6.16 (156.4) | 2.38 (60.3) | 33.2 to 50 | 6.43 (163.3) | 6.901 (175.3) | 158,238 (71 777) | 10,000 (68.95) |
| 8 5/8 | 7.31 (185.7) | 3.00 (76.2) | 24 to 49 | 7.381 (187.5) | 8.207 (208.5) | 237,218 (107 602) | 7,500 (51.71) |
| 9 5/8 | 8.25 (209.6) | 3.75 (95.3) | 36 to 53.5 | 8.403 (213.4) | 9.049 (229.9) | 379,267 (172 036) | 7,500 (51.71) |
| 0 0/0 | 7.8 (198.1) | 3.00 (76.2) | 58.4 to 71.8 | 7.958 (202.1) | 8.587 (218.1) | 237,200 (107 592) | 7,500 (51.71) |
| 10.3/4 | 9.4 (238.8) | 3.75 (95.3) | 40.5 to 55.5 | 9.631 (244.6) | 10.189 (258.9) | 444,600 (201 667) | 5,000 (34.48) |
| 10 0/ 1 | 8.85 (224.8) | 3.75 (95.3) | 60.7 to 85.3 | 8.976 (228.0) | 9.818 (249.4) | 444,600 (201 667) | 5,000 (34.48) |
| 11 3/4 | 10.6 (269.2) | 3.75 (95.3) | 47 to 54 | 10.756 (273.2) | 11.223 (285.1) | 444,600 (201 667) | 5,000 (34.48) |
| | 10.1 (256.5) | 3.75 (95.3) | 60 to 71 | 10.438 (265.1) | 10.934 (277.7) | 444,600 (201 667) | 5,000 (34.48) |
| 12 3/4 | 11.1 (281.9) | 3.75 (95.3) | 57 to 81 | 11.5 (292.1) | 11.884 (301.9) | 444,600 (201 667) | 3,000 (20.69) |
| 13 3/8 | 11.94 (303.3) | 3.75 (95.3) | 54.5 to 72 | 12.203 (310.0) | 12.783 (324.7) | 651,300 (295 425) | 5,000 (34.48) |
| 10 0/0 | 11.5 (292.1) | 3.75 (95.3) | 72 to 98 | 11.76 (298.7) | 12.403 (315.0) | 651,300 (295 425) | 5,000 (34.48) |
| 14 | 12.25 (311.2) | 3.75 (95.3) | 82.5 to 98 | 12.449 (316.2) | 13.067 (331.9) | 651,300 (295 425) | 5,000 (34.48) |
| | 14.43 (366.5) | 3.75 (95.3) | 55 to 65 | 15.115 (383.9) | 15.564 (395.3) | 651,300 (295 425) | 2,500 (17.24) |
| 16 | 14.18 (360.2) | 3.75 (95.3) | 84 to 109 | 14.509 (368.5) | 15.215 (386.5) | 651,300 (295 425) | 2,500 (17.24) |
| | 13.62 (345.9) | 3.75 (95.3) | 109 to 146 | 13.968 (354.8) | 14.688 (373.1) | 651,300 (295 425) | 2,500 (17.24) |
| 18 5/8 | 16.87 (428.5) | 3.75 (95.3) | 78 to 118 | 17.257 (438.3) | 17.98 (456.7) | 651,300 (295 425) | 2,500 (17.24) |

RTTS® Packers



| Casing Size in. | Packer Main Body OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating* Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|------------------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|--|
| | 17.87 (453.9) | 3.75 (95.3) | 94 to 133 | 18.535 (470.8) | 19.213 (488.0) | 1,000,000 (453 592) | 2,500 (17.24) |
| 20 | 17.25* (438.2) | 4.14 (105.2) | 133 to 187 | 17.257 (438.3) | 17.98 (456.7) | 1,000,000 (453 592) | 2,500 (17.24) |
| | 17.25 (438.2) | 3.75 (95.3) | 169 to 204 | 17.951 (456.0) | 18.65 (473.7) | 1,000,000 (453 592) | 2,500 (17.24) |

RTTS® Packers

*High-expansion packer

RTTS® V3 Packers

| Casing Size in. | Packer Main Body OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating* Ib (kg) | Maximum Working Pressure* psi (MPa) |
|-----------------------|------------------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|---|
| 10.3/4 | 9.280 (235.7) | 3.50 (88.9) | 65.7 | 9.415 (239.1) | 9.723 (247.0) | 350,000 (158 757) | 6,500 (44.82) |
| 10 5/4 | 8.875 (225.4) | 3.50 (88.9) | 73.2 to 85.3 | 8.976 (228.0) | 9.577 (243.3) | 350,000 (158 757) | 6,500 (44.82) |
| 13 3/8 | 11.94 (303.28) | 2.44 (62.0) | 54.5 to 72.0 | 12.203 (320.0) | 12.783 (324.7) | 1,000,000 (453 592) | 8,000 (55.16) |
| 13 5/8 | 11.94 (303.28) | 2.44 (62.0) | 86.0 to 88.2 | 12.203 (320.0) | 12.783 (324.7) | 1,000,000 (453 592) | 8,000 (55.16) |
| 14 | 11.94 (303.28) | 2.44 (62.0) | 103.5 to 113.0 | 12.203 (320.0) | 12.783 (324.7) | 1,000,000 (453 592) | 8,000 (55.16) |
| 16 | 14.18 (360.2) | 3.00 (76.2) | 95.0 to 97.0 | 14.684 (373.0) | 15.079 (383.0) | 1,000,000 (453 592) | 7,500 (51.71) |

*Please consult your Halliburton representative to determine maximum hang-off and pressure test requirements.

| Туре | Assembly OD in. (mm) | RTTS [®] Size Range in. | Maximum Working Pressure psi (MPa) | Tensile Rating Ib (kg) | Valve Type |
|---------|----------------------------|--|--|------------------------------|---------------|
| | 3.72 (94.5) | 4 1/2 to 5 1/2 | 8,000 (55.16) | 218,306 (99 022) | Sliding |
| SSC I | 4.87 (123.7) | 6 5/8 to 7 5/8 | 6,200 (42.75) | 335,811 (152 321) | Sliding |
| | 6.25 (158.8) | 8 5/8 to 20 | 10,000 (68.95) | 598,040 (271 266) | Sliding |
| | 4.75 (120.7) | 6 5/8 to 7 5/8 | 10,000 (68.95) | 186,946 (84 797) | Ball |
| SSC II | 4.75* (120.7) | 6 5/8 to 7 5/8 | 15,000 (103.42) | 302,449 (137 188) | Ball |
| | 6.5 (165.1) | 8 5/8 to 20 | 10,000 (68.95) | 452,092 (205 066) | Ball |
| SSC III | 8.5 (215.9) | 10 3/4 to 20 | 8,000 (55.16) | 1,038,600 (471 101) | Ball |
| SSC IV | 8.0 (203.2) | 9 5/8 to 20 | 8,000 (55.16) | 400,000 (181 437) | Ball |
| | 8.5 (215.9) | 10 3/4 to 20 | 8,000 (55.16) | 1,058,487 (480 121) | Ball |

Subsurface Control (SSC) Valves

*This SSC II valve has a 1.50-in. ID to increase the pressure and tensile rating.



| Casing Size in. | Main Body OD in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|-----------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| 4 1/2 | 3.75 (95.3) | 9.5 to 13.5 | 3.920 (99.6) | 4.090 (103.9) | 65,200 (29 574) | 10,000 (68.95) |
| | 4.35 (110.5) | 11.5 | 4.560 (115.8) | 4.778 (121.4) | 65,200 (29 574) | 10,000 (68.95) |
| 5 | 4.25 (107.9) | 13 to 15 | 4.408 (112.0) | 4.494 (114.2) | 65,200 (29 574) | 10,000 (68.95) |
| | 3.93 (99.8) | 18 to 21.4 | 4.126 (104.8) | 4.276 (108.6) | 65,200 (29 574) | 10,000 (68.95) |
| 5 1/2 | 4.60 (116.8) | 13 to 20 | 4.778 (121.4) | 5.044 (128.1) | 65,200 (29 574) | 10,000 (68.95) |
| 5 1/2 | 4.35 (110.5) | 20 to 23 | 4.560 (115.8) | 4.778 (121.4) | 65,200 (29 574) | 10,000 (68.95) |
| 6 5/8 | 5.43 (137.9) | 24 to 32 | 5.675 (144.2) | 5.921 (150.4) | 65,200 (29 574) | 10,000 (68.95) |
| 7 | 5.65 (143.5) | 17 to 38 | 5.920 (150.4) | 6.538 (166.1) | 65,200 (29 574) | 10,000 (68.95) |
| 7 5/8 | 6.35 (161.3) | 20 to 39 | 6.625 (168.3) | 7.125 (181.0) | 65,200 (29 574) | 10,000 (68.95) |
| 8 5/8 | 7.04 (178.8) | 49 to 56 | 7.313 (185.8) | 7.511 (190.8) | 117,800 (53 433) | 7,500 (51.71) |
| 9 5/8 | 8.15 (207.0) | 29.3 to 53.5 | 8.535 (216.8) | 9.063 (230.2) | 117,800 (53 433) | 7,500 (51.71) |
| 10 3/4 | 9.40 (238.8) | 32.75 to 55.5 | 9.760 (247.9) | 10.192 (258.9) | 117,800 (53 433) | 7,500 (51.71) |
| 10 0/4 | 8.85 (224.8) | 60.7 to 80.8 | 9.250 (235.0) | 9.660 (245.4) | 117,800 (53 433) | 7,500 (51.71) |

Model 3L[™] Retrievable Bridge Plugs



Testing and Treating Solutions



Well servicing and workover is used to extend the economically viable productive life of a well. This is accomplished through performance of several zonal treatment procedures, such as high-pressure acidizing, fracturing, perforation washing, and squeezing.

Testing potential producing zones is accomplished by placing the formation into temporary production conditions. This requires the use of a robust service packer that isolates the zone so the pressure at the formation can be reduced to bring flow into the wellbore and ultimately build pressure back up, indicating it can produce hydrocarbons. Halliburton testing and treating systems provide the following:

- » Negative and positive test for well integrity locates problems then squeeze cement fixes the leak
- » Multiple operations in one trip
- » Custom tool combinations



RTTS® Straddle Packer

The RTTS® straddle packer allows selected sections of the wellbore to be isolated and serviced. Based on the industry-proven RTTS packer, the RTTS straddle packer allows operators to test and treat selected zones and can be further tailored by adjusting the straddle distance between the upper and lower elements.

The RTTS straddle packer is a hookwall packer used for testing, treating, and squeeze operations. The packer body includes an upper and lower packer with spacer tubing and an integral bypass and ball seat. The lower packer incorporates a J-slot mechanism, mechanical slips, packer elements, and a bypass. Large, heavy-duty slips in the hydraulic holddown mechanism are contained in the upper packer to help prevent the tool from being pumped uphole. Drag blocks operate the J-slot, and automatic J-slot sleeves are standard equipment on all Halliburton RTTS straddle packers.

- » Optimized flow areas allow for a high volume of fluid to be pumped through the tool
- » Straddle intervals can be tailored utilizing industrystandard tubular and pipe connections
- » Packer can be set and relocated as many times as necessary
- » Tungsten carbide slips provide greater holding ability and improved wear resistance in high-strength casing
- » Integral bypass ensures pressure equalization across the packer, when required
- » A ball and seat allows isolation of the wellbore below the tool for targeted treatments



Straddle Packer



RTTS® Circulating Valve

The RTTS® circulating valve is a multi-function valve that serves as both a circulating valve and bypass. The clearance between an RTTS packer and the casing ID is relatively small. To reduce the effect of fluid-swabbing action when the tool is run in or pulled out of the hole, a packer bypass is used.

The RTTS circulating valve automatically moves to the closed position when the packer is set. During testing and squeezing operations, the ability to lock the valve in the closed position helps prevent it from being pumped open. A straight J-slot in the locked-open position can be used with the straight J-slot (optional) in the packer body. This combination helps eliminate the need to turn the tubing to close the circulating valve or reset the packer after the tubing is displaced with cement.

- » Valve can be locked closed when the packer is unset to reverse fluid around the bottom of the packer
 - A lower circulating point allows fluid to circulate farther down the wellbore, if required
- » Full opening allows tubing-type guns and other wireline equipment to pass
- » Rugged seal system provides highly reliable isolation between workstring and annulus



RTTS® Circulating Valve



Model 2 RTTS® Circulating Valve

The Model 2 RTTS[®] circulating valve provides an efficient, safe method of performing inflow/negative tests and can be deployed as a means of general circulation and fluid positioning. This locked-open valve serves as both a circulating valve and a bypass valve and is held closed by internal pressure and/or pipe weight.

A straight J-slot in the circulating valve allows the valve to be used with a straight J-slot in the packer assembly. This combination helps eliminate the need to rotate the tubing to close the circulating valve or reset the packer after the tubing has been displaced with alternative fluids. A straight spline option allows the valve to be opened and closed without string rotation.

- » Well control is maintained while monitoring pressure at the packer
- » Fluid can be circulated to kill the well while maintaining packer seal integrity
- » Valve can be manipulated between open and close without removing weight set on the packer
- » Valve can be used in conjunction with the RTTS packer





RTTS® Safety Joint

The RTTS® safety joint is a recommended backoff device that helps prevent unintentional operations. In the event that the lower string becomes stuck during operations, the safety joint will release the workstring and tools.

The RTTS safety joint is run immediately above the RTTS packer to allow for optimized recovery of the workstring.

Before the safety joint can be used, a tension sleeve located on the bottom of the lug mandrel must first be parted by pulling up on the workstring. This tension sleeve should be considered whenever additional tools or workstring are run below the packer. Excessive weight below the packer can cause unexpected parting of this sleeve during the tool makeup process.

After the tension sleeve has parted, the safety joint is released by right-hand torque while the workstring is reciprocated a specified number of cycles.

By incorporating the RTTS safety joint in the workstring, operators can help ensure that even if the bottomhole assembly becomes stuck in the well, it can be recovered safely and efficiently with minimum downtime.

- » Positive sequence of operation helps prevent premature release
- » Tools above the safety joint can be retrieved when string is stuck, preventing tools from being lost in the well, sidetracked, or redrilled





CHAMP[®] IV Packer

The CHAMP® IV packer is a hookwall retrievable packer with a concentric bypass that can be used as a stimulation or testing packer. The CHAMP IV packer is well suited for tubing-conveyed perforating (TCP) applications where the firing head assembly is easily incorporated, as well as horizontal applications because of its limited rotational requirements and integrated bypass. Just a guarter-turn is required at the tool to set the packer and close the bypass. A straight upward pull opens the bypass and unseats the packer.

To control setting of the packer, the tool is lowered into the hole where a J-slot holds the bypass open. When the packer is set, the bypass closes as weight is applied by the workstring. After the packer is set, a balancing piston activated by tubing pressure holds the bypass closed.

Each tool assembly includes a J-slot mechanism, mechanical slips, packer elements, hydraulic slips, and a bypass. Round, piston-like slips used in the hydraulic holddown mechanism prevent the tool from being pumped uphole. The bypass allows fluids to pass around the bottom of the tool when it is removed from the hole. This design helps eliminate accidentally opening a conventional bypass during circulation around the bottom of the packer.

Circulation around the CHAMP IV packer is not interrupted if the packer element seals unintentionally, as when it passes through points of interference in the casing.

- » Ideal for highly deviated wells or where pipe manipulation is difficult
- » Picking the packer straight up (no torgue required) opens the bypass
- » Easily relocated in multiple zones during a single trip for treating, testing, or squeezing
- » Concentric bypass has a larger bypass flow area to allow for high circulation rates
- » Used with a retrievable bridge plug for straddling zones during various operations
- » Tool of choice where positive circulation below the packer is required, such as:
 - Drillstem testing
 - TCP applications using tailpipe for shallow service
 - Liner tools



Packer



CHAMP® IV Non-Rotational Retrievable Packer

The CHAMP® IV non-rotational packer is ideal for deepwater, extendedreach situations where achieving sufficient torque downhole to manipulate the toolstring can be challenging, particularly when running with multiple umbilicals, such as drillstem test applications. This tool has the same basic features as the standard CHAMP IV packer, but with the added feature that it does not require rotation to set. The CHAMP IV non-rotational packer consists of a hookwall retrievable packer with a concentric bypass and a continuous indexing J-slot. This J-slot allows the packer to be run in the casing, set, and unset without applying any rotation to the workstring. The packer can cycle from the run-in-hole (RIH) to the set and pull-out-of-hole (POOH) positions simply by reciprocating the workstring in the wellbore.

A J-slot position locking mechanism keeps the packer in the RIH configuration until the desired depth is reached and the locking mechanism is deactivated. The position locking mechanism is deactivated using a rupture disk, which is set to rupture at a predetermined pressure. The deactivation pressure can be either wellbore hydrostatic at a certain depth or pump pressure applied to the annulus at surface. The locking mechanism allows the packer to be run on jointed pipe without cycling through the positions in the J-slot as each joint of pipe is being made up at the surface.

The concentric bypass allows fluids to circulate around the bottom of the tool when it is removed from or moved uphole in the wellbore. Therefore, circulation as the packer assembly is passed through tight spots, where packer elements might unintentionally achieve a temporary seal, remains uninterrupted. The bypass valve is also designed to be pressure balanced with applied pressure. This prevents the unintentional opening of the bypass during treatment applications.

- » Easily operated in extended-reach or highly deviated wellbores
- » No rotation required to set packer
 Picking the packer straight up (no torque required) opens the bypass
- » Will not set until the hydrostatic pressure at a predetermined depth is reached or annulus pressure is applied
- Easily relocated to multiple zones during a single trip for treating, testing, or squeezing
- Concentric bypass allows a larger bypass flow area with positive circulation below the packer and tailpipe
- » Temperature rating of 400°F (204.4°C)



Non-Rotational Retrievable Packer



CHAMP® IV Non-Rotational Restricted-Set Retrievable Packer

The CHAMP® IV non-rotational restricted-set packer is ideal for deepwater, extended-reach applications on floating, heaving vessels where obtaining sufficient torque downhole to manipulate the toolstring can be challenging, particularly when running with multiple umbilicals, such as drillstem test applications with subsea equipment. This packer has the same basic features as the standard CHAMP IV packer, but with the added feature that it does not require rotation to set and can be reset a predetermined number of times.

The CHAMP IV non-rotational packer is a hookwall retrievable packer with a concentric bypass and a continuous indexing J-slot that incorporates a lock-out mechanism. The packer can cycle from the run-in-hole (RIH) to the set and pull-out-of-hole (POOH) positions simply by reciprocating the workstring in the wellbore. After the packer has been set the required number of times, it can be mechanically locked out to prevent any further setting operations during toolstring recovery from the wellbore.

Each assembly includes an indexing lock-out J-slot mechanism, mechanical slips, packer elements, hydraulic slips, and a concentric bypass. Hydraulic piston-type slips in the hydraulic holddown mechanism prevent the packer from being pumped uphole.

A J-slot position locking mechanism keeps the packer in the RIH configuration until the desired depth is reached and the locking mechanism is deactivated. The position locking mechanism is deactivated using a rupture disk, which is set to rupture at a pressure that is predetermined during the job calculations. The deactivation pressure can be either wellbore hydrostatic at a predetermined depth or pump pressure applied to the wellbore at surface.



The locking mechanism allows the packer to be run without cycling through the positions in the J-slot, as each joint of pipe is made up at the surface.

The J-slot lock-out mechanism prevents the packer from setting after the operation is complete and allows the string to move freely, even in significant heave situations on floating vessels.

- » Easily operated in extended-reach or highly deviated wellbores
- » No rotation required to set packer
 - Picking the packer straight up (no torque required) opens the bypass
- » Will not set until the hydrostatic pressure at a predetermined depth is reached or annulus pressure is applied
- » Easily relocated to multiple zones during a single trip for treating, testing, or squeezing
- » Sets up to eight times continuously before locking out
- » "Locked out" mechanically to allow recovery from the wellbore in significant heave
- » Concentric bypass allows a larger bypass flow area with positive circulation below the packer and tailpipe
- » Temperature rating of 400°F (204.4°C)



CHAMP® IV Non-Rotational Restricted-Set Retrievable Packer

CHAMP[®] V Packer

The CHAMP® V packer is a 15K-psi rated hookwall retrievable packer with a concentric bypass and is ideally suited for high-pressure/high-temperature (HP/HT) wells. The packer's higher-grade materials and elastomers are supported with backup rings and an element package. As the tool is lowered into the hole, a J-slot holds the bypass open and controls the setting of the packer. When the packer is set, a balancing piston activated by tubing pressure holds the bypass closed, preventing accidental communication with the annulus.

Each tool assembly includes a J-slot mechanism, mechanical slips, packer elements, hydraulic slips, and a bypass. Round, piston-type slips are used in the hydraulic holddown mechanism to help prevent the tool from being pumped uphole. The CHAMP V 15K packer has additional holddown mechanisms to help keep it in place because of the higher loads caused by high pressure. The bypass allows the fluids to pass around the bottom of the tool when it is removed from the hole. This design helps eliminate accidental opening of a conventional bypass during circulation around the bottom of the packer. Additionally, circulation around the packer is uninterrupted when it passes through points of interference in the casing.

- » Ideal for highly deviated wells or where pipe manipulation is difficult
- » Simply picking the packer straight up (no torque required) opens the bypass, saving time and costs
- » Easily relocated in multiple zones during a single trip for treating, testing, or squeezing
- » Large bypass area allows for higher circulation rates
- » Ideal for HP/HT testing, tubing-conveyed perforating, or stimulation applications
- » High-strength construction makes it extremely durable and reliable
- » Rugged tungsten carbide slips allow multiple sets in the hardest casings





CHAMP® V 15K Non-Rotational Retrievable Packer

The CHAMP® V 15K non-rotational packer is ideal for deepwater, extended-reach situations where achieving sufficient torque downhole to manipulate the toolstring can be challenging. It is made up of a hookwall retrievable packer with a concentric bypass and a continuous indexing J-slot.

The CHAMP V 15K non-rotational packer is constructed with highergrade materials, and all elastomers are supported with backup rings. The J-slot enables the packer to be run in the casing, set, and unset without applying any rotation to the workstring. The packer can cycle from the run-in-hole (RIH) to the set and pull-out-of-hole (POOH) positions simply by lifting or lowering the drillpipe or tubing in the wellbore.

Each assembly includes an indexing J-slot mechanism, mechanical slips, packer elements, hydraulic slips, and a concentric bypass. Round, piston-type slips are used in the hydraulic holddown mechanism to help prevent the tool from being pumped uphole. It also contains additional holddown mechanisms to help keep it in place because of the higher loads.

A J-slot position locking mechanism keeps the packer in the RIH configuration until the required depth is reached and the locking mechanism is deactivated. The position locking mechanism is deactivated using a rupture disk, which is set to rupture at a predetermined pressure. The deactivation pressure can be either wellbore hydrostatic at a certain depth or pump pressure applied to the annulus at surface. The locking mechanism enables the packer to be run on jointed pipe without cycling through the positions in the J-slot as each joint of pipe is made up at the surface.

The concentric bypass enables fluids to circulate around the bottom of the tool when it is removed from or moved uphole in the wellbore. Therefore, circulation as the packer assembly is passed through tight spots, where packer elements might unintentionally achieve a temporary seal, remains uninterrupted. The bypass valve is also designed to be pressure balanced with applied pressure. This prevents unintentional opening of the bypass during treatment applications.

- » Easily operated in extended-reach or highly deviated wellbores
- » No rotation required to set packer
- » Locked in the RIH position until the hydrostatic pressure at a predetermined depth is reached or annulus pressure is applied
- Easily relocated to multiple zones during a single trip for treating, testing, or squeezing
- » Concentric bypass enables a larger bypass flow area with positive circulation below the packer and tailpipe
- » Rated up to 15,000-psi (103.42-MPa) working pressure with a temperature rating of up to 400°F (204.4°C)



CHAMP® V 15K Non-Rotational Retrievable Packer



PinPoint Injection (PPI) Packer

The PinPoint Injection (PPI) packer is a retrievable, treating straddle packer that features 1 ft of spacing between packer elements. This spacing helps ensure that the maximum number of perforations within a long producing interval can be broken down to accept stimulation fluids uniformly. Once the entire zone is broken down individually, a large-scale treatment can be performed more effectively.

Adapters are provided to run tubing for spacer if intervals greater than 1 ft (30.48 cm) are required. A typical PPI packer toolstring consists of the following tools (top to bottom):

- » RFC® retrievable fluid control valve
- » RTTS[®] circulating valve
- » PPI packer
- » Collar locator

The PPI packer has a straight J-slot drag-block body. The collar locator, if used, can be run either above or below the PPI packer. The RFC valve retains acid used to break down perforations in the tubing as the PPI packer is moved to the next setting point.

Fluid passage through the center of the bottom packer is closed off with the retrievable plug or ball included in the conversion kit. The retrievable plug or ball can be run in place with the PPI packer or can be dropped from the surface after the tools are run in.

After the RFC valve is removed, the retrievable plug passes through the RFC valve seats. If a ball is used, it must be reversed out or brought out with the toolstring.

- » Spacing between packer and elements
- » RTTS packer reliability built into the PPI packer
- » Adapters allow for spacing intervals greater than 1 ft
- » Provides more thorough stimulation of the producing interval
- » Allows for the collection of more detailed formation data for planning the main treatment
- » Can perform treatments through the same tool with one trip in the hole





Testing and Treating Solutions Tables

Following are the specifications tables for the Testing and Treating Systems. The values of tensile, burst, and collapse strength are calculated with new tool conditions, Lame's formulas with von Mises Distortion Energy Theory for burst and collapse strength, and stress area calculations for tensile strength.

These ratings are guidelines only. For more information, consult your local Halliburton representative.

| Casing Size in. | Packer Main Body OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|------------------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| | 3.89 (98.8) | 1.8 (45.7) | 9.50 | 3.941 (100.1) | 4.154 (105.5) | 77,077 (34 962) | 10,000 (68.95) |
| 4 1/2 | 3.75 (95.3) | 1.8 (45.7) | 11.6 to 13.5 | 3.852 (97.9) | 4.041 (102.6) | 77,077 (34 962) | 10,000 (68.95) |
| | 3.55 (90.2) | 1.8 (45.7) | 15.1 to 17.1 | 3.657 (92.9) | 3.903 (99.1) | 107,059 (48 562) | 10,000 (68.95) |
| | 4.55 (115.6) | 1.9 (48.3) | 13 to 20 | 4.694 (119.2) | 5.102 (129.6) | 142,344 (64 567) | 10,000 (68.95) |
| 5 1/2 | 4.4 (111.8) | 1.8 (45.7) | 20 to 23 | 4.577 (116.3) | 4.867 (123.6) | 84,649 (38 397) | 10,000 (68.95) |
| | 4.25 (107.9) | 1.9 (48.3) | 23 to 26 | 4.444 (112.9) | 4.765 (121) | 84,649 (38 397) | 10,000 (68.95) |
| 7 | 5.65 (143.5) | 2.38 (60.3) | 17 to 38 | 5.799 (147.3) | 6.551 (166.4) | 160,810 (72 943) | 10,000 (68.95) |
| 1 | 5.25 (133.4) | 2.00 (50.8) | 49.50 | 5.384 (136.8) | 5.701 (144.8) | 133,208 (60 423) | 10,000 (68.95) |
| 7 5/8 | 6.35 (161.3) | 2.38 (60.3) | 24 to 39 | 6.509 (165.3) | 7.129 (181.1) | 160,810 (72 943) | 10,000 (68.95) |
| 7 5/0 | 6.16 (156.4) | 2.38 (60.3) | 29.7 to 45.3 | 6.43 (163.3) | 6.901 (175.3) | 158,238 (71 777) | 10,000 (68.95) |
| 9.5/8 | 8.25 (209.6) | 3.75 (95.3) | 36 to 53.5 | 8.403 (213.4) | 9.049 (229.9) | 379,267 (172 036) | 7,500 (51.71) |
| 5 5/6 | 7.8 (198.1) | 3.00 (76.2) | 58.4 to 71.8 | 7.958 (202.1) | 8.587 (218.1) | 237,200 (107 592) | 7,500 (51.71) |
| 10 3/4 | 9.4 (238.8) | 3.75 (95.3) | 40.5 to 55.5 | 9.631 (244.6) | 10.189 (258.9) | 444,600 (201 667) | 5,000 (34.48) |
| 10 3/4 | 8.85 (224.8) | 3.75 (95.3) | 60.7 to 85.3 | 8.976 (228.0) | 9.818 (249.4) | 444,600 (201 667) | 5,000 (34.48) |

RTTS® Straddle Packers

RTTS® Circulating Valves

| Size in. | OD in. (mm) | ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|----------------|------------------------|----------------|------------------------------|--|
| 2 3/8 | 1.68 | 0.68 | 31,900 | 9,900 |
| | (42.7) | (17.3) | (14 451) | (68.25) |
| 2 7/8 | 2 7/8 2.15 1.00 37,500 | | 37,500 | 7,800 |
| | (54.6) (25.4) (17 009) | | (17 009) | (53.77) |
| 3 1/2 | 2.37 | 1.00 | 52,500 | 10,000 |
| | (60.1) | (25.4) | (23 813) | (68.95) |
| 4 | 3.06 | 1.50 | 92,200 | 8,100 |
| | (77.7) | (38.1) | (41 821) | (55.84) |
| 4 1/2 to 5 | 3.60 | 1.80 | 85,000 | 10,100 |
| | (91.4) | (45.7) | (38 505) | (69.63) |
| 5 1/2 to 6 5/8 | 4.18 | 1.99 | 150,700 | 10,000 |
| | (106.2) | (50.5) | (68 356) | (68.95) |
| 7 to 7 5/8 | 4.87 | 2.44 | 148,800 | 10,000 |
| | (123.7) | (61.9) | (67 606) | (68.95) |
| 8 5/8 to 20 | 6.12 | 3.00 | 311,400 | 10,500 |
| | (155.4) | (76.2) | (141 200) | (72.39) |

| Size in. | Casing Weight Ib/ft | Maximum OD in. (mm) | Minimum ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-------------|---------------------------|---------------------------|---------------------------|------------------------------|--|
| 8 5/8 | 24 to 49 | 6.50 (165.1) | 2.00 (50.8) | 322,998 (146 817) | 10,000 (68.95) |
| 9.5/8 | 40 to 71.8 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 5 5/6 | 29.3 to 53.5 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 10 3/4 | 32.75 to 81 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 11 3/4 | 38 to 71 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 13 3/8 | 48 to 98 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 16 | 75 to 109 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 18 5/8 | 78 to 118 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |
| 20 | 94 to 204 | 6.50 (165.1) | 2.40 (61.0) | 322,998 (146 817) | 10,000 (68.95) |

Model 2 RTTS® Circulating Valves

RTTS® Safety Joints

| Size in. | OD in. (mm) | ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|----------------|----------------|----------------|------------------------------|--|
| 2 3/8 | 1.81 | 0.68 | 32,000 | 9,600 |
| | (46.0) | (17.3) | (14 500) | (66.20) |
| 2 7/8 | 2.15 | 1.00 | 24,300 | 5,000 |
| | (54.6) | (25.4) | (11 022) | (34.47) |
| 3 1/2 | 2.37 | 0.75 | 65,700 | 12,200 |
| | (60.1) | (19.0) | (29 801) | (84.11) |
| 4 | 3.34 | 1.50 | 92,100 | 12,900 |
| | (84.8) | (38.1) | (41 775) | (88.94) |
| 4 1/2 to 5 | 3.68 | 1.90 | 88,600 | 9,900 |
| | (93.5) | (48.3) | (40 272) | (68.28) |
| 5 1/2 to 6 5/8 | 4.06 | 2.00 | 127,400 | 10,200 |
| | (103.1) | (50.8) | (57 789) | (70.33) |
| 7 to 7 5/8 | 5.00 | 2.44 | 148,800 | 10,900 |
| | (127.0) | (61.9) | (67 606) | (75.10) |
| 8 5/8 to 20 | 6.12 | 3.12 | 271,900 | 10,400 |
| | (155.4) | (79.2) | (123 600) | (71.70) |

Note: Although other sizes might be available, these sizes are the most common.

CHAMP® IV Retrievable Packers

| Casing Size in. | Packer OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|--------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| 4 1/2 | 3.87 (98.3) | 1.80 (45.7) | 9.5 to 10.5 | 4.044 (102.7) | 4.090 (103.9) | 71,200 (32 300) | 8,400 (57.92) |
| 4 1/2 | 3.75 (95.2) | 1.80 (45.7) | 11.6 to 13.5 | 3.852 (97.8) | 4.068 (103.3) | 71,200 (32 300) | 8,400 (57.92) |
| 5 | 3.98 (98.3) | 1.80 (45.7) | 18 to 20.8 | 4.156 (105.6) | 4.276 (108.6) | 71,200 (32 300) | 8,400 (57.92) |
| 5 | 4.18 (106.2) | 1.80 (45.7) | 11.5 to 15.0 | 4.408 (112.0) | 4.560 (115.8) | 71,200 (32 300) | 8,400 (57.92) |
| 5 1/2 | 4.55 (115.6) | 2.00 (50.8) | 13 to 20 | 4.694 (119.2) | 5.120 (130.0) | 99,600 (45 177) | 8,400 (57.92) |
| 51/2 | 4.38 (111.3) | 1.80 (45.7) | 20 to 23 | 4.670 (118.6) | 4.778 (121.4) | 71,200 (32 300) | 8,400 (57.92) |

| Casing Size in. | Packer OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|--------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| 6 5/8 or 7 | 5.25 (133.4) | 2.00 (50.8) | 6 5/8: 28 to 32 7: 41 to 49.5 | 5.384 (136.8) | 5.947 (151.1) | 97,600 (44 270) | 10,000 (68.95) |
| 7 | 5.65 (143.5) | 2.37 (60.2) | 17 to 38 | 5.920 (150.4) | 6.538 (166.1) | 148,600 (67 404) | 10,000 (68.95) |
| 7 5/8 | 6.35 (161.3) | 2.37 (60.2) | 20 to 39 | 6.509 (165.3) | 7.224 (183.5) | 148,500 (67 385) | 10,000 (68.95) |
| 7 3/4 | 6.22 (158.0) | 2.37 (60.2) | 46.1 | 6.694 (170.0) | 6.427 (163.2) | 148,500 (67 358) | 10,000 (68.95) |
| 8 5/8 | 7.04 (178.8) | 2.62 (66.5) | 44 to 56 | 7.313 (185.8) | 7.625 (193.7) | 215,640 (97 813) | 7,500 (51.71) |
| 0.5/0 | 6.75 (171.4) | 2.37 (60.2) | 58.7 to 68.1 | 7.001 (177.8) | 7.251 (184.2) | 313,600 (142 247) | 7,500 (51.71) |
| 9.5/8 | 8.15 (207.0) | 2.87 (72.9) | 36 to 53.5 | 8.403 (213.4) | 9.049 (229.8) | 407,400 (184 794) | 7,500 (51.71) |
| 5 5/6 | 7.80 (198.1) | 2.87 (72.9) | 40 to 71.8 | 8.125 (206.4) | 8.835 (224.4) | 341,900 (155 083) | 7,500 (51.71) |
| 10 3/4 | 9.07 (230.4) | 3.00 (76.2) | 55.5 to 80.8 | 9.250 (235.0) | 9.760 (247.9) | 524,600 (237 955) | 5,000 (34.47) |
| 11 3/4 | 10.40 (264.2) | 3.00 (76.2) | 47 to 71 | 10.438 (265.1) | 11.151 (283.2) | 524,600 (237 955) | 5,000 (34.47) |
| 13 3/8 | 11.94 (303.3) | 3.75 (95.2) | 54.5 to 72 | 12.203 (310.0) | 12.783 (324.7) | 651,300 (295 424) | 3,000 (20.68) |
| 10 0/0 | 11.50 (292.1) | 3.75 (95.2) | 72 to 98 | 11.937 (303.2) | 12.347 (313.6) | 651,300 (295 424) | 3,000 (20.68) |

CHAMP® IV Retrievable Packers

Note: Although other sizes might be available, these sizes are the most common.

CHAMP® IV Non-Rotational Retrievable Packers

| Casing Size in. | Packer OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|--------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| 7 | 5.65 (143.5) | 2.37 (60.2) | 26 to 35 | 6.004 (152.5) | 6.538 (166.1) | 148,600 (67 403) | 10,600 (73.08) |
| 7 | 6.00 (152.4) | 2.30 (58.4) | 26 | 6.276 (159.4) | 6.276 (159.4) | 131,900 (59 829) | 10,000 (68.95) |
| 9 5/8 | 8.25 (209.6) | 2.87 (72.8) | 36 to 53.5 | 8.535 (216.8) | 8.921 (226.6) | 345,000 (156 489) | 8,700 (59.98) |
| 9 5/8 | 7.80 (198.1) | 2.87 (72.8) | 58.4 to 71.8 | 8.125 (206.4) | 8.435 (214.2) | 345,000 (156 489) | 7,500 (51.71) |

CHAMP® IV Non-Rotational Restricted-Set Retrievable Packer

| Casing | Packer | Packer | Nominal | Minimum | Maximum | Tensile | Maximum |
|--------|-----------------|----------------|---------------|------------------|------------------|---------------------|-------------------|
| Size | OD | ID | Casing Weight | Casing ID | Casing ID | Rating | Working Pressure |
| in. | in. (mm) | in. (mm) | Ib/ft | in. (mm) | in. (mm) | Ib (kg) | psi (MPa) |
| 7 | 5.75 (146.1) | 2.30 (58.4) | 26 to 35 | 6.004 (152.5) | 6.276 (159.4) | 131,915 (59 835) | 10,000 (68.95) |

CHAMP[®] V Retrievable Packers

| Casing Size in. | Packer OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|--------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| 7 | 5.75 (146.1) | 2.25 (57.2) | 29 to 35 | 6.004 (152.5) | 6.201 (157.5) | 163,330 (74 085) | 15,000 (103.42) |
| 7 5/8 | 6.00 (152.4) | 2.25 (57.2) | 47.1 to 51.2 | 6.251 (158.8) | 6.375 (161.9) | 163,330 (74 085) | 15,000 (103.42) |
| , 0,0 | 6.25 (158.8) | 2.25 (57.2) | 39 to 42.8 | 6.501 (165.1) | 6.625 (168.3) | 163,330 (74 085) | 15,000 (103.42) |
| 9 5/8 | 8.165 (207.4) | 3.00 (76.2) | 47 to 61.1 | 8.231 (209.1) | 8.681 (220.5) | 340,000 (154 221) | 15,000 (103.42) |

| Casing | Packer | Packer | Nominal | Minimum | Maximum | Tensile | Maximum |
|--------|------------------|----------------|---------------|------------------|------------------|----------------------|--------------------|
| Size | OD | ID | Casing Weight | Casing ID | Casing ID | Rating | Working Pressure |
| in. | in. (mm) | in. (mm) | Ib/ft | in. (mm) | in. (mm) | Ib (kg) | psi (MPa) |
| 9 7/8 | 8.165 (207.4) | 3.00 (76.2) | 62.8 | 8.480 (215.4) | 8.632 (219.3) | 340,000 (154 221) | 15,000 (103.42) |
| 10 3/4 | 8.165 | 3.00 | 91.2 to 109 | 8.434 | 9.032 | 340,000 | 15,000 |
| HW | (207.4) | (76.2) | | (214.2) | (229.4) | (154 221) | (103.42) |

CHAMP[®] V Retrievable Packers

Note: Although other sizes might be available, these sizes are the most common.

CHAMP® V 15K Non-Rotational Retrievable Packers

| Casing Size in. | Packer OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Temperature Rating °F (°C) | Maximum Working Pressure psi (bar) | Absolute Pressure psi (bar) |
|-----------------------|--------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|----------------------------------|--|-----------------------------------|
| 7 | 5.75 (146.1) | 2.00 (50.8) | 29 to 35 | 6.004 (152.5) | 6.184 (157.1) | 150,000 (68 038) | 400 (204.4) | 15,000 (1034) | 25,000 (1724) |
| 7 5/8 | 6.62 (161.8) | 2.25 (57.2) | 29.7 to 39 | 6.625 (168.3) | 6.875 (174.6) | 150,000 (68 038) | 400 (204.4) | 15,000 (1034) | 25,000 (1724) |
| 9 5/8 | 8.165 (207.4) | 3.00 (76.2) | 47 to 61.1 | 8.231 (209.1) | 8.681 (220.5) | 340,000 (154 221) | 400 (204.4) | 15,000 (1034) | 25,000 (1724) |
| 9 7/8 | 8.165 (207.4) | 3.00 (76.2) | 62.8 | 8.480 (215.4) | 8.632 (219.3) | 340,000 (154 221) | 400 (204.4) | 15,000 (1034) | 25,000 (1724) |
| 10 3/4 HW | 8.165 (207.4) | 3.00 (76.2) | 91.2 to 109 | 8.434 (214.2) | 9.032 (229.4) | 340,000 (154 221) | 400 (204.4) | 15,000 (1034) | 25,000 (1724) |

Note: Although other sizes might be available, these sizes are the most common.

PinPoint Injection (PPI) Packers

| Casing Size in. | Main Body OD in. (mm) | Packer ID in. (mm) | Nominal Casing Weight Ib/ft | Minimum Casing ID in. (mm) | Maximum Casing ID in. (mm) | Tensile Rating Ib (kg) | Maximum Working Pressure psi (MPa) |
|-----------------------|-----------------------------|--------------------------|-----------------------------------|----------------------------------|----------------------------------|------------------------------|--|
| 4 | 3.18 (80.8) | 0.805 (20.4) | 9.5 to 11.6 | 3.350 (85.1) | 3.599 (91.4) | 73,959 (33 584) | 10,000 (68.95) |
| | 3.89 (98.8) | 1.50 (38.1) | 9.5 | 3.941 (100.1) | 4.154 (105.1) | 77,077 (34 962) | 10,000 (68.95) |
| 4 1/2 | 3.75 (95.3) | 1.50 (38.1) | 11.6 to 13.5 | 3.852 (97.9) | 4.041 (102.6) | 77,077 (34 962) | 10,000 (68.95) |
| | 3.55 (90.2) | 1.50 (38.1) | 15.1 to 17.1 | 3.657 (92.9) | 3.903 (99.1) | 107,059 (48 562) | 10,000 (68.95) |
| | 4.25 (108.0) | 1.50 (38.1) | 11.5 to 13 | 4.430 (112.5) | 4.560 (115.8) | 84,649 (38 397) | 10,000 (68.95) |
| 5 | 4.06 (103.1) | 1.50 (38.1) | 15 to 18 | 4.194 (106.5) | 4.486 (113.9) | 86,026 (39 021) | 10,000 (68.95) |
| 5 | 3.89 (98.8) | 1.50 (38.1) | 21.4 | 4.031 (102.4) | 4.219 (107.2) | 77,077 (34 962) | 10,000 (68.95) |
| | 3.78 (95.3) | 1.50 (38.1) | 23.2 | 3.945 (100.2) | 4.145 (105.3) | 77,077 (34 962) | 10,000 (68.95) |
| | 4.55 (115.6) | 1.50 (38.1) | 13 to 20 | 4.694 (119.2) | 5.102 (129.6) | 142,344 (64 567) | 10,000 (68.95) |
| 5 1/2 | 4.40 (111.8) | 1.50 (38.1) | 20 to 23 | 4.577 (116.3) | 4.867 (123.6) | 84,649 (38 397) | 10,000 (68.95) |
| | 4.25 (107.9) | 1.50 (38.1) | 23 to 26 | 4.444 (112.9) | 4.765 (121.0) | 84,649 (38 397) | 10,000 (68.95) |
| 6 5/8 | 5.65 (143.5) | 1.50 (38.1) | 17 to 20 | 5.799 (147.3) | 6.551 (166.4) | 160,810 (72 943) | 10,000 (68.95) |
| 7 | 5.65 (143.5) | 1.50 (38.1) | 17 to 38 | 5.799 (147.3) | 6.551 (166.4) | 160,810 (72 943) | 10,000 (68.95) |
| 1 | 5.25 (133.4) | 1.50 (38.1) | 49.5 | 5.384 (136.8) | 5.701 (144.8) | 133,208 (60 423) | 10,000 (68.95) |
| 7 5/8 | 6.35 (161.3) | 1.50 (38.1) | 24 to 39 | 6.509 (165.3) | 7.129 (181.1) | 160,810 (72 943) | 10,000 (68.95) |
| 8 5/8 | 7.31 (185.7) | 1.50 (38.1) | 24 to 49 | 7.381 (187.5) | 8.207 (208.5) | 237,218 (107 602) | 7,500 (51.71) |
| 9 5/8 | 8.25 (209.6) | 1.50 (38.1) | 36 to 53.5 | 8.403 (213.4) | 9.049 (229.9) | 379,267 (172 036) | 7,500 (51.71) |

Specialty Tools



Specialty Tools have unique features and characteristics because they are designed as a unique solution for a designated customer or group of customers. These tools have been developed to meet specific requirements or certain market demands.

Specialty Tools are generally run in conjunction with other Halliburton service tools to improve overall job quality or lower overall job costs.



Completion Tools

Selective Injection Packer (SIP) Tool

Used most often in mature fields and conventional wells, the Selective Injection Packer (SIP) tool's main purpose is to open clogged or restricted perforations to re-establish communication with the producing formation.

The tool has opposing cups that isolate perforations for chemical treatments or perforation washing. Normal spacing between the cups is 1 ft; however, spacing can be expanded, if required.

Some methods, such as a ball-and-seat or ball valve, must be used to close off the center opening below the tool and force treating or washing fluid through ports between the cups.

A concentric bypass built into the SIP tool allows pressure to equalize from the annulus above to the annulus below the bottom cup. Fluid flows through the bypass, under the tool, and pushes the ball up.

Circulating valves are designed specifically for use with SIP tools. These ball-drop valves require approximately 1,350 psi (93.08 MPa) pressure to open.

- » Opens restricted perforations
- » Removes near-wellbore damage
- » Helps return well to maximum production
- » Optimizes total recovery
- » Ball-and-seat arrangement or optional ball valves that close off the bottom of the tubing below the SIP tool assembly
- » Reversing valve that drains the tubing when tools are removed from the well (either a ball-drop circulating valve or an RTTS[®]-type circulating valve)
- » Treating packer and/or RFC[®] III valve, either of which is useful during chemical treatment processes



Selective Injection Packer (SIP) Tool



RFC[®] III Valve

The RFC[®] III retrievable fluid control valve controls the amount of fluid pumped into a formation, allowing treatment of a completed well without pulling the tubing. The valve is preset to operate at a specific pressure and allows precise amounts of fluid to be pumped through tubing into a formation.

The RFC III valve can be used for various purposes including:

- » Scale removal operations
- » Chemical treatment
- » Acidizing with jet tools on long openhole intervals or multiple sets of perforations

The RFC III valve can be run in and retrieved on sandline, wireline, and slickline, or it can be dropped directly into the tubing for simplicity and ease of operation. If the shoe and seal ring are changed, then one tool can be used in either 2 3/8-in. EUE or 2 7/8-in. EUE tubing, making it more versatile.

When used in low-fluid-level wells, the RFC III valve prevents the loss of excess chemicals, reducing both waste and costs. The valve also allows for the removal of the final displacement fluid after a treating job, without subjecting the formation to the displacement fluid. Should scale or other downhole conditions cause difficulty with the tool, it can be removed and replaced without pulling the tubing string.

- » Full range of closing pressures from 1,500 to 7,100 psi
- » Hardened ball and seat to minimize fluid cutting issues
- » Can be used to wash openhole sections below tubing
- » Adjustable operating pressure feature allows controlled opening for various depths and fluid weights
- » Can be used separately or in conjunction with packers or Hydra-Jet[™] tools
- » Can be run in, removed, and replaced without pulling the tubing string





Indicating Ball Catcher System

Cement/scale buildup in the workstring and inaccurate fluid placement have continuously caused problems during industry operations. The plugging of bits or downhole assemblies and over-displacement are examples of such issues. Costs of replacing a workstring and reaming out cement sheaths can be significant, particularly for offshore operations. The Halliburton Indicating Ball Catcher System helps minimize these issues.

Features and Benefits

- » Reduces costs through accurate fluid placement
- » Provides positive surface indication of displacement
- » Reduces costly cement/ scale cleanup
- » Capable of multiple squeeze jobs without tripping pipe
- » Separates incompatible fluids in the workstring and highly deviated or horizontal wells
- » Enables wiping of tapered tubing string
- » Reduces over-displacement occurrence
- » Compatible with circulation and reverse circulation
- » Can be run with retrievable or drillable packers
- » Configuration includes ball catcher, launching and retrieving head, and rubber wiper balls

Ball Catcher

The indicating ball catcher is designed to provide a positive indication of displacement volume and can retain multiple balls. This tool incorporates a reduced orifice at the top of the ball catcher to produce the pressure indication. Once the wiper ball is pumped through the orifice restriction, it enters the largerdiameter retaining chamber. The retaining chamber is designed with a lower orifice that retains the wiper balls and enables continued circulation and/or reverse circulation. Rates in excess of 5 bbl/min (3.15 m³/min) with a pressure drop less than 500 psi (3.45 MPa) have been achieved during field operations. Currently, the ball catcher is available in 2 3/8-in. (60.3-mm) through 6 5/8-in. (168.3-mm) sizes.

Launching and Retrieving Head

The launching and retrieving head facilitates wiper ball placement into the smaller-diameter workstring. A ported nipple within the head enables wiper ball retrieval at the surface if reverse circulation is required before the ball reaches the indicating ball catcher. As a result, the cement slurry can be reversed out of the workstring without shutdown.

Wiper Ball

The wiper ball consists of a 50-durometer nitrile compound. This compound provides the flexibility and durability necessary for proper workstring wiping. The wiper balls are available in 2.50-in. (63.5-mm) through 6.3-in. (160-mm) sizes.



Indicating Ball Catcher System



Specialty Tools Tables

Following are the specifications tables for the Specialty Tools. The values of tensile, burst, and collapse strength are calculated with new tool conditions, Lame's formulas with von Mises Distortion Energy Theory for burst and collapse strength, and stress area calculations for tensile strength.

These ratings are guidelines only. For more information, consult your local Halliburton representative.

| Casing Size in. | Casing Weight Ib/ft | ID in. (mm) | Cup OD in. (mm) | Packer Rings OD in. (mm) | |
|-----------------------|---------------------------|------------------|-----------------------|--------------------------------|--|
| 3 1/2 | 9.20 | 2.992 (76.0) | 3.03 | 2.62 | |
| 0 1/2 | 10.20 | 2.992 (76.0) | (77.0) | (66.5) | |
| | 9.50 | 4.090 (103.9) | | | |
| | 10.50 | 4.052 (102.9) | 4.10 (104.1) | 3.78 (96.0) | |
| 4 1/2 | 11.60 | 4.000 (101.6) | | | |
| | 13.50 | 3.920 (99.6) | 3.95 | 3.62 | |
| | 15.10 | 3.826 (97.2) | (100.3) | (91.9) | |
| | 11.50 | 4.560 (115.8) | 4.60 | 4.25 | |
| | 13.00 | 4.494 (114.1) | (116.8) | (107.9) | |
| 5 | 15.00 | 4.408 (112.0) | 4.45 | 4.00 (101.6) 3.90 | |
| | 18.00 | 4.276 (108.6) | (113.0) 4.31 | | |
| | 21.00 | 4.154 (105.5) | (109.5) | (99.1) | |
| | 15.50 | 4.950 (125.7) | 4.98 | 4.62 | |
| | 17.00 | 4.892 (124.3) | (126.5) | (117.3) | |
| | 20.00 | 4.778 (121.4) | 4.81 | 4.42 | |
| | 23.00 | 4.670 (118.6) | (122.2) | (112.3) | |
| 5 1/2 | 13.00 | 5.044 (128.1) | 5.04 | 4.60 | |
| | 14.00 | 5.012 (127.3) | (128.0) | (116.8) | |
| | 15.50 | 4.950 (125.7) | 4.98 | 4.60 | |
| | 17.00 | 4.892 (124.3) | (126.5) | (116.8) | |
| | 20.00 | 4.778 (121.4) | 4.808 (122.1) | 4.60 (116.8) | |
| | 17.00 | 6.538 (166.1) | 6.578 | 6.00 | |
| | 20.00 | 6.456 (164.0) | (167.1) | (152.4) | |
| 7 | 23.00 | 6.366 (161.7) | 6.416 (163.0) | 6.00 (152.4) | |
| | 26.00 | 6.276 (159.4) | 6.306 | 5.75 | |
| | 29.00 | 6.184 (157.1) | (160.2) | (146.0) | |

Selective Injection Packer (SIP) Tools


| Casing Size in. | Casing Weight Ib/ft | ID in. (mm) | Cup OD in. (mm) | Packer Rings OD in. (mm) | |
|-----------------------|---------------------------|------------------|-----------------------|--------------------------------|--|
| | 32.00 | 6.094 (154.8) | | | |
| 7 | 35.00 | 6.004 (152.5) | 6.124 (155.5) | 5.65 (143.5) | |
| | 38.00 | 5.920 (150.4) | | | |
| | 26.40 | 6.969 (177.0) | 7.055 (179.2) | 6.50 (165.1) | |
| 7 5/9 | 29.70 | 6.875 (174.6) | 6.905 | 6.35 | |
| 7 5/8 | 33.70 | 6.675 (169.5) | (175.4) | (161.3) | |
| | 39.00 | 6.625 (168.3) | 6.655 (169.0) | 6.20 (157.5) | |
| | 29.30 | 9.063 (230.2) | 9.113 | 8.50 | |
| | 32.30 | 9.001 (228.6) | (231.5) | (215.9) | |
| 9.5/9 | 36.00 | 8.921 (226.6) | 8.951 | 8.50 | |
| 9 5/8 | 40.00 | 8.835 (224.4) | (227.4) | (215.9) | |
| | 43.50 | 8.755 (222.4) | 8.785 | 8.18 | |
| | 47.00 | 8.681 (220.5) | (223.1) | (207.8) | |

Selective Injection Packer (SIP) Tools

RFC[®] III Valve

| Casing | Main | Retrieving | Length | | | |
|----------------|---------------------|---------------------|---|--|--|--|
| Size in. | Body OD in. (mm) | Head OD in. (mm) | Zero Auxiliary Spring Assemblies in. (mm) | One Auxiliary Spring Assembly in. (mm) | Two Auxiliary Spring Assemblies in. (mm) | |
| 2 3/8 to 2 7/8 | 1.52 (38.6) | 0.625 (15.9) | 46.08 (1170.4) | 58.28 (1480.3) | 70.48 (1790.2) | |

Indicating Ball Catcher System

| Tubing/ Casing Size in. | Maximum OD in. (mm) | ID (Ball Passage) in. (mm) | ID End (Ball Passage) Connections | |
|-------------------------------|---------------------------|----------------------------------|--------------------------------------|-----------------------------------|
| 2 3/8 | 3.63 (92.2) | 1.10 (27.9) | 1.10 (27.9) 2 3/8-in. 8 RD EU | |
| 2 7/8 | 3.63 (92.2) | 1.40 (35.6) | 2 7/8-in. 8 RD EU | 3.00 (4 ea) |
| 3 1/2 | 4.75 (120.7) | 1.75 (44.5) | 3 1/2-in. API IFTJ | 3.50 (3 ea) |
| 3 1/2 | 4.75 (120.7) | 2.00 (50.8) | 3 1/2-in. API IFTJ | 3.50 (10 ea) |
| 4 1/2 | 5.35 (133.4) | 2.00 (50.8) | 4 1/2-in. XT-M40 | 4.50 (7 ea) |
| 4 1/2 | 6.25 (158.8) | 2.00 (50.8) | 4 1/2-in. API IFTJ | 4.50 (3 ea) |
| 5 1/2 | 7.25 (184.2) | 2.50 (63.5) | 5 1/2-in. HT-55TJ | 5.00 (4 ea) |
| 5 1/2 | 7.25 (184.2) | 2.50 (63.5) | 5 1/2-in. XT-57 TJ | 5.00/5.50/6.3 (4 ea/3 ea/2 ea) |
| 6 5/8 | 8.50 (215.9) | 3.25 (82.6) | 6 5/8-in. FHTJ | 6.3 (4 ea) |
| 6 5/8 | 8.50 (215.9) | 3.25 (82.6) | 6 5/8-in. FHTJ | 6.3 (10 ea) |

HALLIBURTON



Wellbore Cleaning Technology



Introduction

Halliburton CleanWell[®] system technology specializes in rotational, single-trip mechanical wellbore cleaning solutions designed to deliver value-driven results throughout the well construction process. Understanding the evolution of this service and the limitations of existing technology in the market has driven our innovative tool designs.

CleanWell systems help reduce mechanical risk, promote rig time savings, and allow both technical and operational efficiencies.

Service quality, product reliability, commercial competitiveness, and superior project results are some of the reasons our clients have chosen and continue to use CleanWell system technology.



Casing Cleaning Tools

Drill Tech[®] Casing Scraper

The CleanWell[®] Drill Tech[®] casing scraper is designed with rotational features to mechanically assist in cleaning wellbore casings by scouring and removing mud film and other restrictive material from the inner casing wall diameters.

The tool can be run as a standalone device for cleanout runs where plugback total depth might need to be established or integrated into a single-trip system in combination with other wellbore cleaning tools. A rotational system is required to address debris and restrictions that might be encountered in downhole environments.

Features and Benefits

- » Robust, rotational cleaning
- » Integral mandrel
- Smooth inner bore
- No internal connections or upsets
- » Greater than 360° casing coverage without rotation
- » Casing-friendly blade design
- » Large ID to minimize pressure drop
- » Fixed and spring-loaded 25° blades
- Independent finger action
- » API and premium connections available
- » Adaptable stabilizers
 - Standard stabilizers
 - Tapered mill sleeve
 - Top dress mill sleeve
- » Stress concentration management
- » No external bolts or fasteners
- » Technical specifications validated through finite element analysis modeling

Drill Tech® Casing Scrapers

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 16 to 20 | 200 | 120 | 90 | 50 |
| 11 3/4 to 13 5/8 | 200 | 120 | 90 | 50 |
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 |
| 5 to 5 1/2 | 200 | 120 | 90 | 15 |



Drill Tech[®] Casing Scraper



Bristle Tech® Brush

The CleanWell[®] Bristle Tech[®] brush tool is designed to mechanically assist in cleaning wellbore casings by polishing and removing mud film and other restrictive material from inner casing wall diameters.

The brush can be run as a standalone device for cleanout runs when clear fluid is present in the wellbore or can be integrated into a single-trip system in combination with other wellbore cleaning tools for typical mud displacements.

Features and Benefits

- » Robust, rotational cleaning
- » Integral mandrel
- Smooth inner bore
- No internal connections or upsets
- » Casing-friendly blade design
- » Greater than 360° casing coverage without rotation
- » Large ID to maximize flow area
- » Fixed 25° blades
- Independent finger action
- Short, twisted, and crimped wire
- Superior ovality and radial contact
- » API and premium connections available
- » Stress concentration management
- » No external bolts or fasteners
- » Technical specifications validated though finite element analysis modeling

Bristle Tech® Brush

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 11 3/4 to 13 5/8 | 200 | 120 | 90 | 50 |
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 |





Combo Tech® Scraper/Brush

The CleanWell[®] Combo Tech[®] scraper/brush tool is designed to mechanically assist in cleaning wellbore casings by scouring, polishing, and removing mud film and other restrictive material from the inner casing wall diameters. The Combo Tech tool can be run as a standalone device for cleanout runs where plugback total depth might need to be established, or it can be integrated into a single-trip system in combination with other wellbore cleaning tools. The adaptable cleaning features and components allow the tool to be built as required for the application of use.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections
- » Large ID to minimize pressure drop
- » Maximum radial total flow area
- » Non-rotating stabilizers available
- » Rotating cleaning features
- » Fixed and spring-loaded scraper blades

Combo Tech® Scraper/Brush

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 9 5/8 | 200 | 120 | 90 | 50 |
| 7 to 7 5/8 | 200 | 120 | 90 | 35 |



Combo Tech® Scraper/Brush



Drill Tech® Deburr Mill

The CleanWell[®] Drill Tech[®] deburr mill is a specialized version of the standard Drill Tech scraper. It is designed to remove burrs and leftover materials on the casing ID as a result of perforating operations.

The stabilizer sleeves assist in restoring drift, while the carburized saw tooth blades restore the casing ID. The tool can be run as a standalone device for post-perforation deburring operations, although it is recommended to be run in combination with other wellbore cleaning tools for optimal debris removal. The tool is ideal for any operations that precede running a packer or multiple packers through a perforation zone.

Features and Benefits

- » Robust
- » Integral mandrel shared with the standard Drill Tech scraper
- Hardened, carburized (8620) saw tooth blades
 Cutting relief feature behind primary cutting edge
- » Tungsten carbide edged stabilizer sleeves
 - Narrow stabilizer blades to take smaller "bites" while milling and restoring drift and preventing torque spikes and hangups while deburring
 - Increased milling surface compared to regular stabilizer sleeves
- » Technical specifications validated through finite element analysis modeling



Drill Tech® Deburr Mills

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Recommended Deburring Rotational Speed RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|---|
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 30 to 60 | 50 |
| 7 to 7 5/8 | 200 | 120 | 90 | 30 to 60 | 35 |



Spiral Wrap String Mill

The CleanWell[®] Spiral Wrap String Mill is designed to restore casing drift and downsize debris generated during cased-hole milling or drilling applications. The mill design provides a 360° smooth overlap OD when descending or ascending in the wellbore. Both upper and lower lead-tapered edges are dressed with tungsten carbide, and the rotational edge of the maximum OD is also dressed with tungsten carbide for restriction engagement and removal.

The mill is offered in opposing pitch options (left and right hand). The mill is used in a variety of applications ranging from common single-trip drillout displacements to deburring post-perforation specialty runs. The mill can be run as a standalone device for cleanout runs or more commonly integrated with other mechanical wellbore cleanout tools during various phases of the well construction process.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections or upsets
- » Full 360° wrap at maximum OD
- » Smooth, casing-friendly maximum OD
- » Tungsten carbide tapered ends
- » Specialty sizes and designs available
- » Stress concentration management

Spiral Wrap String Mill

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 16 to 20 | 200 | 120 | 90 | 50 |
| 11 3/4 to 13 5/8 | 200 | 120 | 90 | 50 |
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 |
| 5 to 5 1/2 | 200 | 120 | 90 | 15 |





Debris Extraction Tools

Vali Tech® Downhole Mechanical Filter

The CleanWell[®] Vali Tech[®] downhole filter tool is designed to provide a mechanical alternative for collecting solid contaminates remaining in vertical or deviated wellbores. The robust filter tube design helps eliminate wire-wrapped screen concerns while allowing for improved operating specifications.

The Vali Tech filter includes a fluid interrupter sleeve (FIS) that provides a protected, redundant wiper diverter system designed to mitigate tearing, ripping, or damage concerns. The upper location of the FIS prevents potential debris loss.

The innovative modulating valve allows fluid bypass should the collection chamber become full and helps prevent swabbing concerns. This system is also designed to eliminate the need for other ball-drop bypass valves.

The Vali Tech filter is ideal for highly deviated wellbores where solids tend to settle on the low side or when unfavorable hydraulics are present. The tool can be run as a standalone device for specialty intervention runs or integrated into a single-trip system in combination with other wellbore cleaning tools.

Features and Benefits

- » Robust
- » Integral mandrel
- » Large ID to minimize pressure drop
- » Stabilized for positive centralization and protection
- » Allows for reverse circulating when required
- » No spring-loaded valves to remain lodged open below the filter chamber
- » Robust filter sleeve
 - Elimination of wire-wrapped screens
 - Increased operating specifications
- » FIS (diverter)
 - Shifting sleeve design
- Self-centralizing
- » Self-modulating bypass
 - Helps eliminate swabbing potential
 - Provides regulated bypass



Vali Tech® Downhole Mechanical Filters

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb | Tool Debris Capacity ft ³ (L) |
|-----------------------|---------------------------------|--|--|---|---|
| 11 3/4 to 13 5/8 | 200 | 120 | 90 | 50 | 1.171 (33.16) |
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 | 0.984 (27.86) |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 | 0.572 (16.2) |

HALLIBURTON



Vor Tech[®] Casing Junk Basket

The CleanWell® Vor Tech® casing junk basket is designed to assist in capturing larger debris or solids that cannot be circulated out of the casing because of volume challenges or unfavorable hydraulics. This cost-effective solution is designed to create a vortex effect that promotes solids dropping out of circulation and into the large upper collection throat.

The Vor Tech basket is typically run in conjunction with other downhole tools, such as the Drill Tech® casing scraper or Bristle Tech® brush. It can be integrated into a single-trip system in combination with other wellbore cleaning tools during the displacement process or specialty intervention runs.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
- No internal connections or upsets
- » Large ID to minimize pressure drop
- » Large upper throat/opening for easy debris entry
- » API and premium connections available

Vor Tech® Casing Junk Baskets

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 |
| 5 to 5 1/2 | 200 | 120 | 90 | 15 |





Completion Tools

Mag Tech[®] Casing Magnet

The CleanWell® Mag Tech® casing magnet is designed to assist in collecting ferrous or non-ferrous material that has become magnetically charged because of pipe rotation during the displacement process. The casing magnet is designed to run in conjunction with the Drill Tech® casing scraper, Bristle Tech® brush, Vali Tech® downhole filter, and other casing cleaning tools in displacement, drilling, or other intervention applications. The neodymium bar magnets are high-energy and extremely strong. Magnet strength combined with good stabilization and a large surface collection area provide for large volume recoveries.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections or upsets
- » Large ID to minimize pressure drop
- » Large surface collection area
- » Stabilizers maximize debris retention volume
- » API and premium connections available
- » No external bolts or fasteners
- » Neodymium for standard service and samarium cobalt available for high-temperature applications

Mag Tech® Casing Magnets

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 11 3/4 to 13 5/8 | 200 | 120 | 90 | 50 |
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 |
| 4 1/2 to 5 1/2 | 200 | 120 | 90 | 15 |





PowerMag® and PowerMag II Magnets

The CleanWell® PowerMag® magnet is designed to assist in collecting ferrous or non-ferrous material that has become magnetically charged because of pipe rotation or movement during displacement, drilling, or intervention runs. Fashioned from integral drill collar bar stock with high-tensile, high-torsion strength, the tool has a large ID to minimize pressure loss. Recessed, flat magnet sections provide more than 2,800 in. of surface collection area. The tool is equipped with powerful neodymium bar magnets. Integral body water coursing provides high flow area but remains streamlined for safely exiting casing or use in various drilling or fishing operations.

The CleanWell PowerMag II magnet is a compact version of the field-proven Halliburton PowerMag magnet. The PowerMag II magnet includes all the features of the original PowerMag magnet, yet in a compact size to allow for quick and easy field installation. It is an economical solution for applications that does not compromise on performance or debris capacity.

Both PowerMag magnet tools can be deployed with other CleanWell systems in displacement cleanout runs, and it is ideal for operations where large amounts of ferrous material are produced or anticipated, such as window milling or post-perforation cleanouts, when flow rates are limited because of fluid loss.

Features and Benefits

- » Robust
- » Integral mandrel
- Smooth inner bore
- No internal connections or upsets
- » Large ID minimizes pressure loss
- » Neodymium for standard service and samarium cobalt available for high-temperature applications
- » Abundant total flow area provides optimal fluid flow, even when at full debris capacity, by alternating between its magnetic and non-magnetic surfaces
- » Undersized integral stabilizers maximize the flow area and the capability to operate in a wide range of casing sizes without changing components
- » Efficient, complete cleanup in minutes on the rig floor or after laying down



| Casing Size in. | Integral Stabilizer Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------------|---------------------------------|--|--|---|
| 7 to 7 5/8 | 5.69 | 200 | 120 | 90 | 35 |
| 9 5/8 to 13 5/8 | 7.625 | 200 | 120 | 90 | 50 |

PowerMag® and PowerMag II Magnets



CleanWell® Vac Tech® and Vac Tech II Downhole Eductor System

The CleanWell[®] Vac Tech[®] and Vac Tech II downhole educator system is designed to induce a reverse circulating system in an isolated area at the bottom of the workstring. This system addresses problematic debris, including fill, cement, formation residual, gun debris, etc., located in complicated well geometries or in situations where debris maintenance or retrieval is less than optimal. The tool is run in hole in the closed position, allowing conventional circulation from the surface to the bottom of the string. Once activated by dropping a ball, two flow loops are created. The lower flow loop lifts solids at the bottom of the string, which are captured in the Vac Tech system collection chambers. Multiple collection chambers can be incorporated depending on the amount of debris expected.

The CleanWell Vac Tech II downhole educator system shows increased tool functionality compared to the original Vac Tech system. The tool activates with a ball drop like the Vac Tech; however, a second ball can be dropped to deactivate the tool and restore flow to the bit. This helps eliminate the need for a separate bypass tool. In addition to allowing a return to conventional circulation, pressure tests on sump packer cleanouts, with a dummy seal assembly, can be performed after Vac Tech system cleaning operations are complete. All sheared components and activation/deactivation balls are captured in an internal ball catcher.

Other mechanical cleaning tools are customarily incorporated into runs with Vac Tech systems to help ensure the successful completion of run objectives.

Features and Benefits

- Isolates before and after cleaning operations (Vac Tech II system)
- » Adjustable nozzle size to modify lower flow loop and surface pressure during operations
- » Calculation sheet available for accurate pre-job planning
- » Eductor power head induces pressure differential to create the debris lifting loop
- » Helps eliminate long interval inefficiencies and limitations potentially created by tailpipe
- » Ideal for post-perforation cleanouts or isolation plug retrieval runs
- » Modular system for safe, efficient debris management
- » 7 7/8-in. and 5 1/4-in. OD eductor systems available



CleanWell[®] Vac Tech[®] Downhole Eductor System

CleanWell® Vac Tech® II Downhole Eductor System

HALLIBURTON

CleanWell[®] Vac Tech[®] System Chambers

The CleanWell[®] Vac Tech[®] system is equipped with modular handling chambers for easy cleaning and safe rig management. The internal, sequential collection system allows mechanical retention ranging from large debris to formation sand.

The chambers are placed below the Vac Tech or Vac Tech II system eductor head. Knockout chambers are placed in the lower portion of the string and are the primary collection area for most debris lifted by the Vac Tech system. The screen chamber is run directly below the eductor head and is the secondary collection area for debris too small or moving at too great of a velocity to be captured in the knockout chamber.

In addition to the two different types of chambers, each knockout and screen chamber has a long and short version. Length selection is driven by the required chamber capacity for the application, as well as rig space/ handling and storage capacity.

Finally, high-pressure chambers are also available and are primarily for use with the Vac Tech II systems. The Vac Tech II system toolstring can be used to pressure test a sump packer with a dummy seal assembly after cleaning operations are complete by isolating the tool in the closed position. To meet the high-pressure test requirements, thicker walled, higher-grade steel, and highpressure collection chambers are required.

Features and Benefits

- » Robust, industry-proven knockout cone system
- » Adjustable debris chambers
- » Filter screen chamber for fine debris
- » Modular system for safe, efficient debris management

| OD Size in. | Length | Туре | Capacity ft ³ |
|----------------|--------|----------|-----------------------------|
| | Short | Screen | 1.48 |
| 7 5/8 | Short | Knockout | 3.25 |
| 7 5/0 | Long | Screen | 2.47 |
| | Long | Knockout | 5.87 |
| | Short | Screen | 0.56 |
| 5 | Short | Knockout | 1.43 |
| 5 | Long | Screen | 1.08 |
| | Long | Knockout | 2.10 |

CleanWell® Vac Tech® Collection Chambers



CleanWell® Vac Tech® System Screen Chamber

CleanWell[®] Vac Tech[®] System Knockout Chamber



Completion Tools

Jetting and Bypass Tools

Jet Tech[®] Slimline Valve

The CleanWell[®] Jet Tech[®] slimline valve is designed to flush subsea blowout preventers and wellheads. Its slimline OD helps eliminate critical space out concerns when deploying single-trip mechanical displacements. The valve is equipped with jet nozzles for optimal impact forces for effective flushing of cavities or profiles.

The Jet Tech valve provides large ID benefits both before and after activation to minimize pressure drop when circulating during the displacement process.

Features and Benefits

- » Robust
- » One full open/close cycle available
- » Slimline body OD with eight phased jets
- » 5 1/16-in. and 7 1/16-in. jet nozzles available
- » Built in the open or closed position
- » When functioned, the tool locks in position so the valve cannot be shifted by fluid flow
- » Steel ball activation, dart or ball deactivation
- » Multiple tools can be run in line for additional cycles
- » Rated to 5,000-psi differential pressure
- » API and premium connections available

Jet Tech® Slimline Valves

| Tool Size OD in. | Ball OD in. | Activation Rate bbl/min | Deactivation Rate bbl/min | Ball Seat ID in. | Jetting Total Flow Area in. ² |
|------------------------|-------------------|-------------------------------|---------------------------------|------------------------|---|
| 6 3/4 | 2.75 | 8 | 3 (Dart), 12 to 15 (Ball) | 2.382 | 1.199 |
| 6 3/4 | 2.25 | 8 | 12 to 15 (Ball) | 1.886 | 1.199 |



Jet Tech® Slimline Valve



Jet Sub

The CleanWell[®] Jet Sub is typically used to jet and flush surface blowout preventer cavities or surface wearbushing profiles. The tool remains in the open position and is equipped with a series of phased and nozzled ports. An internal flow choke can be used for flowsplitting applications and can be sized according to optimal hydraulics.

Features and Benefits

- » Simple, robust design
- » Integral body
- » Adjustable inner flow choke
- » Extended body sizes available for customized applications
- » Tool always in open/jetting position

Jet Subs

| Tool Body OD in. | Maximum OD in. | Nozzles | Total Flow Area in.² |
|------------------------|----------------------|---------|----------------------------|
| 7 | 11 | 12 | 1.325 |
| 7 | 10.5 | 12 | 1.325 |
| 7 | 7 | 9 | 0.994 |
| 4.75 | 4.75 | 9 | 0.994 |
| 3.125 | 3.125 | 6 | 0.663 |





16-in. Jet Sub

The CleanWell[®] 16-in. Jet Sub is designed to flush subsea blowout preventers and is equipped with a 16-in. OD outer housing to help ensure optimal jet impact forces and effective cavity flushing. The lower landing nut is profiled to safely engage the wellhead for positive depth correlation.

Features and Benefits

- » Robust
- » Outer housing with phased jets
- » Lower landing nut designed to profile and "no-go" on the subsea wellhead (positive depth correlation)
- » Tool always in the open/jetting position

16-in. Jet Sub

| Tool | Maximum | Nozzles | Total |
|---------|---------|---------|-----------|
| Body OD | OD | | Flow Area |
| in. | in. | | in.² |
| 8.25 | 16 | 24 | 2.65 |



16-in. Jet Sub



Completion Tools

Turbo Tech® II Multi-Activation Bypass Valve

The CleanWell[®] Turbo Tech[®] II compression-activated bypass valve is designed to allow uphole boosting above liner tops during displacement or cleanout interventions. The Turbo Tech II valve promotes best practices for displacement, allowing optimal circulating rates, pipe rotation, and pipe reciprocation while circulating and boosting. It is not required to shut down circulation when activating the tool, which is critical during a displacement.

The Turbo Tech II valve can be activated as often as required and remains in the locked position until cycled again. The valve is typically used when long liners or smaller drillpipe restrictions exist downhole, thus restricting annular velocity and preventing turbulent flow in larger casings uphole.

The Turbo Tech II valve is typically integrated with other mechanical wellbore cleanout tools and can help manage non-productive time associated with poor hydraulics to help improve circulating and overall displacement timelines.

Features and Benefits

- » Robust
- » Compression activated
- » Unlimited cycles
- » Locks open allowing the string to be rotated and reciprocated
- » Repeatable and resettable metering system
 Available in 20, 40, and 60 klb
- » Cycled under pressure not required to shut pumps down to activate
- » 4.46-in.² bypass flow area
- » Rated to 8,000-psi differential pressure before shifting and 5,000-psi differential pressure after shifting
- » High flow rate capability when open in all fluid types



Turbo Tech® II Multi-Activation Bypass Valve



Drain Sub

The CleanWell® Drain Sub is designed to offer a simple and reliable one-time fluid bypass. The tool offers split flow capability or full bypass with flow to the bit blocked, depending on the size of the activation ball used. The tool can be used as a standalone device or along with other CleanWell tools, most commonly with the CleanWell Vac Tech® downhole educator system, to provide an option for conventional circulation after cleanup operations are compete. The tool can be activated by pumping down the activation ball or landing the ball and applying pressure in the event that some portion of the string below the tool has become blocked or flow is impeded.

Features and Benefits

- » Simple, robust design
- » High-torque internal connection
- » Small (2.25 in.) activation ball to block flow to the bit and direct flow out of the ports
- » Large (2.75 in.) activation ball for split flow applications (ports and bit)
- » Rated to 8,000-psi differential pressure
- » 5.31-in.² port flow area
- » High flow rate capability when open in all fluid types





Riser Cleaning Tools

Riser Bristle Tech® Brush

The CleanWell[®] Riser Bristle Tech[®] brush is designed to mechanically assist in cleaning subsea risers by polishing and removing mud film and other restrictive material from the inner wall diameters. The brush provides superior riser wall cleaning without reducing circulating flow area. Fluid flow can either be directed around the tool OD, self cleaning the bristles, or under the brush sleeves helping eliminate the potential for pressure drop.

The Riser Bristle Tech brush can be integrated into a single-trip system in combination with other wellbore cleaning tools during the displacement process. It can also be run as a standalone device for offline riser cleanout runs.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections or upsets
- » Large ID to minimize pressure drop
- » Non-rotational (independent from mandrel)
- » 360° riser coverage per bristle sleeve section (two bristle sleeve sections)
- » API and premium connections available
- » Synthetic or steel bristles available
- » Mitigates surge and swab concerns by maximizing flow area underneath brush carriers
- » Technical specifications validated through finite element analysis modeling

Riser Bristle Tech® Brush

| Riser | Maximum | Maximum |
|-------------|------------|----------------|
| ID | Trip Speed | Rotating Speed |
| in. | ft/min | RPM |
| 15.25 to 20 | 200 | 120 |





Mag Tech[®] Riser Magnet

The CleanWell[®] Mag Tech[®] riser magnet is designed to assist in collecting ferrous or non-ferrous material, which has become magnetically charged because of pipe rotation during the displacement process.

The 16-in. OD riser magnet is designed to run in combination with riser equipment to assist in collecting material removed from the blowout preventer (BOP) cavities during a BOP flush or throughout the displacement process.

Strong, high-energy neodymium bar magnets enable the Mag Tech riser magnet to retain its collection force throughout the displacement process. Good stabilization and large surface collection area provide for highvolume recoveries.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections or upsets
- » Large ID to minimize pressure drop
- » Maximum radial total flow area
- » Non-rotational (independent from mandrel)
- » Excellent standoff for debris retention
- » API and premium connections available
- » Technical specifications validated through finite element analysis modeling

Mag Tech® Riser Magnet

| Riser | Maximum | Maximum |
|----------|------------|----------------|
| ID | Trip Speed | Rotating Speed |
| in. | ft/min | RPM |
| 17 to 20 | 200 | 120 |





Riser Vali Tech® Filter

The CleanWell® Riser Vali Tech® filtering tool is designed to actively recover debris that was unable to be circulated out of the hole before, during, and after displacement from drilling mud to completion fluid. The tool utilizes a fluid interrupter sleeve (FIS) to switch the tool from bypass mode, while circulating conventionally or running the tool in-hole, to a filtering mode when reverse circulating or tripping out-of-hole.

The Riser Vali Tech filter features include a flexible FIS, which provides a redundant wiper diverter system designed to mitigate tearing, ripping, or damage concerns. The flexible design allows the tool to fit through restrictions near surface, while retaining the ability to properly make contact with the riser ID.

The innovative modulating valve allows fluid bypass should the collection chamber become full and helps prevent swabbing concerns. This system is also designed to help eliminate the need for other ball-drop bypass valves.

The Riser Vali Tech filter is typically run in conjunction with CleanWell technology riser systems. It can be run as a standalone device or integrated into a single-trip system in combination with other wellbore cleaning tools during the displacement process.

Features and Benefits

- » Robust
- » Integral mandrel
- » Stabilized for positive centralization and protection
- » Large volume capacity 5.85 ft³ (166 L)
- » Allows for reverse circulating when required
- » Robust filter sleeve
- » Flexible FIS (diverter)
 - Shifting sleeve design
- Redundant wipers
- » Self-modulating bypass
 - Helps eliminate swabbing potential
 - Provides regulated bypass
- » API and premium connections available

Riser Vali Tech® Filter

| Riser | Maximum | Maximum |
|----------------|------------|----------------|
| ID | Trip Speed | Rotating Speed |
| in. | ft/min | RPM |
| 18.75 to 19.75 | 200 | 120 |



Riser Vali Tech® Filter



Vor Tech[®] Riser Junk Bucket

The CleanWell® Vor Tech® riser junk bucket is designed to assist in capturing larger debris or solids that cannot be circulated out of the riser or casing because of volume challenges or unfavorable hydraulics. The riser junk bucket is designed to create a vortex effect that promotes solids dropping out of circulation and into the large upper collection throat.

The Vor Tech riser junk bucket is typically run in conjunction with CleanWell riser systems or other downhole tools, such as the Drill Tech® casing scraper or Bristle Tech® brush. It can be integrated into a single-trip system in combination with other wellbore cleaning tools during the displacement process or specialty intervention runs.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections or upsets
- » Large ID to minimize pressure drop
- » Abundant radial total flow area
- » Large volume capacities
- » Non-rotational bucket
- » Large upper throat/opening for easy debris entry
- » Numerous drain ports
- » API and premium connections available

Vor Tech® Riser Junk Bucket

| Riser | Maximum | Maximum |
|-------------|------------|----------------|
| ID | Trip Speed | Rotating Speed |
| in. | ft/min | RPM |
| 15.25 to 20 | 200 | 120 |





Specialty Tools

Inflow Tech[®] High-Performance Test Packer

The CleanWell® Inflow Tech® High-Performance (HP) test packer is designed to perform isolated negative or positive inflow tests on downhole liner tops. The tool has top and bottom connections and can be run in conjunction with other wellbore cleaning tools promoting single-trip displacement runs.

The Inflow Tech HP test packer is equipped to promote quick trip speeds with generous bypass area under the packer element. Rather than loading the liner top during the inflow test, the slip system helps eliminate the potential for liner-top damage caused by excessive compressional forces and helps manage critical space out issues. These proven components can be used during drilling operations, or more traditionally, during the displacement process.

Features and Benefits

- » Robust
- » Simple slackoff and pickup setting
- Rotational speeds allow up to 80 RPM when tool is not in use
- » Compression-set slip design
- » No liner-top loading
- » Generous bypass area under packer element
- Top seal isolation
- » Increased trip speeds
- » Capable of drilling and milling operations

Inflow Tech® High-Performance (HP) Test Packers

| Casing Size in. | Casing Weight Ib/ft | Differential Pressure Rating psi | Temperature Rating °F | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM |
|-----------------------|---------------------------|---|-----------------------------|---------------------------------|--|
| 13 5/8 | 88.2 | 5,000 | 250 | 150 | 80 |
| 13 3/8 | 48 to 72 | 5,000 | 250 | 150 | 80 |
| 10 3/4 | 55.5 to 65.7 | 6,000 | 300 | 150 | 80 |
| 9 5/8 | 36 to 43.5 | 6,000 | 325 | 150 | 80 |
| 9 5/8 | 47 to 58.4 SD | 8,000 | 350 | 150 | 80 |
| 7 | 23 to 35 | 8,000 | 350 | 150 | 80 |



Inflow Tech® HP Test Packer



Inflow Tech® Test Packer With Setting Control Module

The Setting Control Module enhances the Inflow Tech® packer by repeatedly providing resistance that must be overcome with compression each time the packer is set. This allows the tool to be run in conditions that are challenging for a standard Inflow Tech packer. Such conditions include highly deviated wells with minimal effective weight/tension below the tool, high-flow-rate situations where a risk of the tool setting hydraulically exists, or a combination of the two. The valve in the setting control module resets after each cycle, so the tool is not reliant on string weight/tension provided by drillpipe below the tool. The setting control module is a true addon feature. The Inflow Tech packer can be converted to be run with or without the setting control module when built in the shop with minimal part changes, as the operator's requirements vary by well.

Features and Benefits

- » Robust
- » Compression activated
- » Unlimited cycles
- » Repeatable and resettable metering system
 Available in 20, 40, and 60 klb
- » High-torque internal connections does not introduce any weak points to the Inflow Tech packer assembly
- » Does not reduce differential pressure or temperature rating to the base Inflow Tech packer
- » Allows the Inflow Tech packer to be run in challenging well geometries, while helping eliminate concerns of accidental packer setting

Inflow Tech® Packer With Setting Control Module

| Casing Size in. | Casing Weight Ib/ft | Differential Pressure psi | Temperature Rating °F | Available Set Weight klb |
|-----------------------|---------------------------|---------------------------------|-----------------------------|--------------------------------|
| 9 5/8 | 36 to 58.4 SD | 8,000 | 350 | 20, 40, 60 |
| 9 5/8 | 36 to 43.5 | 6,000 | 325 | 20, 40, 60 |
| 10 3/4 | 55.5 to 65.7 | 6,000 | 300 | 20, 40, 60 |



Inflow Tech® Test Packer With Setting Control Module



StimTech® Long-Stroke Slick Joint

The CleanWell[®] StimTech[®] long-stroke slick joint is designed to mitigate concerns of stripping a tool joint through the annular preventer during frac, gravel pack, tubing-conveyed perforating, or other sequences requiring the back side to remain closed. This slick joint helps with critical space out demands and allows easement for keeping weight down during pumping operations or stripping to cycle downhole valves. This tool protects the annular preventer from damage when stripping by minimizing the mid-tool joint upset.

Features and Benefits

- » Minimized mid-connection upset
- » Range 3 joint length (41 to 43 ft)
- » Large ID to minimize pressure drop
- » Simplified space out
- » No external components (seals, etc.)
- » Reduced mechanical risk
- » Pressure limitation of annular preventer only
- » Multiple joints can be run together to create appropriate length to match operation objectives

StimTech® Long-Stroke Slick Joints

| Tube Tool OD Joint OD in. in. | | Connection |
|-------------------------------------|-------|----------------|
| 5.00 | 5.156 | CT-M43,TSH 533 |
| 5.875 | 6.25 | XT-M46 |
| 6.625 | 6.875 | CT-M57, XT-57 |



StimTech® Long-Stroke Slick Joint



Completion Tools

Tru-Drift[®] Mill Sleeve

The CleanWell[®] Tru-Drift[®] mill sleeve is designed to provide a 360° downhole drift simulation. Water-coursed stabilizers are locked to the integral mandrel, allowing the mill sleeve to be rotated and to mechanically assist in addressing casing tight spots or restrictions. The mill sleeve can be dressed with tapered tungsten mills for aggressive casing ID restoration or standard stabilizers for routine drift validation.

The Tru-Drift mill sleeve can be run in conjunction with other casing cleaning systems. The mill sleeve can save valuable rig time and helps ensure zero non-productive time is incurred when deploying critical OD equipment downhole. Additionally, the sleeve often eliminates the need to make a wireline/gauge ring run subsequent to displacement operations.

Features and Benefits

- » Robust
- » Integral mandrel
 - Smooth inner bore
 - No internal connections or upsets
- » Large ID to minimize pressure drop
- » 360° drift simulation
- » Locking sleeves rotate with pipe, enabling tight spots to be addressed
- » Simulates close tolerance completion equipment
- » API and premium connections available
- » Adaptable stabilizers
 - Standard stabilizers
 - Tapered mill sleeves
- » Technical specifications validated through finite element analysis modeling

Tru-Drift® Mill Sleeves

| Casing Size in. | Maximum Trip Speed ft/min | Maximum Rotating Speed in Tension RPM | Maximum Rotating Speed in Compression RPM | Maximum Compression While Rotating klb |
|-----------------------|---------------------------------|--|--|---|
| 9 5/8 to 10 3/4 | 200 | 120 | 90 | 50 |
| 7 to 8 5/8 | 200 | 120 | 90 | 35 |
| 5 to 5 1/2 | 200 | 120 | 90 | 15 |



Tru-Drift® Mill Sleeve





Completion Tools



Drillable Service Tools



Introduction

This section contains information about tool applications, sizes available, running, setting, and operating drillable tools and related accessories. Drillable Service Tools have many functions including wellbore isolation, stimulation isolation, remedial cementing, and plug and abandonment.

Halliburton is dedicated to providing top-quality equipment and service. Halliburton maintains strict standards and well-documented processes and procedures to help ensure excellence and dependability in our Drillable Service Tools equipment. As the industry leader in composite material products, Halliburton is well suited to deliver high-performance drillable tools for wellbore isolation, stimulation, remedial cementing, and plug and abandonment operations.



Completion Tools

EZ Drill[®] Packers and Bridge Plugs

The EZ Drill[®] line of tools consists of packers and bridge plugs that can be used for applications, such as wellbore isolation, remedial cementing, and plug and abandonment. Halliburton offers two styles of packers: a poppet valve squeeze packer and a sliding valve (SV/SVB) squeeze packer. The poppet valve squeeze packer contains a one-way check valve that allows operators to place cement below the packer and check backflow without the need for workstring manipulation to open or close the poppet valve. The SV squeeze packer can control flow and differential pressure in either direction by workstring manipulation of the sliding valve inside the tool. Using a conversion kit, either of these packers can be altered to create a top-drilling bridge plug capable of holding differential pressure in either direction.

Features and Benefits

- » Can be set mechanically or hydraulically on jointed pipe, coiled tubing, electric wireline, or slickline using the Halliburton DPU[®] downhole power unit
- » Sets in a wide range of casing sizes and grades
- » Effective setting and sealing in elevated temperatures and pressures
- » Tool OD held to a minimum, allowing more clearance between the tool and casing for faster run-in



EZ Drill® Squeeze Packer



| Casing Size in. (mm) | Maximum Casing ID in. (mm) | Minimum Casing ID in. (mm) | Maximum Tool OD in. (mm) | Rated Pressure psi (MPa) | Poppet Valve | Sliding Valve | API 11D1 Qualified |
|----------------------------|----------------------------------|----------------------------------|--------------------------------|--------------------------------|-----------------|------------------|-----------------------|
| 2 7/8 (73.0) | 2.440 (62.0) | 2.320 (58.9) | 2.18 (55.4) | 10,000 (69.0) | х | | |
| 3 1/2 (88.9) | 3.240 (82.3) | 2.890 (73.4) | 2.69 (68.3) | 10,000 (69.0) | х | х | |
| 4 (101.6) | 3.640 (92.5) | 3.320 (84.3) | 3.12 (79.2) | 10,000 (69.0) | х | х | |
| 4 1/2 (114.3) | 3.920 (99.6) | 3.826 (97.2) | 3.58 (90.9) | 10,000 (69.0) | х | х | |
| 5 (127.0) | 4.560 (115.8) | 4.276 (108.6) | 3.97 (100.8) | 10,000 (69.0) | х | х | х |
| 5 1/2 (139.7) | 5.040 (128.0) | 4.670 (118.6) | 4.37 (111.0) | 10,000 (69.0) | х | х | х |
| 6 (152.4) | 5.590 (142.0) | 5.220 (132.6) | 4.87 (123.7) | 10,000 (69.0) | | х | |
| 6 5/8 (168.3) | 5.900 (149.9) | 5.670 (144.0) | 5.32 (135.1) | 10,000 (69.0) | | х | |
| 7 (177.8) | 6.460 (164.1) | 5.900 (149.9) | 5.50 (139.7) | 10,000 (69.0) | х | х | х |
| 7 5/8 (193.7) | 7.125 (181.0) | 6.500 (165.1) | 6.12 (155.4) | 10,000 (69.0) | | х | х |
| 8 5/8 (219.1) | 7.830 (198.9) | 7.310 (185.7) | 6.88 (174.8) | 10,000 (69.0) | | х | |
| 8 5/8 (219.1) | 8.130 (206.5) | 7.450 (189.2) | 7.00 (177.8) | 10,000 (69.0) | | х | |
| 9 5/8 (244.5) | 9.063 (230.2) | 8.157 (207.2) | 7.74 (196.6) | 7,500 (51.7) | | х | х |
| 10 3/4 (273.1) | 9.500 (241.3) | 9.156 (232.6) | 8.69 (220.7) | 7,500 (51.7) | | х | х |
| 10 3/4 (273.1) | 10.192 (258.9) | 9.560 (242.8) | 9.00 (228.6) | 7,500 (51.7) | | х | х |
| 11 3/4 (298.5) | 10.406 (264.3) | 10.282 (261.2) | 9.73 (247.1) | 7,500 (51.7) | | х | |
| 11 3/4 (298.5) | 11.084 (281.5) | 10.438 (265.1) | 9.87 (250.7) | 7,500 (51.7) | | х | |
| 13 3/8 (339.7) | 12.281 (311.9) | 11.907 (302.4) | 11.31 (287.3) | 5,000 (34.5) | | х | |
| 13 3/8 (339.7) | 12.715 (323.0) | 12.281 (311.9) | 11.68 (296.7) | 5,000 (34.5) | | х | х |
| 16 (406.4) | 15.250 (387.4) | 14.688 (373.1) | 13.96 (354.6) | 2,500 (17.2) | | х | х |
| 18 5/8 (473.1) | 18.000 (457.2) | 17.439 (443.0) | 16.80 (426.7) | 2,500 (17.2) | | х | |
| 20 (508.0) | 19.124 (485.7) | 17.938 (455.6) | 17.24 (437.9) | 2,500 (17.2) | | х | |

EZ Drill[®] Packers and Bridge Plugs

These ratings are guidelines only. For more information, contact your local Halliburton representative.



Casing Alignment Tool

Severe corrosive action, excess tensile loading, or joint backoff during drilling operations can part casing strings. Sometimes these parted sections become misaligned, making well operations difficult. In such case, the operator must either abandon further work below this point or realign and stabilize the parted casing, adding extra time and costs to the operation.

Casing Alignment

The Halliburton casing alignment tool has been used to successfully realign and permanently stabilize many parted casing strings. The casing alignment tool is made up by connecting threads at the lower end of the EZ Drill® (poppet valve) squeeze packer. The EZ Drill SVB squeeze packer can be used in conjunction with a poppet-type valve adapter kit. When lowered into the well, the tapered nose of the alignment tool guides the main body into the shifted lower casing. Continued lowering forces the larger, close-fitting outer case of the alignment tool into the lower casing string to align the casing sections.

Casing Stabilization

The EZ Drill (or adapted EZ Drill SVB) squeeze packer is set by tubing or drillpipe to pack off within the upper string. The packer forms an upper seal for placement of permanent stabilizing cement behind the realigned casing and holds the alignment tool in place across the parted section of the casing. Cement slurry is then pumped through the squeeze packer and the alignment tool, filling the casing and the formation annular space surrounding the casing alignment tool. After the cement sets, the squeeze packer, alignment tool, and cement are drilled out using a conventional rock bit, leaving a uniform diameter passage through the casing ID. The new cement barrier also helps isolate the casing interior from formation fluid or gas intrusion.

Equipment

After the problem well is evaluated, the proper alignment tool is built. Casing alignment tools are custom manufactured for specific jobs because of the various diameter/ length combinations possible. Alignment tool ODs vary according to individual casing weights to minimize clearance between the alignment tool and the casing ID. This helps establish minimum alignment variation between upper and lower realigned casing sections. Alignment tool lengths vary because casing separation lengths as well as damaged casing lengths vary. Experience proves that 10 ft of alignment tool should extend into good pipe on both sides of the damaged or parted casing.

As mentioned, the lower end of the EZ Drill (poppet valve) squeeze packers have threads to attach the alignment tool. EZ Drill squeeze packers are not made for casings 7 5/8 in. or larger, so the EZ Drill SVB squeeze packer plus poppet valve conversion kit is necessary to attach the alignment tool. This conversion kit also changes the packer from side discharge to bottom discharge, so cement slurry will flow through the alignment tool and exit at the lower end.

The casing alignment tool is available in 4 1/2-in. to 20-in. sizes.



Casing Alignment Tool



DrillGun[™] Assembly (EZSVB)

The DrillGun[™] assembly is a drillable perforating system that provides reliable, quality performance while lowering overall wellsite costs by:

- » Eliminating the high costs associated with wireline services
- » Eliminating the need to switch to a mud system during workovers

The DrillGun perforating system combines rugged, reliable Halliburton perforating components with the versatility of drillable materials. The DrillGun perforating system is a drillable, disposable system that helps save time and costs.

Components of the drillable perforating system are drillpipe conveyed to the zone of interest, thereby eliminating mobilization or demobilization charges normally associated with wireline units. Additionally, because no mud system is necessary, clear fluids can remain in place during workover operations. When the EZ Drill® SVB packer is set, the firing head is actuated by pressure applied through the tubing. After perforating, the gun can be drilled out using conventional drilling methods.

The drillable perforating system is ideal for:

- » Single-trip perforating, packer placement, and cementing on tubing
- » Cementing and perforating in underbalanced conditions
- » Plug-to-abandon operations
- » Workover cementing with clear fluids
- » Plugback set on wireline
- » Limited-entry drillstem testing

Components of the drillable perforating system include:

- » Aluminum perforating gun
- » High-performance perforating charges
- » Halliburton industry-proven EZ Drill SVB packer
- » Also available in select sizes with Fas Drill[®] SVB and composite gun systems

DrillGun[™] Assembly Perforating

| Tool Size in. | Thread Size and Type in. (mm) | Maximum OD in. (mm) | Maximum Operating Pressure psi (MPa) | Minimum Operating Pressure psi (MPa) | Temperature Rating °F (°C) | Maximum Overall Length ft (m) | Weight Ib (kg) |
|---------------------|-------------------------------------|---------------------------|---|---|----------------------------------|--|-------------------|
| 4 | 2 7/8 EU 8 Rd (73.03 EU 8 Rd) | 4.00 (101.6) | 14,500 (99.98) | 3,500 (24.13) | 350 max. (176.7) | 3.98 (1.213) | 79 (34.0) |
| 7 | 2 7/8 EU 8 Rd (73.03 EU 8 Rd) | 7.00 (177.8) | 14,500 (99.98) | 3,500 (24.13) | 350* (176.7) | 4.10 (1.251) | N/A |

*Dependent on explosives. For use in wells above 350°F, contact a Halliburton TCP Technology representative. These ratings are guidelines only. For more information, contact your local Halliburton representative.

HALLIBURTON



Fas Drill[®] Packers and Bridge Plugs

The Fas Drill[®] line of tools consists of composite packers and bridge plugs that can be used for applications, such as wellbore isolation, stimulation isolation, remedial cementing, and temporary plug and abandonment. Halliburton offers a composite sliding valve (SVB) squeeze packer that can control flow and differential pressure in either direction by workstring manipulation of the sliding valve inside the tool. The Fas Drill bridge plug, manufactured from composite materials, functions similarly to a conventional drillable bridge plug. It is ideal for situations requiring temporary abandonment or where minimal weight is available to remove a conventional metal bridge plug. As with all Halliburton drillable bridge plugs, they are drilled from the top down, providing reliable well control.

Features and Benefits

- » Can be set mechanically or hydraulically on jointed pipe, coiled tubing, electric wireline, or slickline using the Halliburton DPU[®] downhole power unit
- » Sets in a wide range of casing sizes and grades
- » Tool OD held to a minimum, allowing more clearance between the tool and casing for faster run-in
- » Helps save rig time and reduce casing damage caused by long drillout processes
- » Drills out with conventional tricone, PDC, or with junkmill bits



Fas Drill® SVB Squeeze Packer



| Casing Size in. (mm) | Maximum Casing ID in. (mm) | Minimum Casing ID in. (mm) | Maximum Tool OD in. (mm) | Rated Pressure* psi (MPa) | Packer | Bridge Plug |
|----------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------|----------------|
| 2 7/8 (73.0) | 2.440 (62.0) | 2.260 (57.4) | 2.12 (53.8) | 10,000 (69.0) | | х |
| 4 1/2 (114.3) | 3.826 (97.2) | 3.640 (92.5) | 3.44 (87.4) | 10,000 (69.0) | | х |
| 4 1/2 (114.3) | 4.090 (103.9) | 3.920 (99.6) | 3.66 (93.0) | 10,000 (69.0) | X* | х |
| 5 (127.0) | 4.276 (108.6) | 4.126 (104.8) | 3.85 (97.8) | 10,000 (69.0) | | х |
| 5 (127.0) | 4.560 (115.8) | 4.276 (108.6) | 3.97 (100.8) | 10,000 (69.0) | | х |
| 5 1/2 (139.7) | 4.778 (121.4) | 4.376 (111.2) | 4.15 (105.4) | 10,000 (69.0) | | х |
| 5 1/2 (139.7) | 4.950 (125.7) | 4.670 (118.6) | 4.37 (111.0) | 10,000 (69.0) | X* | х |
| 7 (177.8) | 6.184 (157.1) | 5.920 (150.4) | 5.50 (139.7) | 8,000 (55.2) | X* | х |
| 7 (177.8) | 6.456 (164.0) | 6.184 (157.1) | 5.80 (147.3) | 8,000 (55.2) | X* | х |
| 7 5/8 (193.7) | 7.125 (181.0) | 6.500 (165.1) | 6.12 (155.4) | 5,000 (51.7) | х | х |
| 9 5/8 (244.5) | 9.063 (230.2) | 8.157 (207.2) | 7.75 (196.9) | 5,000 (51.7) | х | х |
| 10 3/4 (273.1) | 9.450 (240.0) | 9.190 (233.4) | 8.69 (220.7) | 5,000 (51.7) | х | |
| 10 3/4 (273.1) | 9.950 (252.7) | 9.560 (242.8) | 9.00 (228.6) | 5,000 (51.7) | х | х |
| 11 3/4 (298.5) | 11.084 (281.5) | 10.420 (264.7) | 9.87 (250.7) | 5,000 (51.7) | х | |
| 13 3/8 (339.7) | 12.715 (323.0) | 12.280 (311.9) | 11.68 (296.7) | 5,000 (51.7) | х | х |
| 16 (406.4) | 15.250 (387.4) | 14.610 (371.1) | 13.96 (354.6) | 2,000 (13.8) | х | |
| 18 (457.2) | 17.145 (435.5) | 16.563 (420.7) | 16.25 (412.8) | 3,500 (24.1) | х | |

Fas Drill[®] Packers and Bridge Plugs

[•]Packers are rated to a maximum of 5,000 psi unless otherwise noted.



Completion Tools

Mechanical Setting Tool

The Halliburton mechanical setting tool sets and operates all drillable tools. This setting tool is run on tubing or drillpipe and is operated by workstring rotation and reciprocation.

The load transfer feature of the tool limits the amount of string weight that can be applied to the sliding valve. This feature helps ensure that the packer mandrel is placed in compression rather than in tension, making the tool more resistant to breakage.

Features and Benefits

- » Acts as a load transfer device
- » Provides positive indication when packer is set
- » Allows tubing or drillpipe to be rotated as the tool comes out of the hole

Operation

The drag blocks/springs contact the well casing to restrict the rotation of the outer components while the right-hand rotation of the workstring causes the outer components to move down and begin the setting motion.

The right-hand rotation unlatches the packer lock ring and sets the top slips. An upward pull on the workstring completely sets the packer and releases it from the setting tool.

Additional right-hand rotation moves the setting tool's outer components farther downward to unlock the upper mandrel from the drag blocks, which moves the setting tool's outer components upward. This movement allows the lower mandrel to extend down far enough to operate the squeeze packer sliding valve. The disengagement also causes the setting tool to become freewheeling, so the workstring can be rotated out of the hole without causing excessive wear on the setting tool drag blocks/springs.

The setting tool will not cycle again until it is redressed with the setting sleeve properly locked in place and the keys are returned to their grooves.





| Tool | Maximum Tool OD | Overall Length | Minimum | Tensile |
|------------------|------------------|------------------|----------|-----------|
| Size | Drag-Spring Type | Drag-Spring Type | Tool ID | Strength* |
| in. (mm) | in. (mm) | in. (mm) | in. (mm) | Ib (kg) |
| 2 7/8 | 2.20 | 42.17 | 0.59 | 36,000 |
| (73.0) | (55.9) | (1071.1) | (15.0) | (16 329) |
| 3 1/2 | 2.69 | 51.22 | 0.56 | 62,500 |
| (88.9) | (68.3) | (1301.0) | (14.2) | (28 350) |
| 4 1/2 to 5 | 3.55 | 67.57 | 0.87 | 130,000 |
| (114.3 to 127.0) | (90.2) | (1716.3) | (22.1) | (58 967) |
| 5 1/2 to 6 5/8 | 4.35 | 37.18 | 1.00 | 130,000 |
| (139.7 to 168.3) | (110.5) | (944.4) | (25.4) | (58 967) |
| 7 to 8 5/8 | 5.53 | 34.17 | 1.13 | 139,000 |
| (177.8 to 219.1) | (140.5) | (867.9) | (28.7) | (63 049) |
| 9 5/8 to 13 3/8 | 7.00 | 38.40 | 1.62 | 316,000 |
| (244.5 to 339.7) | (177.8) | (975.4) | (41.2) | (143 337) |
| 16 to 20 | 13.12 | 59.22 | 1.62 | 316,000 |
| (406.4 to 508.0) | (333.2) | (1504.2) | (41.2) | (143 337) |

Mechanical Setting Tools – Drag-Spring Type

Note: These are the most common sizes. Other sizes might be available.

*The tensile strength value is calculated with new tool conditions. Stress area calculations are used to calculate tensile strength.

These ratings are guidelines only. For more information, contact your local Halliburton representative.

Mechanical Setting Tools—Drag-Block Type

| Tool | Maximum Tool OD | Minimum | Overall Length | Tensile |
|------------------|-----------------|----------|-----------------|-------------|
| Size | Drag-Block Type | Tool ID | Drag-Block Type | Strength* |
| in. (mm) | in. (mm) | in. (mm) | in. (mm) | Ib (kg) |
| 4 1/2 to 6 5/8 | 3.56 | 0.87 | 86.46 | 130,000 |
| (114.3 to 168.3) | (90.4) | (22.1) | (2196.1) | (58 967.6) |
| 7 to 8 5/8 | 5.65 | 1.13 | 71.30 | 139,000 |
| (177.8 to 219.1) | (143.5) | (28.7) | (1811.0) | (63 049.34) |
| 9 5/8 to 13 3/8 | 7.00 | 1.62 | 38.40 | 316,000 |
| (244.5 to 339.7) | (177.8) | (41.2) | (975.4) | (143 337.6) |

Note: These are the most common sizes. Other sizes might be available.

*The tensile strength value is calculated with new tool conditions. Stress area calculations are used to calculate tensile strength.

These ratings are guidelines only. For more information, contact your local Halliburton representative.


BP Hydraulic Setting Tool

BP hydraulic setting tools set Halliburton drillable packers and plugs with workstring pressure. They have no mechanism for operating tools once they are set. Because BP hydraulic setting tools use no plugs or balls for operation, they are ideal for horizontal applications.

Design Features

BP hydraulic setting tools can be run on drillpipe, tubing, or coiled tubing. Two versions of the BP hydraulic setting tool are available: fill and non-fill.

- » Fill-type BP hydraulic setting tools have a hydrostatically operated fill valve that allows the workstring to fill during the trip into the hole. This fill valve has shear pins that are preset at the surface to a predetermined hydrostatic pressure. Once the fill valve reaches the preset hydrostatic pressure, the pins shear and the fill valve closes and locks. The fill valve cannot be opened after it closes.
- » Non-fill BP hydraulic setting tools have no means for filling the workstring on the trip in, so an auxiliary fill valve (RTTS[®] bypass, etc.) or filling from the surface is necessary. The differential pressure between the wellbore fluid and dry workstring does not adversely load the setting mechanism during the trip in.

In both versions, the setting piston is activated by a predetermined internal pressure applied to the workstring. This pressure shears the pins holding the setting piston, moving it down against the plug, and setting the top slips. Additional pressure fully sets the plug or packer and parts the tension sleeve/pins.

After the plug or packer sets, the workstring is raised 4 to 5 ft (1.22 to 1.52 m). Continued internal pressure to the workstring causes the setting piston to move down, which opens the tool to establish circulation. Cement can then be spotted on top of the plug.





| Tool Type and Size in. | Tool Length in. (mm) | Stroke in. (mm) | Working Area in.² (mm²) | Top Connection Box | Maximum Number of Setting Piston Pins | Collapse Pressure psi (MPa) | Burst Pressure psi (MPa) | Tensile Rating Ib (kg) |
|------------------------------|----------------------------|--------------------|-------------------------------|--------------------------|--|-----------------------------------|--------------------------------|------------------------------|
| Non-Fill | 32.23 | 14.02 | 7.601 | 2 3/8-in. EUE | 36 | 7,013 | 7,013 | 54,367 |
| 4 1/2 to 6 5/8 | (818.6) | (356.0) | (4903.9) | 8 Rd Box | | (48.35) | (48.35) | (24 660) |
| Fill | 57.48 | 14.02 | 7.601 | 2 3/8-in. EUE | 36 | 7,013 | 7,013 | 54,367 |
| 4 1/2 to 6 5/8 | (1459.9) | (356.0) | (4903.9) | 8 Rd Box | | (48.35) | (48.35) | (24 660) |
| Non-Fill | 30.68 | 15.08 | 11.502 | 2 7/8-in. EUE | 72 | 14,534 | 15,531 | 143,139 |
| 6 5/8 to 8 5/8 | (779.2) | (383.0) | (7420.6) | 8 Rd Box | | (100.20) | (107.08) | (64 926) |
| Fill | 54.50 | 15.08 | 11.502 | 2 7/8-in. EUE | 72 | 14,534 | 15,531 | 143,139 |
| 6 5/8 to 8 5/8 | (1384.3) | (383.0) | (7420.6) | 8 Rd Box | | (100.20) | (107.08) | (64 926) |
| Non-Fill | 40.42 | 14.44 | 17.75 | 4 1/2-in. IF | 72 | 11,092 | 11,788 | 207,856 |
| 9 5/8 to 20 | (1026.6) | (366.8) | (11 451.6) | (NC 50) | | (76.47) | (81.27) | (94 281) |
| Fill | 62.89 | 14.44 | 17.75 | 3 7/8-in. | 72 | 11,092 | 11,788 | 207,856 |
| 9 5/8 to 20 | (1597.4) | (366.8) | (11 451.6) | 6 Stub Acme | | (76.47) | (81.27) | (94 281) |

BP Hydraulic Setting Tools

Standard service rating





Completion Tools



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