

05

Unconventional Completions



Introduction

In unconventional plays, such as shale, margins tend to be razor thin. To assure long-term success, it is important that operators make the best possible decisions to maximize the return on their investment.

Optimizing production in low-permeability unconventional wells is pertinent to the bottom line and requires a variety of completion solutions due to the variation in geologies and reservoir properties — not only from one reservoir to another, but often within each reservoir.

Halliburton offers innovative unconventional completion solutions that reduce overall completion costs, remove risks, and increase speed to production through accelerated development of technologies.

From RapidSuite® multistage frac sleeve systems to Fas Drill® composite plugs to Illusion® dissolvable frac plugs, Halliburton offers many completion solutions designed to do just that — maximize profit in unconventional plays.

Frac Sleeve Systems

RapidStage® Systems

RapidStage® systems optimize the completion of multistage wellbores by enabling highly accurate placement of stimulation treatments without intervention. This helps ensure the stimulation treatment covers the targeted areas in the wellbore and maximizes the stimulated reservoir area. RapidStage systems can be run into a wellbore using a casing string to surface or on liner hanger systems to enable a reliable, trouble-free cemented or openhole installation.

The RapidStage SE (Single-Entry) fracturing system incorporates the proven RapidStage SE sleeve, RapidStart® Initiator, or Initiator CT (Casing Test) sleeve, and a means of sleeve isolation. Halliburton offers several isolation options for a variety of reservoir conditions.

To activate RapidStage SE sleeves, frac balls are dropped in sequence, smallest to largest, from surface using the Halliburton pneumatic ball launcher. The frac balls seal on a corresponding millable baffle, shifting the sleeve open, diverting flow through ports in the sleeve, and providing isolation from previous stages. After stimulation, cleanup is assisted by flowing all lower zones simultaneously.

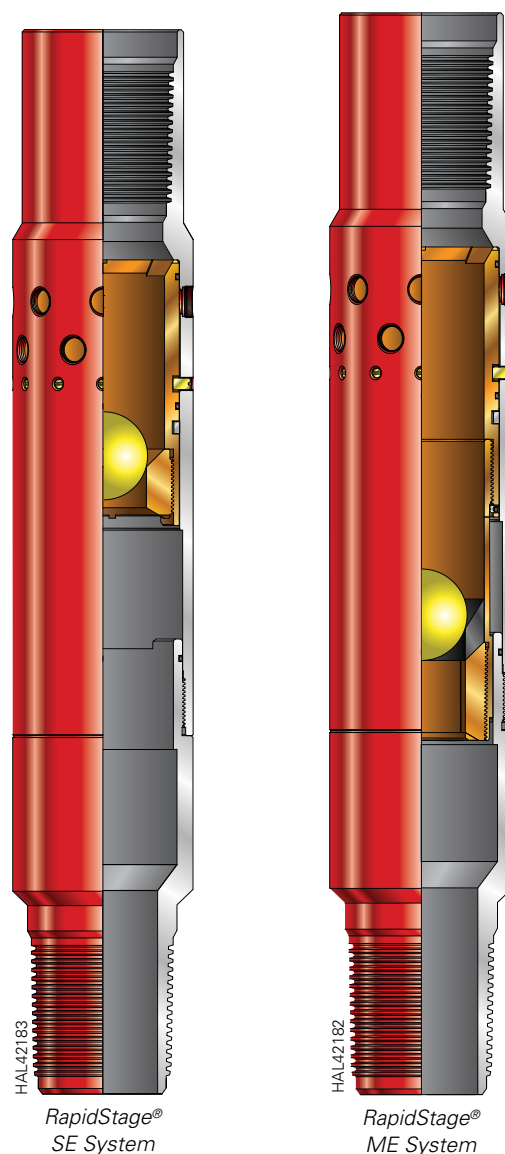
The RapidStage ME (Multi-Entry) fracturing system provides operators with enhanced options for completing multi-interval wellbores to enable highly accurate placement of fractures, with minimal or no intervention.

By allowing multiple entry points per target fracturing stage, RapidStage ME sleeves allow operators to mimic traditional plug-and-perf operations with the efficiency of a ball-drop fracturing sleeve system.

The RapidStage ME system includes both the RapidStage ME and SE sleeves within a single interval. The exit ports of the RapidStage sleeves can be customized to match whatever conditions the operation might require.

The application of RapidBall™ dissolvable ball technology helps eliminate the need for costly wellbore cleanout operations.

Once fracturing is completed, well cleaning is assisted by flowing all lower zones simultaneously.



Features

- » Up to 72 individual stages
- » Can be used with cement or openhole isolation
- » Positive locking engagement when sleeve is opened
- » 10,000 psi in 350°F rated standard service
- » High-pressure/high-temperature (HP/HT) and sour service available (SE sleeve)
- » Multiple sleeves per target stage (ME sleeve)
- » Up to 100-bbl/min fracturing rates
- » Customizable exit ports
- » Anti-rotation feature allows milling of baffle without opening sleeve for contingency planning

Benefits

- » Enables continuous pumping of multistage stimulation treatments
- » Reduces completions OPEX
- » Provides enhanced reservoir contact (ME sleeve)
- » Decreases water and chemical use
- » Minimizes overdisplacement
- » Requires no intervention if used with RapidBall™ dissolvable balls

RapidStage® Sleeves

Casing Size	Tool OD		Tool ID		Maximum Temperature		Maximum Pressure	
	in.	mm	in.	mm	°F	°C	psi	MPa
2 7/8	3.95	100.33	2.4	60.96	350	177	15,000	103
3 1/2	4.4	111.76	2.9	73.66	350	177	10,000	69
4.00	4.4	111.76	2.9	73.66	350	177	10,000	69
4 1/2	5.6	142.24	3.826	97.18	350	177	10,000	69
4 1/2*	5.75	146.05	3.826	97.18	400	204	15,000	103
4 1/2**	5.6	142.24	3.826	97.18	350	177	10,000	69
5.00	5.75	146.05	3.826	97.18	400	204	15,000	103
5 1/2	6.5	165.1	4.67	118.62	350	177	10,000	69
5 1/2*	6.7	170.18	4.443	112.85	400	204	15,000	103
5 1/2**	6.75	171.45	4.443	112.85	350	177	10,000	69
7.00	7.95	201.93	6.004	152.5	350	177	10,000	69

* HP/HT

**Multi-entry

RapidStart® Initiator Sleeve

The RapidStart® Initiator sleeve provides an interventionless means of establishing an initial flow path from the tubing/casing ID to the OD during multizone fracturing or plug-and-perf operations. Activation is achieved using absolute pressure on the ID of the sleeve that exceeds a predetermined shear-pinned value. Designed for extreme environments, the sleeve can be cemented in place without losing functionality.

The RapidStart Initiator sleeve uses an air-chambered mechanism that operates solely off absolute tubing pressure. Before running the completion, the sleeve is pinned according to opening requirements dictated by the well hydrostatics, other tubing pressure-operated tools, and casing pressure ratings. Opening the internal sleeve allows flow to be diverted through ports in the outer case from the ID. Once opened, the sleeve can be used for stimulation of the first zone in a plug-and-perf-type completion, thereby eliminating the need for coiled tubing to establish circulation. Once opened, the sleeve can be used for stimulation of the first zone in a plug-and-perf or frac-sleeve-type completion, thereby eliminating the need for coiled tubing to establish initial flow path.

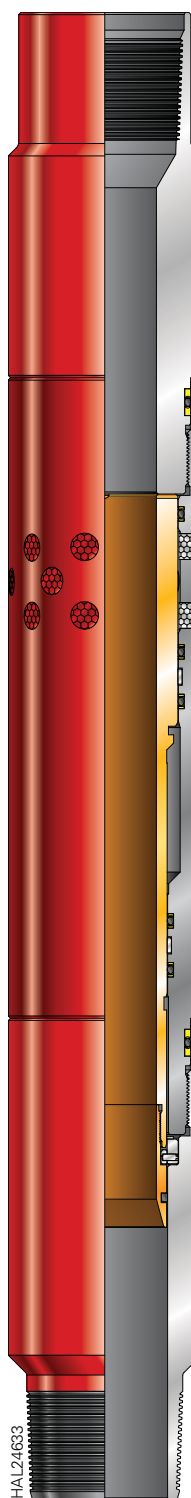
The rugged construction and debris-tolerant design allows the RapidStart Initiator sleeve to be successfully run in cemented applications in both horizontal and vertical wells.

Features

- » Interventionless completion compatibility
- » Tubing/casing internal pressure activation
- » Available up to 15,000-psi differential ratings or up to 20,000-psi absolute pressure
- » Positive locking engagement when sleeve is opened
- » Available in standard service and CO₂ (S13Cr)
- » Shiftable version that can be re-closed after the initial opening

Benefits

- » Allows for interventionless opening of cemented completion string toe, eliminating coiled tubing perforating
- » Provides flow path to pump first frac stage and displace first stage ball
- » Shiftable version can be closed in case of water breakthrough or if other wellbore interventions are required



RapidStart®
Initiator Sleeve

RapidStart® Initiator Sleeves

Casing Size	Tool OD		Tool ID		Minimum Openhole Size*		Maximum Temperature		Maximum Absolute Pressure		Maximum Differential Pressure		Maximum Pump Rate	
in.	in.	mm	in.	mm	in.	mm	°F	°C	psi	kPa	psi	kPa	bbl/min	m ³ /min
3 1/2	4.40	111.76	2.265	57.53	4.75	120.65	350	177	15,000	103.421	10,000	68.948	100	15.899
4 1/2	5.60	142.24	3.00	76.20	5.875	149.23	350	177	15,000	103.421	10,000	68.948	100	15.899
4 1/2 OC**	5.60	142.24	2.82	71.63	5.875	149.23	350	177	15,000	103.421	10,000	68.948	100	15.899
4 1/2 HP/HT	5.75	146.15	3.00	76.20	6.00	152.40	400	204	20,000	137.880	15,000	103.410	100	15.899
5 1/2	6.50	165.10	4.00	101.60	7.875	200.03	350	177	15,000	103.421	10,000	68.948	100	15.899
5 1/2 HP/HT	6.50	165.10	4.00	101.60	7.875	200.03	350	177	18,500	127.55	13,000	89.63	100	15.899

*Recommendation only, smaller openhole sizes should be reviewed per Halliburton HMS guidelines and CriticalWell Review process.

**OC is the open/close or shiftable version.

RapidStart® Initiator CT (Casing Test) Sleeve

The RapidStart® Initiator CT (Casing Test) sleeve is a pressure-operated fracturing sleeve designed to enable a casing pressure test before opening and establishing a fluid flow path to the target formation. This sleeve can be used with either multistage fracturing sleeve systems or plug-and-perf operations. Based on the field-proven RapidStart Initiator sleeve, the RapidStart Initiator CT sleeve provides industry-leading reliability and efficiency, while enabling positive verification of casing integrity before fracturing operations.

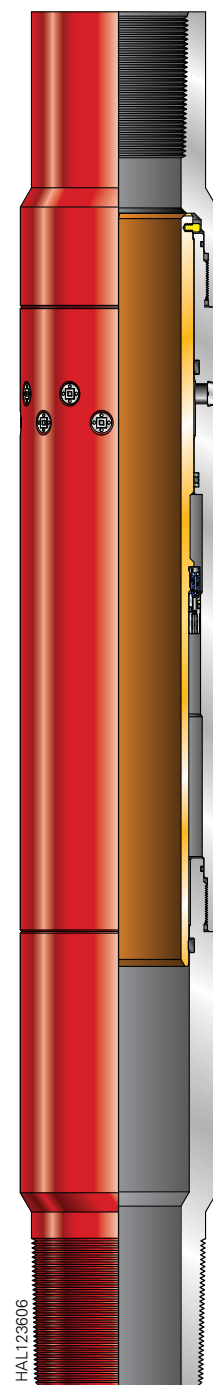
Activation of the RapidStart Initiator CT sleeve is achieved by applying surface pressure to the completion string that exceeds a predetermined shear-pinned value. Through a controlled metering process, pressure can then be increased to perform an accurate casing pressure integrity test. The metering process allows for a 30-minute or longer test to be conducted at up to 20,000 psi (138 MPa) total pressure and 400°F (204°C) before the sleeve will open. If at any time the pressure is released, the sleeve metering process will stop and the sleeve will not open, allowing for a second opportunity at obtaining a positive casing pressure test.

Features

- » Casing pressure test functionality
- » Ability to stop and resume casing test
- » Positive locking engagement when sleeve is opened
- » 20,000-psi absolute pressure and 17,000-psi differential pressure rating
- » More than 25,000 lb of opening force available

Benefits

- » Ability to validate casing integrity before stimulation
- » Unique opening process allows second opportunity to obtain casing pressure integrity test
- » Interventionless means of creating a flow path at the toe of the wellbore
- » Eliminates need for a coiled tubing run with tubing-conveyed or wireline perforating
- » Enables fracturing of the first stage and/or displacement of the second stage frac ball or pumping of perforating guns and frac between composite frac plug to depth



RapidStart® Initiator
CT Sleeve

RapidStart® Initiator CT Sleeves

Casing Size		Tool OD		Tool ID		Maximum Temperature		Maximum Δ Pressure		Maximum Absolute Pressure		Maximum Pump Rate	
in.	mm	in.	mm	in.	mm	°F	°C	psi	MPa	psi	MPa	bbl/min	m ³ /min
4 1/2*	114.3	5.75	146.05	3.65	92.71	350	177	10,000	69	18,000	124	100	15.9
4 1/2**	114.3	5.75	146.05	3.55	90.17	350	177	15,000	69	20,000	138	100	15.9
5 1/2	139.7	7.33	186.2	4.67	118.62	350	177	10,000	69	15,000	103	100	15.9
5 1/2**	139.7	7.50	190.5	4.67	118.62	400	204	17,000	117	20,000	138	100	15.9
5 1/2***	139.7	6.38	162.05	3.55	90.17	350	177	15,000	103	20,000	138	100	15.9

*Low operating pressure tool available

**High-operating-pressure, high-temperature tool

***Slimbore HP/HT tool

RapidShift® Sleeve System

RapidShift® stimulation and production sleeve systems allow for selective multizone stimulation treatments through the production string — cemented or open hole. This versatile sleeve can be operated by either a surface ball-drop system for increased completion efficiency or by a hydro-mechanical shifting tool run on coiled or jointed tubing.

The sleeves are actuated by releasing a ball into the treatment fluid stream, landing it on a baffle in the sleeve, and applying additional hydraulic pressure to shift the sleeve open to expose the ports above the baffle. This permits zonal stimulation through the selected sleeve by diverting flow to the open ports and isolating lower zones from the treatment. After stimulation, cleanup is assisted by flowing all lower zones simultaneously. The ball and seats are millable to provide full wellbore access and allow selective opening and closing for the life of the well.

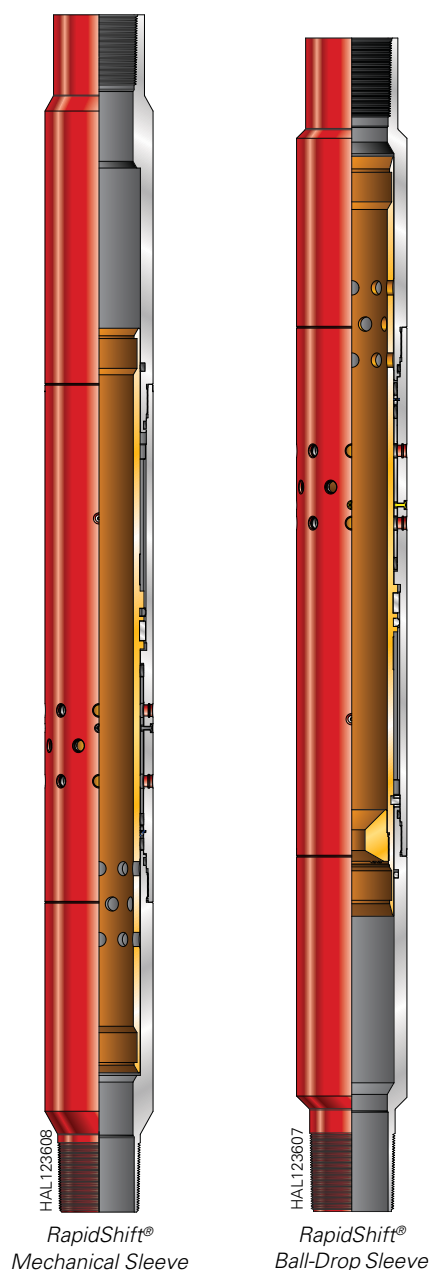
When using the mechanical-shift RapidShift sleeve system, there is no limit to the number of sleeves that can be run in a single completion string. This system allows selective opening and closing for stimulation and production with full wellbore access using the hydro-mechanical shifting tool.

Features

- » Enhanced seal design
- » Ball-drop actuated/mechanically actuated
- » Various metallurgy options
- » B-type shift profile and Halliburton specific shift profile
- » Slimbore/low-profile design

Benefits

- » Underbalanced/overbalanced shifting capability
- » Flexibility of options for actuating sleeves
- » Standard and H₂S compatible tools
- » Flexibility of shift profile options
- » Reduces equivalent circulating density considerations for cemented applications



RapidShift® System

Casing Size	Tool OD		Tool ID		Maximum Temperature		Maximum Pressure	
	in.	mm	in.	mm	°F	°C	psi	MPa
3 1/2	4.40	111.76	2.818	71.58	350	177	10,000	68.95
4 1/2	5.70	144.78	3.75	95.25	350	177	10,000	68.95
5 1/2	7.25	184.15	4.67	118.62	350	177	10,000	68.95

High-pressure/high-temperature tools available.

Dimensions shown are for reference and general consideration when planning for RapidStage® sleeve offerings. For precise dimensions on standard offering and product extensions, please contact your local Halliburton representative.

Shifting Tools for RapidShift® Sleeve Systems

RapidShift® stimulation and production sleeve systems allow for selective multizone stimulation treatments through the production string — cemented or open hole. This versatile sleeve can be operated by either a surface ball-drop system for increased completion efficiency or by one of two hydraulic shifting tool options — RapidShift Hydraulic or High-Expansion shifting tools.

Run as part of a bottomhole assembly, shifting tools are operated by creating differential pressure in the workstring to allow the shifting keys to expand outward. The workstring is then moved up or down to locate the sleeve shifting profile. Depending on the shifting direction of the targeted RapidShift sleeve, additional pull or slackoff force is applied to shift the sleeve to the open or closed position.

RapidShift sleeves are available with a Halliburton proprietary profile or an industry-standard B-type profile. Our hydraulic-shifting tool can handle both by simply changing the shifting keys. Selective keys are available that will not auto-release in the event that over-push/pull indication is desired.

RapidShift® Hydraulic Shifting Tool

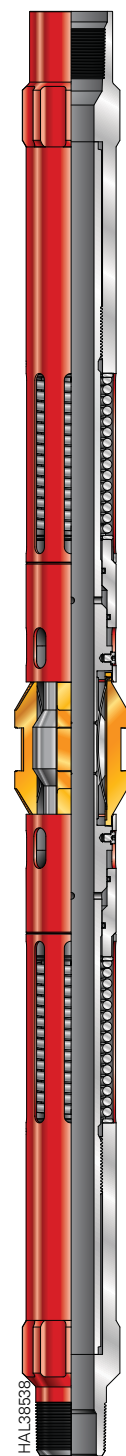
The hydraulic shifting tool is used to manipulate the inner sleeve of a RapidShift sleeve system, allowing the sleeves to be either open or closed before, after, or during stimulation. The shifting tool features bi-directional auto-release shifting keys and is designed to be deployed on either coiled tubing or jointed pipe.

Features

- » Bi-directional keys
- » Auto-release mechanism
- » Low activation pressure
- » Common connections
- » Sandy environment designs available

Benefits

- » Simple and reliable deployment and operation
- » Positive indication of full sleeve shift (open or closed)
- » Selective testing, stimulation, production, and water shutoff with the RapidShift sleeve system



*RapidShift®
Shifting Tool*

RapidShift® High-Expansion Shifting Tool

Designed for the ball-drop RapidShift® sleeve system, the High-Expansion shifting tool allows sleeves to be manipulated without the need for milling baffles. It is designed to be run with the RapidBall™ line of dissolving balls so that no restrictions are present in the well when shifting occurs. The tool allows RapidShift sleeves to be either opened or closed before or after stimulation. The shifting tool features a slimline OD with high-expansion shifting keys and is designed to be deployed on either coiled tubing or jointed pipe.

The High Expansion shifting tool uses the existing baffle in the ball-drop RapidShift system as the shift profile. The shifter is selective and will shear-release in the event that sufficient overpull is produced to activate the shear-release function. In the event the sleeve does not reach the fully shifted position, the keys can be retracted by stopping the pumps and allowing the pressure to equalize around the tool.

Features

- » Ultra-slim OD
- » Shear-release mechanism
- » Low activation pressure
- » Common 1-in. coiled tubing connection

Benefits

- » No milling of baffles required for shifting
- » Simple and reliable deployment and operation
- » Positive indication of full sleeve shift (open or closed)
- » Selective testing, stimulation, production, and water shutoff with the RapidShift sleeve system

RapidShift® Hydraulic Shifting Tools

Total Size	Maximum Tool OD with Keys Retracted		Maximum Tool OD with Keys Expanded		Top Thread	Maximum Temperature		Minimum Key Expansion Pressure		Maximum Operating Pressure	
in.	in.	mm	in.	mm	in.	°F	°C	psi	MPa	psi	MPa
3.5	2.67	67.82	3.201	81.31	1 1/2 AMMT	350	177	600	4.14	10,000	68.95
4.5	3.61	91.69	4.158	105.61	2 3/8-5.95 API EU	350	177	500	3.45	10,000	68.95
4.5	3.36	85.34	4.23	107.44	2 3/8-5.95 API EU	350	177	500	3.45	10,000	68.95
5.5	4.41	112.01	5.35	135.89	2 7/8-8.70 API EU	350	177	650	4.48	10,000	68.95

*Key expansion is limited when in operation by the internal diameter of the tubing/casing.

RapidShift® High-Expansion Shifting Tool

Maximum Tool OD with Shifting Arms Retracted		Maximum Tool OD with Shifting Arms Expanded		Minimum Tool OD with Shifting Arms Expanded		Maximum Temperature		Minimum Shifting Arm Expansion Pressure		Minimum Shifting Pressure		Maximum Operating Pressure		Tensile Rating
in.	mm	in.	mm	in.	mm	°F	°C	psi	MPa	psi	MPa	psi	MPa	lbf
1.75	44.45	3.60	91.44	2.67	67.82	350	177	500	3.45	2,000	13.79	5,000	34.47	15,000

RapidForce® FS (Full Straddle) Sleeve System

Enabling unlimited entry points to maximize stimulation of the reservoir, the RapidForce® FS (Full Straddle) sleeve system provides operators a cost-effective completion solution to increase wellbore production. The RapidForce FS sleeve is a pressure-operated multistage fracturing sleeve activated with a straddle packer system run on coiled tubing or jointed pipe.

RapidForce FS sleeves are run as an integral part of the completion casing string with either cement or openhole packer isolation. The sleeve features a large ID and exit port flow area to maximize production. Additionally, because these sleeves are not activated by a ball-drop method, an unlimited number of RapidForce FS sleeves can be run in a single wellbore.

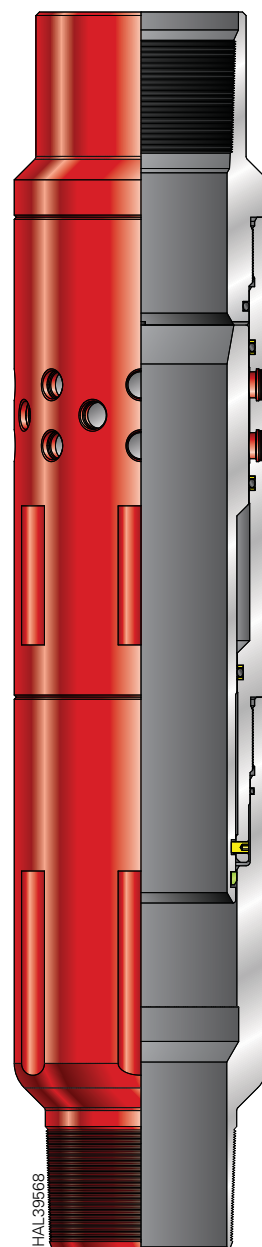
The RapidForce FS sleeve is activated by running a straddle packer bottomhole assembly (BHA) on either coiled tubing or jointed pipe. The straddle packer BHA is then positioned across the sleeve. Pressure is applied to open the target RapidForce FS sleeve. Once the sleeve is opened, the stimulation treatment can be pumped down and out a port between the packers of the straddle packer BHA. This allows for precise placement of each stimulation treatment through the target RapidForce FS sleeve.

Features

- » Straddle packer BHA operated design
- » Unlimited number of stages
- » Can be used with a variety of isolation methods
- » 4 1/2-in. and 5 1/2-in. sizes available

Benefits

- » Unlimited number of sleeves can be run in a wellbore
- » Maximizes stimulation of the reservoir
- » No ID restrictions
- » Cost-effective design
- » Helps reduce completion costs and time



RapidForce® Full Straddle (FS) Sleeve System

RapidForce® FS Sleeves

Casing Size	Tool OD	Nominal Tool ID	Minimum Openhole Size	Overall Tool Length	Maximum Temperature Rating	Maximum Pressure Rating	Number of Stages Available
in.	in.	in.	in.	in.	°F	psi	
4 1/2	5.85	4	6.125	39.90	250	8,000	Unlimited
5 1/2	7.30	4.443	7.875	35.58	250	10,000	Unlimited

RapidForce® HS Sleeve System

Unconventional reservoirs present many unique challenges to operators. Among the world's unconventional plays and even well by well, no one-size-fits-all completion solution exists for multistage fracturing. Various completion methods are available today — each with advantages for operators.

Single-point entry fracturing methods offer a precise and reservoir-centric approach to multistage well fracturing. The RapidForce® HS sleeve system uses pre-installed frac sleeves at each fracturing location. The sleeves are activated by the coiled tubing assembly — a cost-saving and efficient alternative to hydro-jetting perforations for fracture placement.

The RapidForce HS sleeve system enables an unlimited number of fracturing stages to be placed along a production casing string — either cemented or using openhole packer isolation. The sleeve is opened by engaging the shifting tool and pulling the inner sleeve into the open position. The bottomhole assembly (BHA) can then be released and moved below the sleeve to set the packer. With the packer set, the fracture treatment is pumped down the annulus of the coiled tubing string. Once the wellbore treatments are complete, the wellbore is free of restrictions — aiding in wellbore cleanout efficiency and enabling future intervention, as needed.

Features

- » Fracturing sleeve with full bore ID, slim OD, and open-only locked-in-place design
- » Ports phased circumferentially around the tool to optimize contact
- » Port sizes are customizable with inserts

Benefits

- » Unlimited number of accurate fracture treatments for increased production and enhanced ultimate recovery
- » Economical sleeve design, easily handled on the rig floor
- » Full open ID enables highly reliable cementing operations and a restriction-free wellbore upon completion
- » Overdisplacement is eliminated
- » Low cycle times between fracturing stages
- » Real-time monitoring of bottomhole treating pressure through coiled string

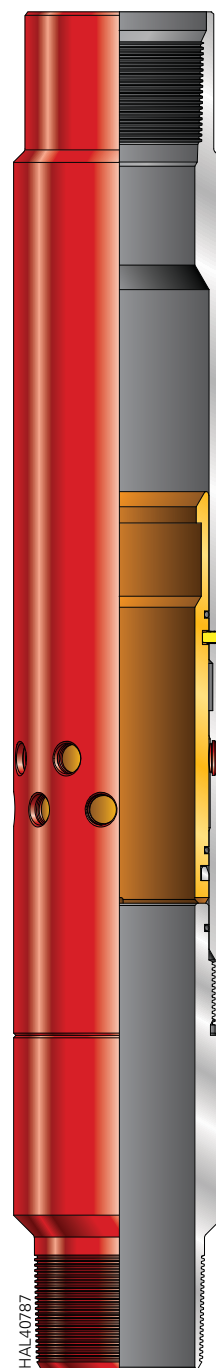
RapidForce® HS Sleeve

Casing Size	Sleeve OD	Sleeve ID	Minimum Openhole Size	Overall Sleeve Length	Maximum Temperature Rating	Maximum Pressure Rating	Number of Stages Available
in.	in.	in.	in.	in.	°F	psi	
4 1/2	5.60	4.00	5.875	36.0	350	10,000	Unlimited

RapidForce® HS Coiled Tubing Bottomhole Assembly

Casing Size	Casing Weight	Packer Body OD	Maximum Packer Differential Rating*	Maximum Temperature Rating	Minimum Set Weight*	Shifter Activation Differential Pressure	BHA Length	BHA Tensile Rating at Packer
in.	lb/ft	in.	psi	°F	lb	psi	ft	lb
4 1/2	11.6 to 13.5	3.75	10,000	250	2,000	1,000	12	112,500

*These ratings are dependent on the application and tool configuration.



RapidForce® HS Sleeve System

StimJet™ Frac Port Inserts

StimJet™ frac port inserts are erodible jets that can be threaded into the exit ports of a RapidStage® or RapidShift® sleeve. StimJet ports combine the operational efficiency of a ball-drop completion with the pinpoint fracturing of hydra-jetting.

In an openhole application, the fracture can initiate anywhere along the wellbore from packer to packer depending on where the formation is the weakest. StimJet ports erode a tunnel into the formation to provide a primary fracture location opposite the sleeve in the wellbore. After the StimJet ports create a tunnel in the formation, the ports themselves erode away, removing the flow resistance and allowing the primary fracture to be pumped at the desired rate.

In traditional openhole applications with multistage frac sleeves, a transverse fracture must initiate as an axial fracture and then transition to the transverse direction. The tunnel created by the StimJet ports eliminates this transition and the resulting tortuosity.

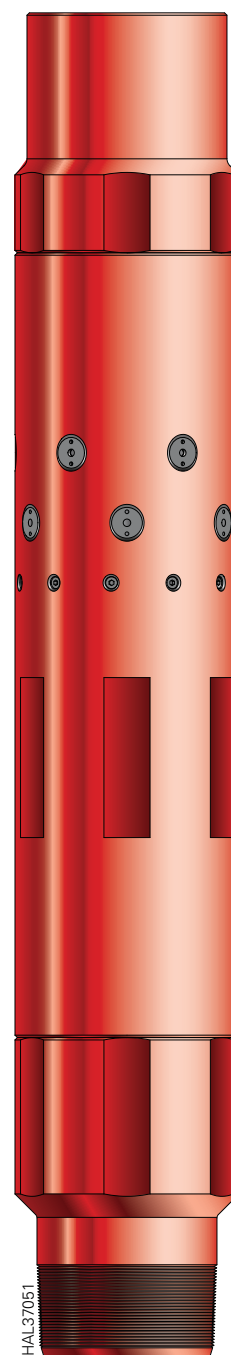
StimJet ports also provide better surface pressure indication of sleeve actuation. When a ball lands and the sleeve shifts open, the only indication of this event is the pressure wave transmitted to the surface pressure transducer. The added flow resistance of the StimJet ports allows for a more pronounced pressure wave, increasing the probability of a visible pressure event.

Features

- » Proven simplistic design
- » Erodes to a diameter of 0.75-in. for maximum treatment area
- » Flush mount design does not increase tool OD

Benefits

- » Provides predictable fracture locations at the sleeve
- » Eliminates near-wellbore fracture tortuosity by preventing axial to transverse fracture transition
- » Provides a more pronounced surface pressure response when the ball lands and sleeve shifts



StimJet™ Frac
Port Inserts

RapidBall™ Landing Collar

The Halliburton RapidBall™ landing collar is a versatile casing attachment that can be added to any completion casing string to create a temporary isolation point while performing various applications, such as testing the casing string, isolation of fracturing stages, and setting hydraulic-set downhole tools.

Graduated landing baffle sizes within the RapidBall landing collar allow for multiple tools to be run in a single completion casing string. Once the landing collar is set on depth, a RapidBall self-removing frac ball will be pumped to the landing collar and will seat in the landing baffle. This creates a pressure seal that allows pressure to be applied from the surface to perform downhole applications but will not hold pressure from below.

Once the job is performed, time, temperature, and well fluids cause the RapidBall self-removing frac ball to degrade, thus restoring wellbore flow from the surface.

Features

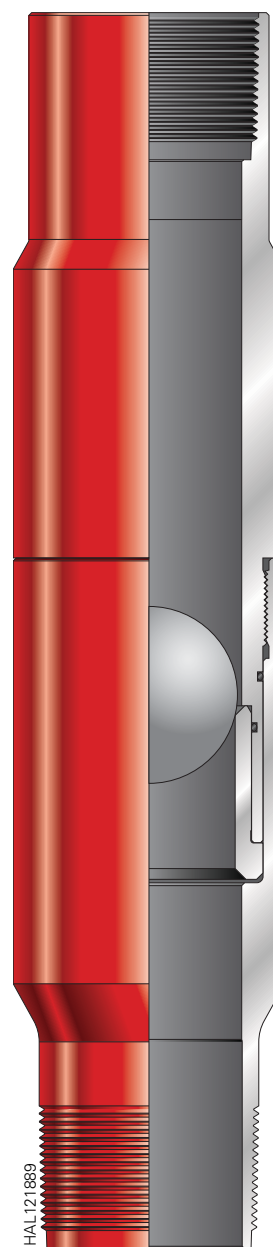
- » Compatible with RapidBall self-removing frac ball technology
- » Multiple tools can be run in a single wellbore
- » Integral part of completion casing string
- » Cemented or openhole completions

Benefits

- » Interventionless means of providing isolation
- » Enables a pressure seal from above
- » Helps reduce completion costs and saves time

RapidBall™ Landing Collars

Casing Size	Tool OD	Tool Length	Temperature Rating
in.	in.	in.	°F
3 1/2	4.40	24.38	350
4 1/2	5.60	25.00	350
5 1/2	6.50	26.92	350



RapidBall™
Landing Collar

HALLIBURTON

Completion Tools

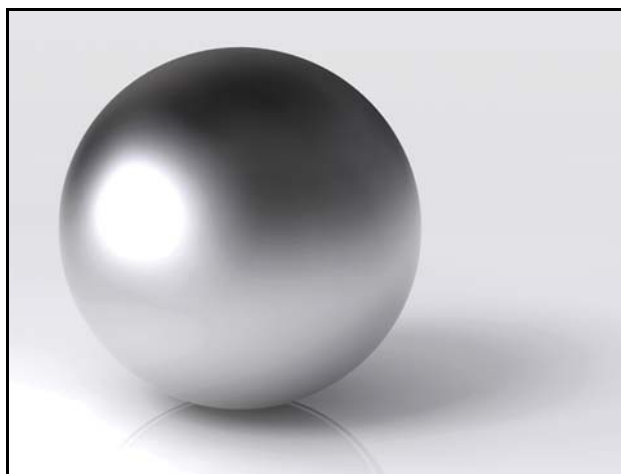
RapidBall™ DM Self-Removing Ball Technology

Flowing fracturing sleeve activation balls back to surface after stimulation can be challenging. Halliburton RapidBall™ DM (Dissolvable Metallic) self-removing ball technology is a series of self-removing, fracturing sleeve activation balls that help eliminate flowback challenges. These specially formulated activation balls quickly break down in a timed reaction, leaving the wellbore open to flow. RapidBall DM ball technology thereby helps eliminate the cost of post-stimulation wellbore intervention and helps provide assurance that the balls used to activate fracturing sleeves in a completion string will not restrict flow during production.

RapidBall DM ball technology is designed specifically to open any of the Halliburton ball-drop-activated RapidSuite® fracturing sleeve systems. The balls are introduced to the stimulation treatment stream and pumped down the wellbore to open the target fracturing sleeve. RapidBall DM ball technology then provides isolation from previous fracturing stages. In a timed reaction, RapidBall DM ball technology then breaks down under time and temperature.

Features

- » Specially formulated compound
- » Compatible with RapidSuite ball-drop fracturing sleeve systems
- » More than 70 possible stages (5 1/2-in. casing)
- » Robust design — withstands harsh fracturing conditions
- » Impact resistant
- » Degrades with time, temperature, and presence of saline well fluids
- » Up to 10,000 psi and 300°F



*RapidBall™ DM
Self-Removing Ball Technology*

Benefits

- » Helps eliminate the need to mill out activation balls and ball seats
- » Helps ensure production from every target interval
- » Improves completion efficiency
- » Can save both time and cost of post-stimulation intervention
- » Brings well onto production faster
- » Optimizes completion design and results

Drillable and Dissolvable Tools

This section contains information about Halliburton drillable and dissolvable tools, which have many functions including wellbore isolation, stimulation isolation, remedial cementing, and plug and abandonment.

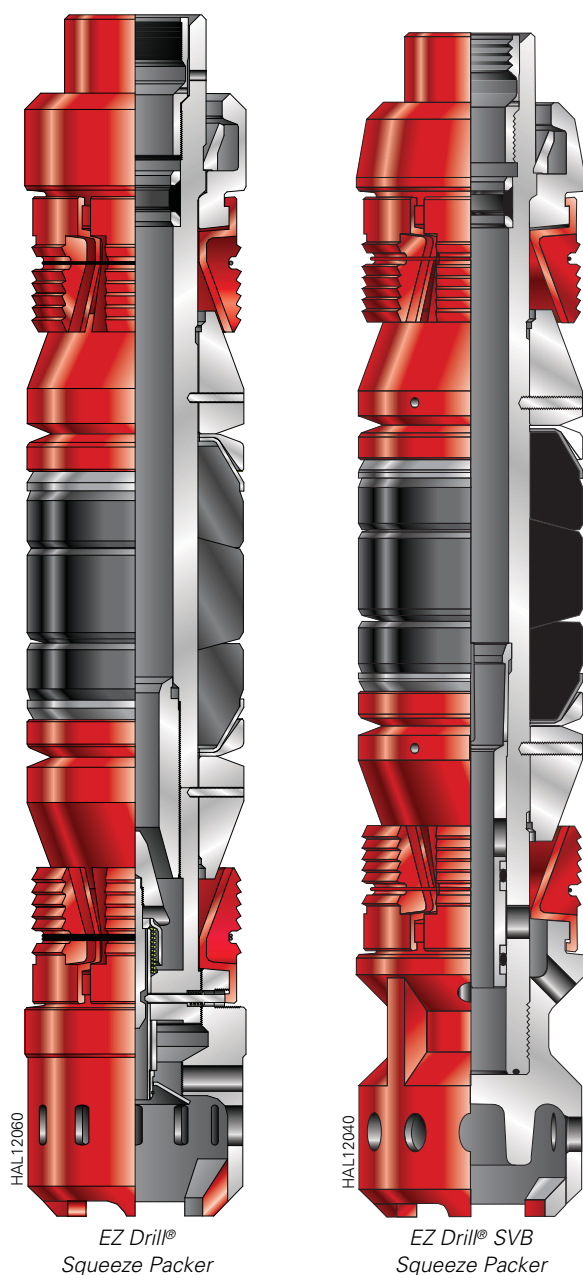
Halliburton is dedicated to providing top-quality equipment and services and maintains strict standards and well-documented processes and procedures to help ensure excellence and dependability in our drillable and dissolvable tools equipment. No matter what the downhole scenario, Halliburton can help develop a low-cost solution to address your challenges.

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. Through 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® Packers and Bridge Plugs

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

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 might 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 cost 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 (Figure 1).

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 (Figure 2). 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 (Figure 3). The new cement barrier also helps isolate the casing interior from formation fluid or gas intrusion.

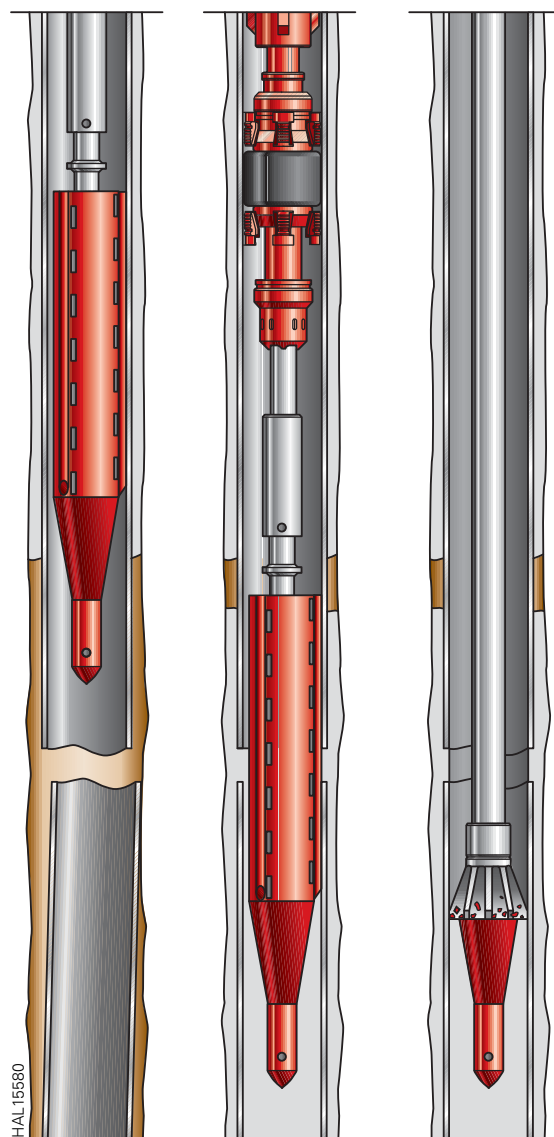


Figure 1:
Running
the Casing
Alignment Tool

Figure 2:
Aligning and
Squeezing the
Parted Casing

Figure 3:
Drilling Out
the Casing
Alignment Tool

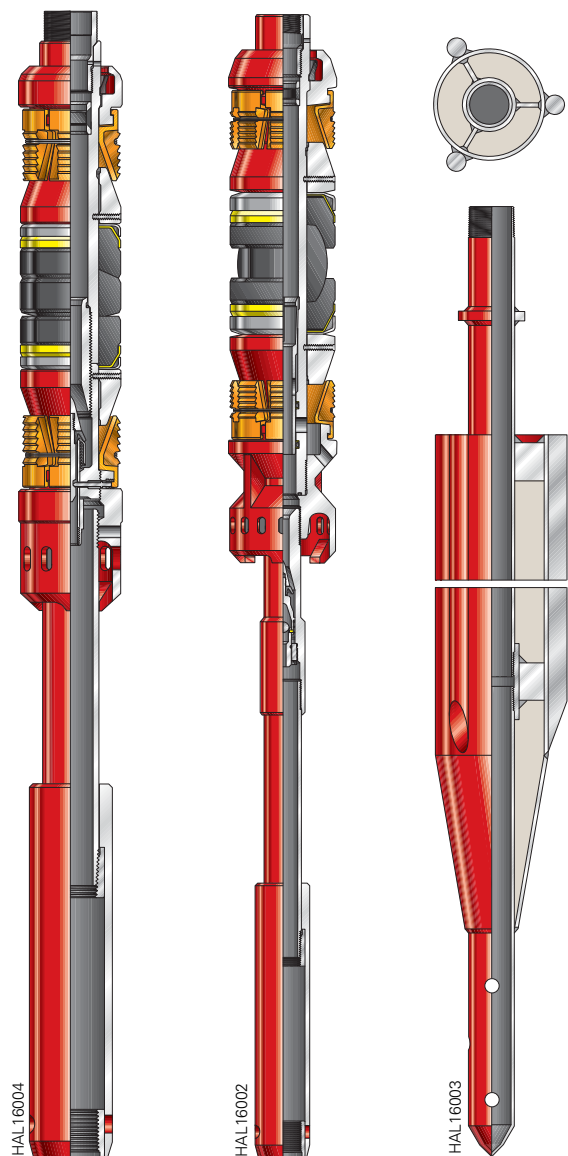
Equipment

After the problem well is evaluated, the proper alignment tool is built. Casing alignment tools are custom manufactured for specific jobs because of the variety of 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 vary as do the lengths of damaged casing. 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
with EZ Drill®
Squeeze Packer*

*Casing
Alignment Tool
with EZ Drill® SVB
and Poppet-Type
Adapter Kit*

*Casing
Alignment Tool
Tapered Nose*

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.

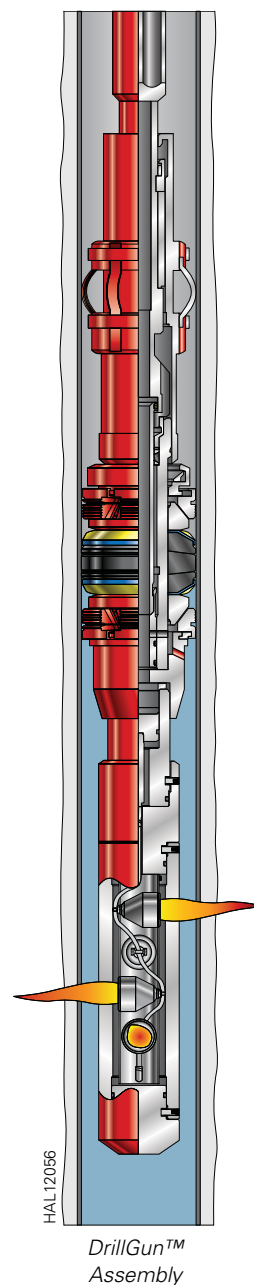
Components of the drillable perforating system are drillpipe conveyed to the zone of interest, thereby eliminating mobilization or demobilization charges normally associated with wireline units. Additionally, because no mud system is needed, clear fluids can remain in place for workover operations. When 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	Thread Size and Type		Maximum OD		Maximum Operating Pressure		Minimum Operating Pressure		Temperature Rating		Maximum Overall Length		Weight	
in.	in.	mm	in.	mm	psi	MPa	psi	MPa	°F	°C	ft	m	lb	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	N/A

*Dependent on explosives. For use in wells above 350°F, contact a Halliburton TCP Technology representative.

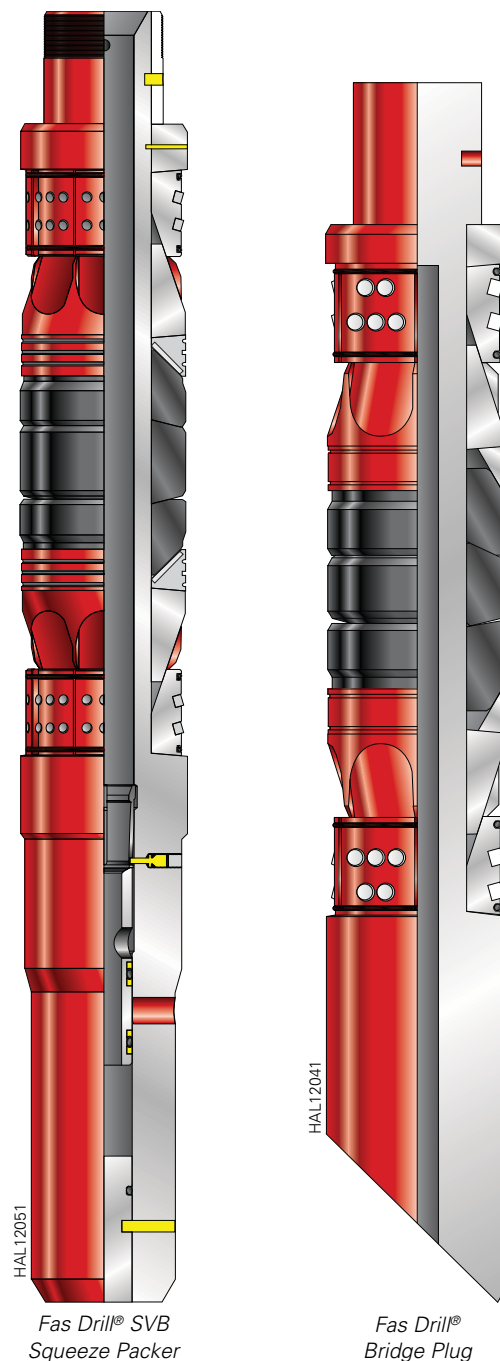
These ratings are guidelines only. For more information, contact your local Halliburton representative.

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 junk-mill bits



Fas Drill® Packers and Bridge Plugs

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

*Packers are rated to a maximum of 5,000 psi unless otherwise noted.

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

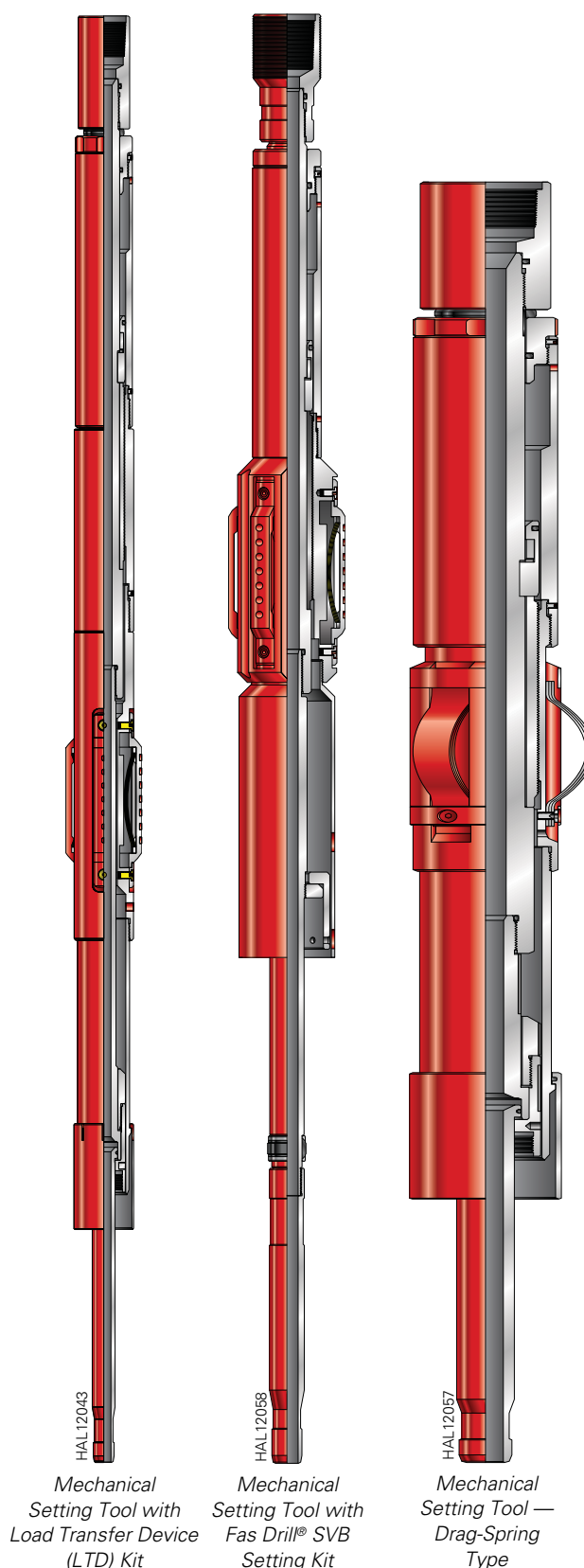
Operation

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.


HALLIBURTON

Completion Tools

Mechanical Setting Tools—Drag-Spring Type

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

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

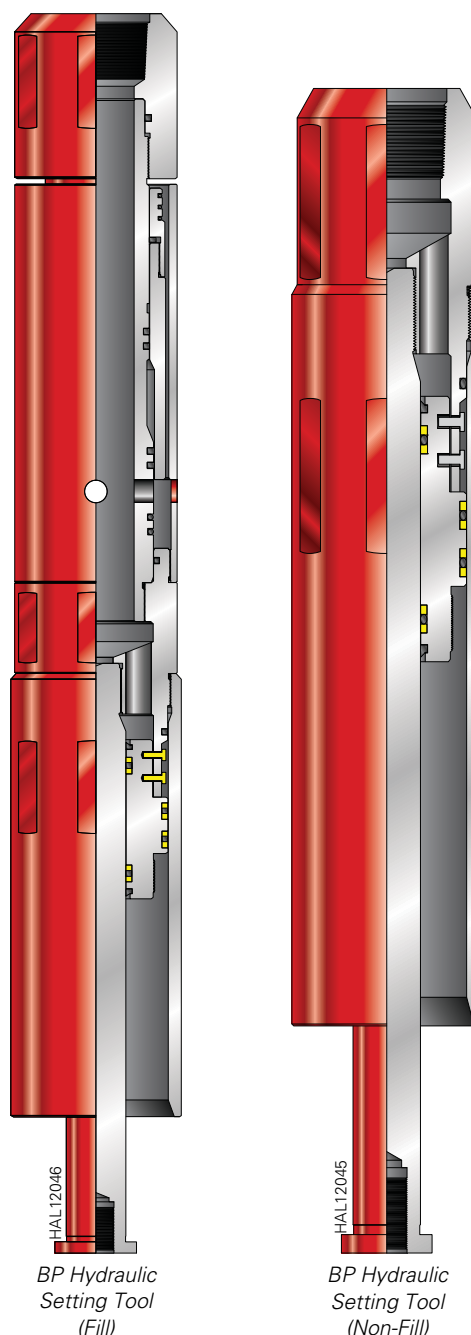
Design Features

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.



BP Hydraulic Setting Tools

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

Standard service rating

HCT Setting Tool

Hydraulic setting tools are used for applications in which pulling forces are necessary to set packers or plugs downhole. For example, these tools can be used to set cast-iron bridge plugs, Fas Drill® plugs and packers, permanent packers, or squeeze cement retainers. These setting tools can also be used for any application in which a conventional wireline setting tool would be used. Because no explosives are necessary, special training is not required to operate these tools. Horizontal wells and wells without a rig that already have a coiled tubing unit (CTU) in place are the most common applications for hydraulic setting tools.

These setting tools are hydraulically activated when a ball is dropped into the tool and tubing pressure is applied. They also have a circulation port that can be uncovered after the plug is set. This feature allows cement to be pumped down on top of the plug, saving another trip in the hole.

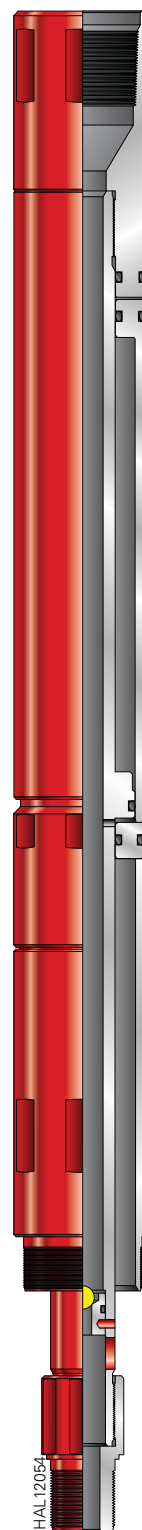
The 1.81-in. OD hydraulic setting tool can be run with only three pulling cylinder assemblies, but the maximum pulling force is reduced. The total working area will be 2.896 in.², which yields an output force of 13,900 lb (6305 kg). The 1.81-in. OD assembly has the same profile as the 1 11/16-in. GO setting tool.

The 3.64-in. OD assembly has the same profile as the Baker No. 10 setting tool.

The 3.81-in. OD assembly will have the same profile as the Baker No. 20 setting tool.

Features and Benefits

- » The bottom connections emulate common wireline setting tools
- » Circulation ports are available to use for spotting cement
- » Setting tools can be run on regular or coiled tubing
- » Hydraulic setting tools require no explosives
- » Tools continue to build pressure in the workstring above the ball so the ball-drop sleeve shears open, establishing circulation through the assembly



3.81-in. HCT
Setting Tool

Coiled Tubing Hydraulic Setting Tools

Tool OD		Tool Length		Stroke		Working Area		Maximum Force		Top Connection Box	Bottom Connection (Setting Tool)	Maximum Pressure ^e		Tensile Rating ^e	
in.	mm	in.	mm	in.	mm	in. ²	mm ²	lb	kg			psi	MPa	lb	kg
1.81	46.0	93.66 ^a	2379.0	10.0	254.0	4.062	2620.6	19,497 ^b	8774	1.315-in. OD 2.25-lb OECO A	1 11/16-in. GO	10,000	68.95	17,500	7875
2.75	69.9	60.99	1549.1	7.00	177.8	7.394	4770.3	40,186	18 228	2 3/8-in. PAC Box	Baker No. 10	13,000	89.60	51,000	23 133
3.64	92.5	33.80	858.5	6.68	169.7	9.91	6393.5	40,135 ^c	18 061	2 3/8-in. EU 8 Rd Box	Baker No. 10	11,000	75.84	78,000	35 100
3.81	96.8	41.98	1066.3	12.0	304.8	10.82	6980.6	55,000 ^d	24 948	2 7/8-in. EU 8 Rd	Baker No. 20	8,400	57.92	73,000	32 850

^aThis is the maximum length of the tool with four cylinders.

^bThis calculation is based on a shear pin rating of 4,800 psi.

^cThis calculation is based on a shear pin rating of 4,050 psi.

^dThis calculation is based on a shear pin rating of 4,500 psi.

^eThis is the pressure/tensile rating after the tool is fully stroked.

Standard service rating

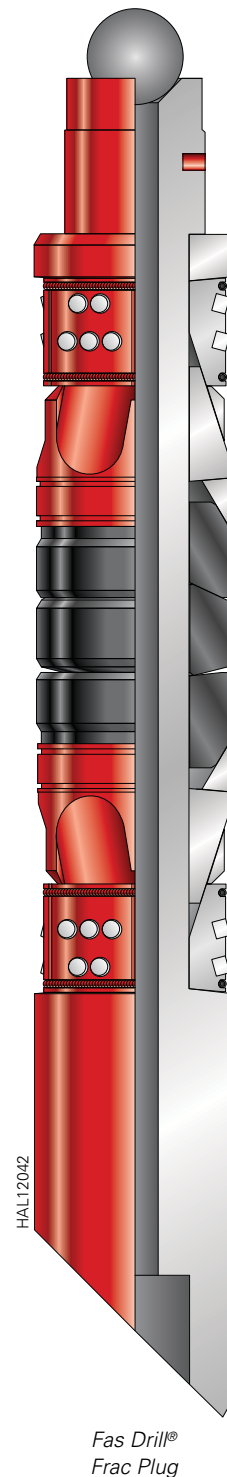
These ratings are guidelines only. For more information, contact your local Halliburton representative.

Fas Drill® Frac Plugs

The Fas Drill® frac plug is a field-proven composite product that provides superior zonal isolation across perforated intervals during wellbore stimulation but with the added benefit of exceptional drillability during wellbore cleanouts. Its unique composite material and efficiency during drillout make Fas Drill frac plugs ideal for horizontal applications. These plugs are available in 3 1/2-in. through 7-in. casing sizes.

Features and Benefits

- » Can be set hydraulically on jointed pipe, coiled tubing, electric wireline, or slickline using the Halliburton DPU® downhole power unit
- » 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 junk-mill bits
- » Frac plug options consist of loose ball or integrated ball
- » Allows flowback from below the plug
- » RapidBall™ self-removing balls can be used with the frac plugs



Fas Drill® Frac Plugs

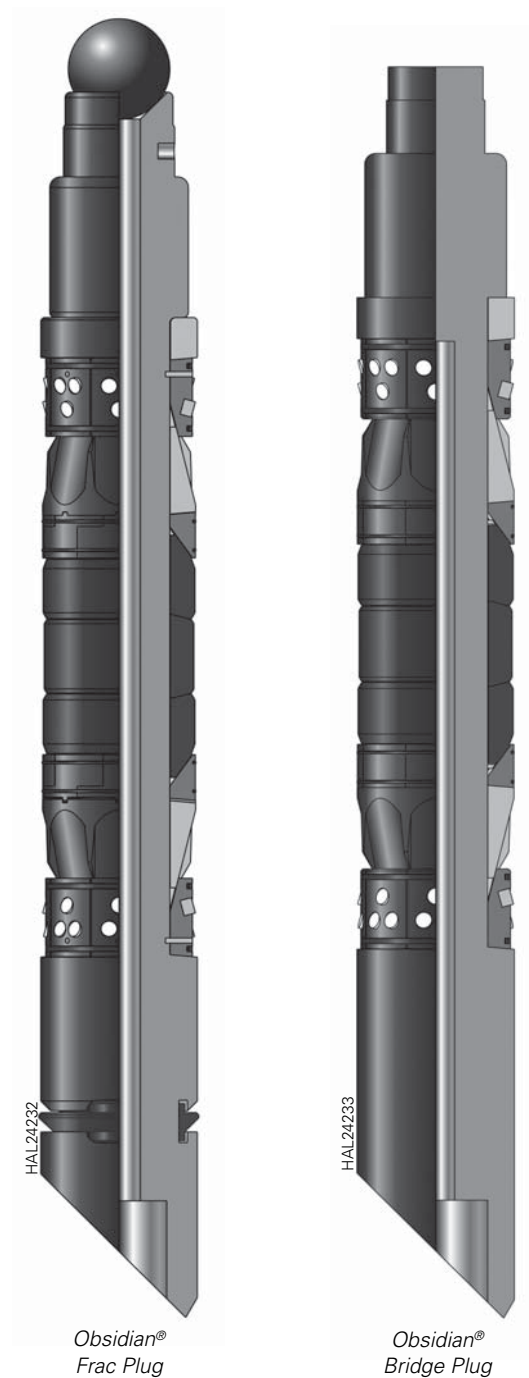
Casing Size		Maximum Casing ID		Minimum Casing ID		Maximum Tool OD		Rated Differential Pressure	
in.	mm	in.	mm	in.	mm	in.	mm	psi	MPa
3 1/2	88.9	2.992	76.0	2.922	74.2	2.69	68.3	8,000	55.2
4 1/2	114.3	3.920	99.6	3.640	92.5	3.3	83.8	10,000	69.0
4 1/2	114.3	3.826	97.2	3.640	92.5	3.44	87.4	12,000	82.7
4 1/2	114.3	3.920	99.6	3.826	97.2	3.50	88.9	10,000	69.0
4 1/2	114.3	3.920	99.6	3.826	97.2	3.54	89.9	14,000	96.5
4 1/2	114.3	4.000	101.6	3.826	97.2	3.60	91.4	10,000	69.0
4 1/2	114.3	4.090	103.9	3.920	99.6	3.66	93.0	10,000	69.0
5	127.0	4.276	108.6	4.126	104.8	3.85	97.8	10,000	69.0
5 1/2	139.7	4.778	121.4	4.376	111.2	4.15	105.4	10,000	69.0
5 1/2	139.7	4.892	124.3	4.670	118.6	4.37	111.0	10,000	69.0
6	152.4	5.240	133.1	5.132	130.4	4.70	119.4	8,000	55.2
7	177.8	6.456	164.0	6.184	157.1	5.80	147.3	8,000	55.2

Obsidian® Frac and Bridge Plugs

Obsidian® frac and bridge plugs are field-proven composite products that provide superior zonal isolation across perforated intervals during wellbore stimulation but with the added benefit of exceptional drillability during wellbore cleanouts. Its unique composite material and efficiency during drillout make Obsidian plugs ideal for horizontal applications. These plugs are available in 4 1/2-in. through 5 1/2-in. casing sizes and rated to 10,000-psi differential pressure.

Features and Benefits

- » Can be set hydraulically on jointed pipe, coiled tubing, electric wireline, or slickline using the Halliburton DPU® downhole power unit
- » Consists of composites and a packer set with no metal content
- » 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 junk-mill bits
- » Frac plug options consist of loose ball or integrated ball
- » Allows flowback from below the plug
- » Top drilling — relieves pressure from below before drilling through the top slips
- » RapidBall™ self-removing balls can be used with the frac plugs



Obsidian® Frac and Bridge Plugs

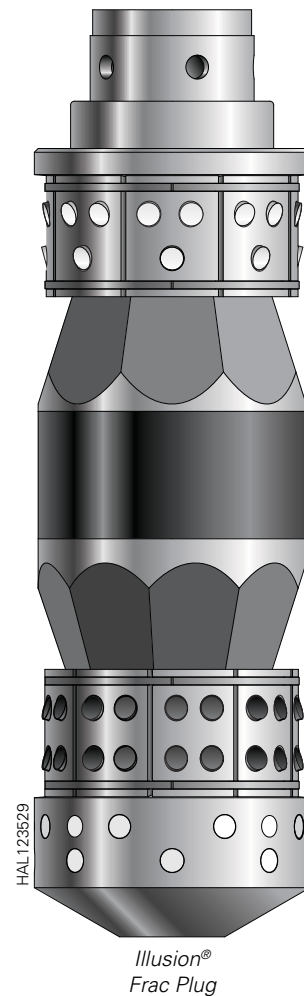
Casing Size		Maximum Casing ID		Minimum Casing ID		Maximum Tool OD		Rated Differential Pressure	
in.	mm	in.	mm	in.	mm	in.	mm	psi	MPa
4 1/2	114.3	4.000	101.6	3.920	99.6	3.66	93.0	10,000	69.0
5 1/2	139.7	4.670	121.4	4.376	111.2	4.15	105.4	10,000	69.0
5 1/2	139.7	4.892	124.3	4.670	118.6	4.37	111.0	10,000	69.0

Illusion® Frac Plugs

Illusion® frac plugs are a field-proven dissolvable/degradable product that provide superior zonal isolation across perforated intervals during wellbore stimulation. The combination of its unique dissolvable metal material and the degradable element package, makes the Illusion plug ideal for horizontal applications, particularly in long laterals where drilling out traditional composite tools becomes difficult. These plugs are available in 3 1/2-in. through 5 1/2-in. casing sizes and are rated to 10,000-psi differential pressure.

Features and Benefits

- » Can be set hydraulically on jointed pipe, coiled tubing, electric wireline, or slickline using the Halliburton DPU® downhole power unit
- » Dissolvable metal and a degradable packer element react based on temperature and/or salinity
- » Tool OD held to a minimum, allowing more clearance between the tool and casing for faster run-in
- » Large ID to assist in flowback and well cleanup
- » Helps save rig time and reduce casing damage caused by drillout processes
- » RapidBall™ self-removing balls can be used with the frac plugs
- » Variety of material options available based on wellbore parameters



Illusion® Frac Plugs

Casing Size		Maximum Casing ID		Minimum Casing ID		Maximum Tool OD		Rated Differential Pressure	
in.	mm	in.	mm	in.	mm	in.	mm	psi	MPa
3 1/2	88.9	2.992	76.0	2.922	74.2	2.69	68.3	10,000	69.0
4 1/2	114.3	4.000	101.6	3.826	97.2	3.54	89.9	10,000	69.0
4 1/2	114.3	4.184	106.3	3.920	99.6	3.68	93.5	10,000	69.0
5	127.0	4.276	108.6	4.126	104.8	3.85	97.8	10,000	69.0
5 1/2	139.7	4.778	121.4	4.126	104.8	3.80	96.5	10,000	69.0
5 1/2	139.7	4.670	118.6	4.376	111.2	4.15	105.4	10,000	69.0
5 1/2	139.7	4.892	124.3	4.670	118.6	4.37	111.0	10,000	69.0

