HALLIBURTON

Liner Hanger Systems

Halliburton Completion Tools

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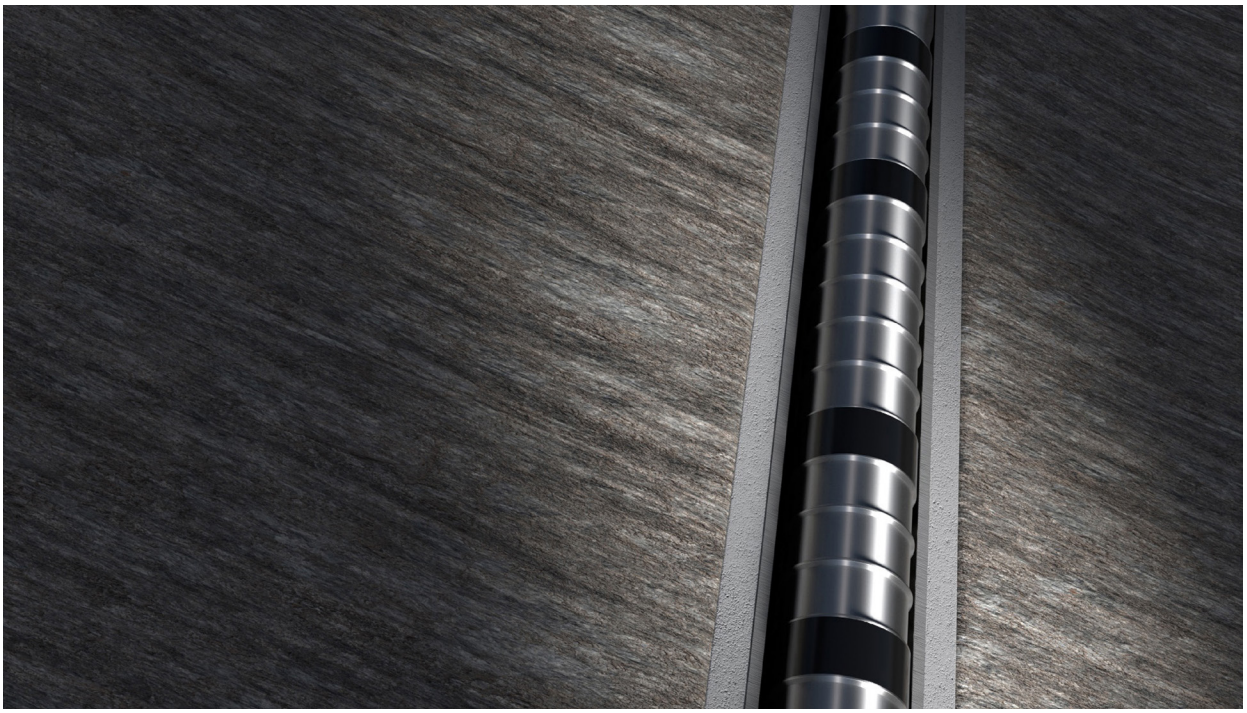


Introduction

Running liners is not without risk. Wellbores take on many characteristics that are often challenging to liner deployment. Wells with high-pressure differentials and extreme temperature ranges can threaten tool integrity, which can lead to nonproductive time and increased costs. These extreme environments require liner system solutions that can effectively manage the liner to total depth while mitigating risks and withstanding severe conditions. Liner systems help reduce capital expenditures by eliminating the need to extend a single, long casing string to the top of the wellbore.

A liner hanger suspends the liner (casing below the liner hanger) in the previous casing string to reduce material costs and provide completion solution options. A seal is required at the top of the liner hanger to prevent transfer of fluid or pressures from either direction. This seal can be in the form of an integral expandable liner hanger or by means of a liner packer.

The Halliburton portfolio of tools offers both expandable and conventional liner hangers to cover all types of well environments, from mature and unconventional assets to shallow and ultra-deep water.

VersaFlex® expandable liner hanger

HCT2518-001b

VersaFlex® expandable liner hanger system

VersaFlex® expandable liner hanger (ELH) systems, the industry's first-to-market ELH system, combines Halliburton industryleading expandable solid liner hanger technology with our complete range of cementing products and services to provide a total system approach to liner installations.

The VersaFlex system features an integral liner hanger/packer made up to an integral tieback receptacle above an expandable solid hanger body and a lower sleeve designed to carry tensile and torque loads during deployment. Elastomeric elements are bonded onto the hanger body. As the hanger body is expanded, the elastomeric elements are compressed in the annular space. This virtually eliminates the liner hanger/casing annulus and provides liner-top pressure integrity while delivering impressive tensile and compressive load capacity on setting. With no moving parts, slips, or cages, the simple VersaFlex ELH system design eliminates the risk of presetting the liner hanger/packer.

Understanding that different applications require different solutions, Halliburton engineered and fully designed several ELH systems suited for various applications. While these applications cover a wide range of conditions, Halliburton maintains simplicity throughout each system to help promote liner deployment and a liner-top seal on setting — all while incorporating fewer installation procedures with minimal operational steps.

VersaFlex ELH System Models

- Standard system
- High-torque system
- XSL system
- XSL-ZE (Zero-Elastomer) system
- XSL-ZE-BL (Breech Lock) system
- GT (Geothermal) system
- Big bore system

Applications

- Drilling liners
- Production liners
- Tight tolerance liners
- Extended-reach liners
- Openhole completions
- Horizontal completions
- Drill-in liners

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide range of industry-standard cementing accessories

Features

- Limited body connections
- No external moving components, including slips, hydraulic cylinders, cages, etc.
- Low-profile bonded element design allows for high circulation rates
- 360° hydraulic expansion reduces uneven slip contact
- No physical damage to the supporting casing; no slip "wickers" to cut into the supporting casing
- Running tool remains static throughout operation; no retrievable or drillable packoff bushing required

Benefits

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide range of industry-standard cementing accessories

VersaFlex® expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
3 1/2	5 1/2	14; 15.5; 17; 20; 23; 26
5	6 5/8	24
5; 5 1/2	7	20; 35
5 1/2	7 5/8	26.4; 39
7; 7 5/8	9 3/8; 9 5/8; 9 7/8	39; 65.10
7 3/4; 7 5/8	10 3/4	55.5; 79.2
9 5/8	11 3/4	54; 82.6
9 5/8	11 7/8	65.0; 71.8
11 3/4	13 3/8	61; 68
11 3/4	13 3/8; 13 5/8	61; 113
11 7/8	13 3/4; 14	61; 115.53

Please contact your Halliburton Liner Hanger representative for additional sizes and weight ranges.

VersaFlex® XSL expandable liner hanger

HCT2518-002b

VersaFlex® XSL expandable liner hanger system

VersaFlex® XSL expandable liner hanger (ELH) systems combine the latest design features from across our liner hanger portfolio. Ideal for onshore and offshore applications, the VersaFlex XSL system is designed to improve the deliverability of a low-to-moderate load-bearing ELH without sacrificing its gas-tight sealing capability or reliability. The system can provide significant value to your well construction project, without compromising quality, and continues our legacy of industry-leading ELH technology with a total system approach to liner installations.

The system's unique body profile uses engineered extrusion limiter spikes, which provide a fully compliant metal-to-metal seal with full bi-directional anchoring capability and a temperature rating up to 350°F. Its ability to provide a 360° metal-to-metal seal is backed by redundant resilient elastomeric seals to provide backup sealing capability. With no external moving parts, its unique integral design eliminates any body connections below the hanger body to minimize leak paths.

In addition, its clean-form design provides a smooth radial flow path allowing for an unrestricted bypass area, which assists in reducing equivalent circulating densities (ECDs) during all operation phases.

The VersaFlex XSL liner hanger system includes a standard length upper tieback receptacle (TBR) and an integral liner-top packer, liner hanger, and setting sleeve. The lower setting sleeve can be adapted or easily threaded to a wide range of thread connections and compatible weight ranges.

Applications

- Conventional liner installations
- Onshore and offshore
- Oil and gas
- Vertical to horizontal

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Improved metal-to-metal anchor and seal
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide range of industry-standard cementing accessories

Features

- Reduced number of body connections
- No external moving components, including slips, hydraulic cylinders, cages, etc.
- Shortened one-piece expandable hanger body design with engineered extrusion limiter spikes
- 360° hydraulically energized metal-to-metal sealing package with resilient backup sealing elastomers eliminates uneven slip contact
- Running tool static throughout operation; no retrievable or drillable packoff bushing required
- Optional designs available with an integrated latched upper TBR (for anchored seal stack)

Benefits

- Potential leak paths minimized
- Component loss or hang up during deployment eliminated
- Less induced stress and more even stress distribution in supporting casing
- Running tools provide hydraulic hanger body expansion — no string weight to set required
- Bi-directional anchoring and sealing capability
- Maximized operating efficiency
- Designs based on field-proven VersaFlex® and XtremeGrip® ELH system technology

VersaFlex® XSL expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
5	7	29; 32
5 1/2	7 5/8; 7 7/8	29.7; 39.3
7; 7 5/8	8 5/8	32
7; 7 5/8	9 5/8; 9 7/8	47; 62.8
8 5/8	10 3/4	45.5

Please contact your Halliburton Liner Hanger representative for additional sizes and weight ranges.

VersaFlex® XSL-ZE expandable liner hanger

HCT2518-003b

VersaFlex® XSL-ZE expandable liner hanger system

The VersaFlex® XSL-ZE (Zero-Elastomer) expandable liner hanger (ELH) system improves the deliverability of a low-to-moderate load-bearing ELH that provides full metal-to-metal sealing (zero elastomers) without sacrificing its gas-tight sealing capability or reliability. The system can provide significant value to your well construction project, without compromising quality, and continues our legacy of industry-leading ELH technology with a total system approach to liner installations.

The system's unique body profile uses engineered extrusion limiter spikes, which provide a fully compliant 360° metal-to-metal seal with full bi-directional anchoring capability and a temperature rating up to 450°F. With no external moving parts, its unique integral design eliminates any body connections below the hanger body to minimize leak paths.

In addition, its clean-form design provides a smooth radial flow path that allows for an unrestricted bypass area, which assists in reducing equivalent circulating densities (ECDs) during all operation phases.

The VersaFlex XSL-ZE liner hanger system includes an upper tieback receptacle (TBR), integral liner-top packer, liner hanger, and setting sleeve. The lower setting sleeve can be adapted or easily threaded to a wide range of thread connections and compatible weight ranges.

Applications

- Conventional liner installations
- Onshore and offshore
- Oil and gas
- Vertical to horizontal

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Improved metal-to-metal anchor and seal
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide range of industry-standard cementing accessories

Features

- Reduced number of body connections
- No external body elastomers, increased temperature rating to 450°F
- No external moving components, including slips, hydraulic cylinders, cages, etc.
- Shortened one-piece expandable hanger body design with engineered extrusion limiter spikes, extended-length TBR for dynamic seal stack
- 360° hydraulically energized metal-to-metal sealing package eliminates uneven slip contact
- Running tool remains static throughout operation; no retrievable or drillable packoff bushing required
- Optional designs available with an integral upper TBR with latching profile (for static seal stack)

Benefits

- Reduces potential leak paths from body connections
- Works across a wider range of muds, fluids, additives, and wellbore environments at increased temperature ratings
- Eliminates component loss or hang up during deployment
- Less induced stress and more even stress distribution in supporting casing
- Running tools provide hydraulic hanger body expansion — no string weight to set required
- No cement required to provide liner-top seal
- Bi-directional anchoring and sealing capability
- Maximized operating efficiency
- Designs based on field-proven VersaFlex® and XtremeGrip® ELH system technology

VersaFlex® XSL-ZE expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
5	7 5/8; 7 7/8	29.7; 39.3 29.7; 39.3
7; 7 5/8	8 5/8	32
7; 7 5/8	9 5/8; 9 7/8	47; 62.8
8 5/8	10 3/4	45.5

Please contact your Halliburton Liner Hanger representative for additional sizes and weight ranges.

VersaFlex® XSL-ZE-BL expandable liner hanger

HCT2518-004b

VersaFlex® XSL-ZE-BL (breech lock) expandable liner hanger system

The VersaFlex® XSL-ZE-BL (Zero-Elastomer Breech Lock) system offers an unparalleled design to increase the compressive load capability of the running tool/liner hanger interface. This expandable liner hanger (ELH) system allows operators to reach total well depth, particularly in highly deviated or long openhole, horizontal wells and extended-reach drilling (ERD) wells.

Excessive loads on the liner hanger are eliminated and directed to the liner connections to maximize tool loading and minimize risks during liner hanger deployment and setting operations.

The system's unique body profile uses engineered extrusion limiter spikes, which provide a fully compliant 360° metal-to-metal seal with full bi-directional anchoring capability, and a temperature rating up to 450°F. Elastomers are intentionally removed to provide the operator with greater flexibility in mud, fluid, additives, and wellbore environments. The system has no external moving parts, and its unique full integral design eliminates body connections above the hanger body to eliminate leak paths.

In addition, its clean-form design provides a smooth radial flow path that allows for an unrestricted bypass area, which assists in reducing equivalent circulating densities (ECDs) during all operation phases.

The VersaFlex XSL-ZE-BL liner hanger system includes an integral upper tieback receptacle (TBR) with latch profile and an integral liner-top packer, liner hanger, and setting sleeve. The lower setting sleeve can be adapted or easily threaded to a wide range of thread connections.

Applications

- Conventional liner installations
- Onshore and offshore
- Oil and gas
- Vertical to horizontal

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Improved metal-to-metal anchor and seal
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide range of industry-standard cementing accessories

Features

- Body connections eliminated
- No external body elastomers, increased temperature rating to 450°F
- No external moving components, including slips, hydraulic cylinders, cages, etc.
- Shortened one-piece expandable hanger body design with engineered extrusion limiter spikes, extended-length TBR replaced with shorter integral TBR with latching profile
- 360° hydraulically energized metal-to-metal sealing package eliminates uneven slip contact
- Running tool static throughout operation; no retrievable or drillable packoff bushing required
- Optional designs available with an extended threaded upper TBR (for dynamic seal stack)

Benefits

- Potential leak paths from body connections eliminated
- Performs across a wider range of muds, fluids, additives, and wellbore environments at increased temperature ratings
- Component loss or hang up during deployment eliminated
- Less induced stress and more even stress distribution in supporting casing
- Running tools provide hydraulic hanger body expansion — no string weight to set required
- No cement required to provide liner-top seal
- Bi-directional anchoring and sealing capability
- Maximized operating efficiency
- Designs based on field-proven VersaFlex® and XtremeGrip® ELH system technology

VersaFlex® XSL-ZE-BL (breech lock) expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
5	7	29; 32
5 1/2	7 5/8; 7 7/8	29.7; 39.3
7; 7 5/8	9 5/8; 9 7/8	47; 62.8

Please contact your Halliburton Liner Hanger representative for additional sizes and weight ranges.

VersaFlex® GT expandable liner hanger

HCT2518-005b

VersaFlex® GT expandable liner hanger system

The VersaFlex® GT expandable liner hanger (ELH) system is a Geothermal Tier 1 offering that combines the latest design features from our portfolio of liner hangers that are ideal for geothermal applications with the ability to handle temperature ranges up to 575°F (302°C). The VersaFlex GT system can provide significant value to your well construction project without compromising quality and continues our legacy of industry-leading ELH technology with a total system approach to liner installations.

When running liners in geothermal wells, using an ELH system solution can potentially overcome challenges to help mitigate risks, reduce non-productive time (NPT), or prevent loss of well.

Using a high-temperature liner hanger with compliant seal on set removes the rig time associated with waiting on cement (WOC) and/or cement squeeze of traditional Geothermal Tier 2 liner systems, such as mechanical hanger and tieback receptacle (TBR).

VersaFlex GT systems include a wide range of sizes and a selection of hanger types that have an extended (threaded) upper TBR or an integral single-piece liner hanger with a shortened upper TBR with latching profile for a static seal stack. The lower end of the liner hanger assembly can be easily adapted to the liner connection by an interchangeable adapter. The system is compatible with a wide range of thread connections and casing weights.

Applications

- Geothermal, oil, and gas
- Conventional liner installations
- Onshore and offshore
- Vertical to horizontal

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Improved metal-to-metal anchor and seal
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide range of industry-standard cementing accessories

Features

- Temperature ratings up to 575°F
- Upper TBR for dynamic floating seal stack
- Shortened one-piece expandable hanger body design with engineered extrusion limiter spikes
- 360° hydraulically energized metal-to-metal sealing package
- Bi-directional anchoring and sealing capability
- Runs with VersaFlex® standard ball-drop system with quick lock collet
- Optional designs available with an integrated latched upper TBR for anchored seal stack

Benefits

- Performs across a wider range of muds, fluids, additives, and wellbore environments at increased temperature ratings
- Potential leak paths from body connections eliminated
- Component loss or hang up during deployment eliminated
- Less induced stress and more even stress distribution in supporting casing
- Running tools provide hydraulic hanger body expansion — no string weight to set required
- No cement required to provide liner-top seal
- Bi-directional anchoring and sealing capability
- Maximized operating efficiency
- Designs based on field-proven VersaFlex® and XtremeGrip® ELH system technology

VersaFlex® GT expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
5; 5 1/2	7	20; 35
7; 7 5/8	9 3/8;9 5/8;9 7/8	39; 65.10
9 5/8	11 3/4	54; 82.6
9 5/8	11 7/8	65.0; 71.8
11 7/8	13 3/4; 14	61; 115.53
16; 17	20	106.5; 169.0

Please contact your Halliburton Liner Hanger representative for additional sizes and weight ranges.

XtremeGrip® expandable liner hanger

HCT2518-006b

XtremeGrip® expandable liner hanger system

Halliburton XtremeGrip® and XtremeGrip high-pressure/high-temperature (HP/HT) expandable liner hanger (ELH) systems take the standard VersaFlex® liner hanger to the next level. This high-performance, advanced technology provides a compliant metal-to-metal seal with a fully bonded resilient elastomeric seal to account for imperfections in the parent casing. Its ability to provide an ISO 14310 V0-tested, gas-tight seal on setting is surpassed only by its ability to provide enhanced hang-weight capabilities at elevated temperatures up to 400°F (204°C) and pressures up to 15,000 psi.

Ideal for use in land, deepwater, HP/HT applications, and wherever long liners are deployed, the XtremeGrip and XtremeGrip HP/HT systems are designed to mitigate risks and maintain hang-weight capabilities at elevated temperatures and pressures. The system offers increased robustness associated with liners and liner deployment. The hanger and running tool are assembled together and form an intrinsic packoff, which minimizes downhole tool components and potential leak paths while cementing. The standard running tool setup offers washdown capabilities, rotation capabilities without bearings, and simultaneously allows for reciprocation of the liner. Once the cement is placed and the tool actuates the expansion process, the hanger is set to offer bi-directional load capabilities and provide a gas-tight, liner-top seal, which eliminates remedial liner-top squeeze jobs after setting.

The unique body profile of the XtremeGrip and XtremeGrip HP/HT systems utilizes engineered extrusion limiter rings to provide metal-to-metal sealing and full bi-directional anchoring capability in all casing grades at elevated temperatures. Its clean-form design offers a smooth radial flow path allowing for an unrestricted bypass area, which assists in reducing equivalent circulating densities (ECDs) during all operation phases.

XtremeGrip ELH System Models

- Standard system
- Low ECD system
- Big bore system

Applications

- Land
- Offshore
- Deep water
- HP/HT

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Improved fluid flow path area (non-tortuous) during cementing
- Improved metal-to-metal anchor and seal
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigate risk
- Compatible with a wide rangeof industry-standard cementing accessories

Features

- Simple, clean-form design
- Metal-to-metal seal with resilient elastomeric seal[1]
- Internal body connections eliminated
- 360° hydraulically energized compliant seal
- Engineered extrusion limiter rings
- Gas-tight, API 19LH VS1 qualified[2]
- Tested to and performs in elevated temperature and pressure environments up to 400°F (204°C) and 15,000 psi
- Heavy liners and vertical or long lateral installations

[1] Resilient seals might not be present on all hangers, application dependent.

[2] Contact a Halliburton representative for full list of API 19LH qualified hangers.

Benefits

- Maintains hang-weight capability at elevated temperatures
- Sets in standard and heavyweight parent casings
- Applicable across multiple applications
- Reduces ECDs and improves flow rates
- Single-piece integral tieback receptacle/packer/hanger minimizes leak paths
- Fewer connections and parts, less problems
- Energized sealing mechanism does not require drillpipe weight to set packer/hanger
- Reliable, engineered solution

XtremeGrip® expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
5 1/2	7	23; 41
5 3/4	7 3/4	46.1
7; 7 5/8; 7 3/4	10 3/4; 10 7/8	55.5; 72
9 5/8; 9 7/8; 10 1/8	11 3/4; 11 7/8	60.0; 71.8
11 3/4; 11 7/8	13 3/8; 14 1/8	54.5; 126.82

Selected sizes in the XtremeGrip® system portfolio is available in the HP/HT configuration to meet industry-recognized temperature ratings of up to 575°F (302°C) and or pressure ratings up to 15,000 psi. Additional sizes or weight ranges are under development and testing.

XtremeGrip® low ECD expandable liner hanger

HCT2518-007b

XtremeGrip® low ECD expandable liner hanger system

XtremeGrip® low equivalent circulating density (ECD) expandable liner hanger (ELH) systems are an advanced variant of the XtremeGrip ELH. Halliburton developed the low ECD system to handle low-pressure formations and fracture-gradient-sensitive wells. This system reduces pressure drop across the liner top during circulation and cementing for easier ECD management.

The low ECD system's unique body profile reduces the liner hanger's maximum OD to greatly enhance the effective bypass area, which allows for greater control of ECDs during deployment and pumping of heavyweight muds and cement. Its clean-form design offers a smooth radial flow path to allow for an unrestricted bypass area, which continues to assist in reducing ECDs during all operation phases. With the reduction in maximum OD, the requirement to step down one liner size is an inherent component of the XtremeGrip low ECD system.

Applications

- Wells with low-pressure fracture gradients
- Wells with excessive fluid loss
- Wells where controlling ECDs are critical
- Land, offshore, deep water

Product Attributes

- Simple clean-form design, no external moving parts, and standard wash and ream capability
- Rotation and reciprocation during deployment and cementing
- Highly improved fluid flow path area (non-tortuous) during cementing
- Improved metal-to-metal anchor and seal
- Hydraulically energized seal on set, no cement required to seal
- Reduced operational steps mitigates risk
- Compatible with a wide range of industry-standard cementing accessories

Features

- Highly reduced maximum OD
- Simple, clean-form design
- Metal-to-metal seal with resilient backup elastomeric seal[1]
- Internal body connections eliminated
- 360° hydraulically energized compliant seal
- Engineered extrusion limiter rings
- Gas-tight, API 19LH VS-1 qualified[2]
- Tested to and performs in elevated temperature and pressure environments up to 575°F (302°C) and 15,000+ psi
- Heavy liners and vertical or long lateral installations

[1] Resilient seals might not be present on all hangers, application dependent.

[2] Contact a Halliburton representative for full list of API 19LH qualified hangers.

Benefits

- Greatly reduces ECDs and improves flow rates
- Maintains hang-weight capability at elevated temperatures
- Sets in multiple parent casing grades
- Applicable across multiple applications
- Single-piece integral tieback receptacle/ packer/hanger minimizes leak paths
- Fewer connections, fewer parts, less problems
- Energized sealing mechanism does not require drillpipe weight to set packer/hanger
- Reliable, engineered solution

XtremeGrip® low ECD expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
5 3/4	7 3/4	46.1
5 3/4	7 5/8; 7 3/4	42.8; 46.1
7 3/4	9 5/8	53.5
11 3/4	13 3/8; 14.15	68; 127

Please contact your Halliburton representative for additional sizes and material grades, XtremeGrip® not available in 22-in. casing size.

VersaFlex® and XtremeGrip® big bore expandable liner hanger

HCT2518-008b

VersaFlex® and XtremeGrip® big bore expandable liner hanger systems

VersaFlex® and XtremeGrip® big bore expandable liner hanger (ELH) systems help reduce risk and capital costs throughout the life of the well. Designed specifically for the deepwater and subsea markets, Halliburton big bore ELH systems are ideal for complex well conditions. Big bore systems do not require landing in a predetermined profile, which helps eliminate complications common to positioning in mudline/casing wellhead profiles.

Big bore ELH systems do not require liner-top cement integrity to achieve a liner-top seal upon setting. Additionally, casing-placement flexibility helps eliminate related liner installation issues, and Halliburton elastomeric seal technology is unmatched in the industry. With no moving parts, our groundbreaking clean-form, all-in-one integral hanger/packer design helps eliminate costly tool failures associated with conventional liner hangers. XtremeGrip Big Bore systems help overcome well construction challenges, such as when heavier hang loads at elevated temperatures are required.

During cementing, the Big bore systems' rotating and reciprocation capabilities allow for zonal isolation integrity. Additionally, high-torque ratings permit reaming through downhole cave-ins, kicking off ledges from previously drilled segments, and drilling new hole sections. Rotation and reciprocation capabilities also help ensure the best possible cement placement and bond. An optimized OD and lack of profile ring greatly reduces surge and ECD risks.

Reduced materials cost provides operators a significant payoff. The Big bore ELH system greatly reduces liner overlap because pressure-bearing tieback strings are not required. Compared to conventional systems, the Big Bore systems also minimize the operating steps required to set the liner hanger/packer while virtually eliminating remediation costs. With its "set-and-forget" reliability, the Big Bore systems' redundant leak-proof design helps eliminate sustained casing pressure.

Applications

- Land
- Offshore
- Deep water

Product Attributes

- Overcome challenges of subsea wellhead supplemental casing hangers
- VersaFlex Big bore ELHs set and seal in standard and seamed casing, across proud welds in sizes up to 22-in.
- XtremeGrip Big bore ELHs set and seal in standard and heavy-wall casing in sizes up to 20-in.
- Simple clean-form design improves run-in-hole speeds and high-circulation rates
- Improved fluid flow path area (non-tortuous) during cementing
- Full bi-directional anchoring and metal-to-metal sealing in tortuous/complex wellbores
- Rotation and reciprocation during deployment and cementing
- Compatible with wide range of industry-standard cementing accessories
- Running tool static throughout operation

Features

- Simple, clean-form design
- VersaFlex® big bore ELH uses protected bonded elastomers with redundant backups in temperature ranges up to 325°F
- XtremeGrip® big bore ELH uses metal-to-metal seal with resilient elastomeric seal in temperature ranges up to 400°F
- Body connections (hanger-type dependent) reduced or eliminated
- 360° hydraulically energized compliant seal
- Engineered extrusion limiter rings
- Gas-tight, API qualified
- Heavy liners and vertical or long lateral installations

  Contact a Halliburton representative to discuss hanger selection for your application.

Benefits

- Maintains hang-weight capability at elevated temperatures
- Sets in standard and heavyweight parent casings
- Applicable across multiple applications
- Reduces ECDs and improves flow rates
- Single-piece integral packer/hanger minimizes leak paths
- Fewer connections and parts, less problems

  Energized sealing mechanism does not require drillpipe weight to set packer/hanger
  Reliable, engineered solution

VersaFlex® and XtremeGrip® big bore expandable liner hanger system

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT
14	16; 16.245	84 to 96; 102.9 to 118
16	17 7/8; 18	93.5; 117.0
16	18	93.54; 117.0
14; 16; 17	18 5/8	85.7; 136.0
16; 17	20	106.5; 169.0
17 1/2; 18; 18 5/8	22	183.92; 328.0

Please contact your Halliburton representative for additional sizes and material grades, XtremeGrip® not available in 22-in. casing size.

Upper Tie-Back Receptacles available only on selected 16" models.

Floating seal stack

HCT2518-009b

Anchored seal stack floating seal stack

HCT2518-010a

Tieback seal unit assemblies

The expandable tieback seal unit is designed to install into the upper tieback receptacle (TBR) of the liner hanger assembly. Tieback seal units allow upper casing string tieback to surface while leaving the largest possible ID in the hanger assembly. Tieback seal assemblies are available in various models.

Floating (dynamic seal stacks)

Product Attributes

- Designed to fully land and allow a no-go locator to locate at the top of the TBR
- Dynamic movement (travel) set by spacing out tieback seal assembly within the given TBR length
- Used alone or in conjunction with Halliburton SuperFill™ TB equipment when cementing surface casing in place is required
- Metallurgy and seal units selected to suit well conditions
- Seal units available in three types of elastomer configurations: premium, molded, and bonded

Anchored (static seal stacks)

Product Attributes

- Designed to latch into the TBR latching profile
- Static (non-movement) or anchored tieback seal assemblies prevent the seals from exiting the sealbore
- Latch mechanism for liner hangers available in both Ratch-Latch™ and Versa-Latch® profiles
- Used alone or in conjunction with Halliburton SuperFill TB equipment when cementing surface casing in place is required
- Metallurgy and seal units selected to suit well conditions
- Seal units available in three types of elastomer configurations: premium, molded, and bonded

Single-trip polished bore assembly

HCT2518-011

Single-trip polished bore assembly with Ratch-Latch™ seal units (ST-PBA w-RL)

Product Attributes

- Designed to latch into the TBR latching profile to provide an anchor for the extended upper TBR, so the dynamic seal unit can disengage to allow for dynamic travel
- Latch mechanism for liner hangers available in both Ratch-Latch and Versa-Latch profiles
- Extended upper TBRs provided in varying lengths
- Metallurgy and seal units selected to suit well conditions
- Seal units available in three types of elastomer configurations: premium, molded, and bonded
- Designs available for deployment in open or closed stroke position

VersaFlex® expandable liner hanger setting and service tools

Halliburton offers various setting tool designs based on the hanger configuration and application. Primary systems include the following:

- Standard ball/flapper set tool
- High torque tool
- Low ECD (equivalent circulating Density / Monobore tool
- Big bore tool
- Breech lock adjustable pressure setting tool

Expandable liner hanger (ELH) expansion (setting) is accomplished using a hydraulically actuated liner running/setting tool assembly. The unique system provides the necessary expansion mechanics, cementing packoff system, a collet assembly to carry and transfer the liner weight to the drillstring while providing torque, and an expansion indicator assembly. The running/setting tool assembly features a primary and secondary releasing system for maximum reliability. Depending on running tool selection, these tool assemblies are compatible with either the VersaFlex® or XtremeGrip® liner hanger models.

Features

- Each tool design is unique; however, each cementing liner hanger running tool contains the following four primary components, which simplifies processes and enhances reliability.
- Piston provides the transition from pressure to force during the expansion process. Various forms of pistons and force multipliers are used to create force.
- Crossover valve incorporates multiple porting, which allows pressure paths for hydraulic expansion and fluid return paths during the reverse-out process.
- Expansion cone assembly uses the force from the piston to drive the cone into the hanger body and expand it into the parent casing.
- Collet assembly transfers the liner string load being conveyed into the wellbore to the drillpipe and transmits torque to the liner through contact with the collet retainer to torque adapter.

Benefits

- Washing and reaming during deployment without special configurations of each tool
- Higher circulating rates and pressures than conventional systems
- Rotation and reciprocation during cementing operations
- Debris-tolerant porting
- Simplified setting processes and procedures
- Redundant setting features on all flapper-set tools
- Tertiary setting systems on high-torque tool system
- Standard contingency release features

TOOL TYPES	SIZES IN.	APPLICATIONS	DISTINGUISHING FEATURES
			
Standard	7 7 5/8 7 ¾ 9 5/8; 9.875 10 3/4 11 ¾; 11 7/8 13 5/8; 14.0	Drilling liners Production liners Tight tolerance liners Drill-In liners	Ball or Flapper (P) set, J-slot with compression and LH shear activation Gen 3 cone, Collets: Standard / Quick Lock / Breech Lock, Used with ELH Models: VersaFlex® STD, XSL, XSL-ZE, XG, VF-GT
			
High torque	5 1/2 7 7 3/4 9 5/8; 9 7/8 10 3/4	Drilling liners Production liners Drill-In liners	Flapper (P) set / ball set HT J-slot with LH shear activation Gen 3 cone Collets: Quick Lock / Breech Lock Tertiary Setting: Flapper (M) Used with ELH Models: VersaFlex® STD, XSL, XSL-ZE, XG, VF-GT
			
Low pressure	7 3/4 9 5/8 10 3/4	Drilling liners Production liners Drill-In liners	Ball set J-slot with compression and LH shear activation Gen 3 cone Collets: Quick Lock / Breech Lock Used with ELH Models: VersaFlex STD, XSL, XSL-ZE, XG, VF-GT
			
Big bore	16 18 5/8 20 22	Drilling liners Tight tolerance liners	Ball set J-slot with compression and LH shear activation Gen 3 cone Collets: Quick Lock / Breech Lock Used with ELH Models: Big bore STD, Big bore XG, Big bore GT

Notes:

1. VersaFlex® running tools deploy both VersaFlex and XtremeGrip® expandable liner hangers
2. Refer to hanger EDS generated in Enterprise/CWI for latest running tool, MN/part number and expansion cones MN/part numbers
3. Design features noted are as per the latest design revision. Older versions of the running tool systems remain in operation that may not include the latest design features
4. (P) Pressure activated flapper (M) Mechanically actuated flapper
5. Sizes & features listed are typical data points. Contact your Halliburton representative for more details.

Top-down squeeze valve

HCT2518-019a

Expandable liner hanger service tools

Top-down squeeze valve

In deepwater markets, well complexity can present liner cementing challenges, particularly in depleted reservoirs and zones with weak formations or prone to fluid loss, which can prevent cement from lifting. The top-down squeeze valve helps ensure sufficient cement is placed to cover and isolate all hydrocarbon-bearing zones and isolate abnormal pressure intervals from normal pressure intervals in the well.

Features

- Minimal components
- Unique expandable ball seat
- Triple-function valve
- Premium seals
- High-quality materials

Benefits

- Top-down squeeze capability
- Positive pressure indicators of valve operation
- Porting provides large flow area
- Pressure rated up to 10,000 psi at 275°F (135°C)
- Enhanced liner cementing capabilities
- Compatible with a wide range of liner cementing accessories

Sizes Available

- 6 5/8-in. and 4 1/2-in.

High-flow sub

HCT2518-020a

High-flow sub

The VersaFlex® high-flow circulation valve provides the capability to increase circulation rates through a controlled flow path from the drillpipe to annulus. The tool is designed with minimal moving components for a simplistic approach to maximize flow area.

Features

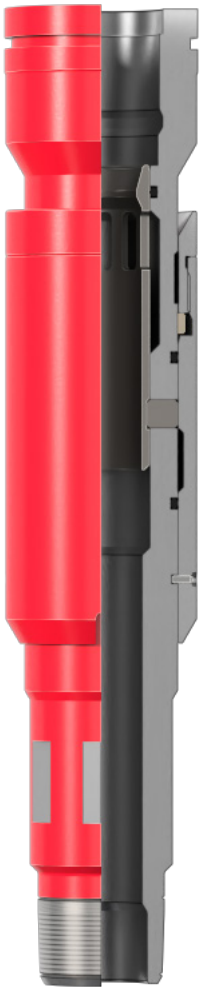
- API drillpipe connections
- Zero body connections
- Field-adjustable pinning
- Largest bypass area available

Benefits

- Reverse-out rates increased up to 25 bbl/min
- Maximized porting develops minimized DP (Delta P)
- Ball-operated/ball-retrieved
- Flow cutting of critical tooling prevented

Sizes Available

- 6 5/8-in. and 4 1/2-in.



Soft-release ball seat

HCT2518-021a

Soft-release ball seat

In sensitive or weak formations, surge generated from downhole pressure shear-out events can induce losses or formation damage.

Formations or well designs might also require circulation of brine, breaker, or acid via inner string post-hanger setting operations or hydraulic activation of openhole packers.

The soft-release ball seat system allows for application of multiple, full-expansion pressure cycles to an expandable liner hanger (ELH), without time restriction, followed by regain of full circulation capability without a pressure surge event.

Applications

ELH systems that deploy the following:

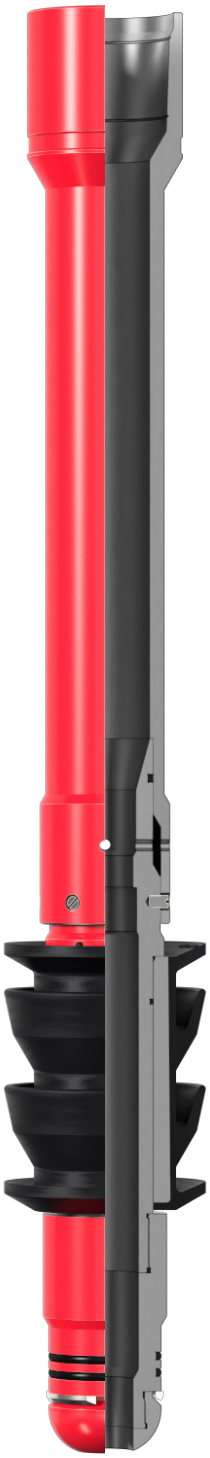
- Screens
- Perforated/slotted liners
- Hydraulically activated openhole packers

Features

- Compatible with the VersaFlex® running tool portfolio
- Ball seat bypass mechanism not time dependent
- Full flow and inner string pressure integrity after ball seat bypass
- Simple, mechanical actuation of ball seat bypass

Benefits

- Mitigates mud losses associated with surge events in weak formations
- Helps protect sensitive formations from surge-related damage
- Provides circulation capability via an inner string after hanger setting and running tool release
- Enables setting of hydraulically actuated openhole packers via inner string
- Includes a simple operating mechanism — no complex micro-hydraulics



VersaFlex® plug assembly

HCT2518-022b

Expandable liner hanger plug systems

The VersaFlex® plug system consists of three main components: the VersaFlex plug assembly, wiper dart, and landing collar. Each component should be ordered separately to meet size and material requirements.

VersaFlex® plug assembly

The plug design uses the proven HWE® high-wiping-efficiency cementing plug to provide superior wiping performance and fluid separation with a single wiper plug. The following unique plug design features provide improved functionality and reliability:

- Integral swivel mechanism allows plug rotation during make up to the liner, along with an equalizing feature to help prevent damage from pressure applied to the plug
- Adjustable shear pins allow adjustable pressure-release features to help ensure plug launch during displacement operations
- Spacer tube fully encapsulates the drillpipe wiper dart to assist in dart centralization for secure latch
- Designed for the most common casing sizes
- Designed for use in conjunction with a VersaFlex landing collar
- Two distinct types:
  - Standard HWE plug assembly for use in casing sizes of 4 1/2 to 5 1/2 in.
  - Heavy mud HWE plug assembly for use in casing sizes of 7 to 11 3/4 in.

MCXV wiper dart

HCT2518-024b

MCXV wiper dart

The MCXV wiper dart is a unique releasing plug designed specifically for use with the VersaFlex® plug assembly. (SSR® subsurface release wiper plugs are not compatible with this system.)

- Available to cover a variety of standard drillpipe sizes
- Also available for tandem string scenarios

VersaFlex® landing collar

VersaFlex plug assemblies are designed for use in conjunction with a landing collar.

VersaFlex plug assembly and landing collar designs are available for the most common casing sizes.

- Uniquely designed to mate with the VersaFlex plug assembly.
- Specially designed landing collar helps ensure a positive seal is created when plug bump is achieved.
- Primarily available in P110 or P110/Q125 grades.

Additional casing equipment

Additional casing equipment and attachments are available from the Halliburton Cementing Casing Equipment Group.

VersaFlex® landing collar

HCT2518-025b

MatchSet® conventional liner hanger system

HCT2518-026

MatchSet® conventional liner hanger

MatchSet® conventional liner hanger systems help solve well challenges in which modular design capability and minimizing risks are key priorities. This suite of conventional liner hanger technologies can result in quantifiable reductions in well construction costs, yet still allow for value in overall performance.

The MatchSet liner hanger system portfolio includes slip-type liner hangers, such as mechanical or hydraulic-set, coupled with a full range of integrated liner-top packers, tieback receptacles, and other complementary components required for various applications.

Regardless of system selection, the goal is always to get the liner to bottom as effectively and efficiently as possible. Our MatchSet liner hanger systems allow for all aspects of a standard liner hanger installation.

MatchSet CLH System Models

- Pocket slip liner hanger
- Liner hanger with integral liner-top packer
- Liner-top packer
- Integral tieback packer and tieback seal

Features

- Compact design
- Pocket-slip arrangement
- Uniform slip loading
- Heavy load-hanging capability

Benefits

- Modular design adjustable to application configuration
- Weight-set sealing element
- Dynamic service tool before cementing

MatchSet® pocket-slip liner hanger

HCT2518-027

MatchSet® pocket-slip liner hanger

MatchSet® conventional liner hangers have a unique compact design for highly deviated or horizontal wells. The hanger is equipped with premium O-rings and glass-filled Teflon® backup rings to seal in the hydraulic cylinder. A high-strength alloy cylinder provides maximum burst and collapse rating.

The hanger is set by applying pressure through the drillpipe. A setting ball is circulated or dropped to the ball seat in the landing collar or running tool. Applied pressure acts on an internal piston, to move the slips up the cones to the set position. The hydraulic-set liner hanger can incorporate a tapered roller bearing assembly, if required, which allows the liner to be rotated in the set position while cementing the liner.

Product Designation

- (R)HLH

Features

- Hydraulic set
- Supplied in rotating and non-rotating versions
- Integral anti-preset mechanisms
- Flow area maintained in unset and set position
- Adjustable setting initiation pressure
- Static piston seals during cementing rotation
- High hanging load capability

Teflon® is a registered trademark of The Chemours Company.

MatchSet® pocket-slip liner hanger

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT	MATERIAL
4 1/2	7	23 to 38	L80, P110, and Q125
5	7	23 to 38	
5 1/2	7 5/8	29.7 to 45.3	
7	9 5/8	40 to 58.4	
7 5/8	9 5/8	40 to 53.5	
9 5/8	13 3/8	54.5 to 72	

Please contact your Halliburton representative for additional sizes and material grades.

MatchSet® liner hanger with integral liner-top packer

HCT2518-026

MatchSet® liner hanger with integral liner-top packer

The MatchSet® conventional liner hanger with integral liner-top packer has a unique compact design for highly deviated or horizontal wells. The hanger is equipped with premium O-rings and glass-filled Teflon® backup rings to seal in the hydraulic cylinder. A high-strength alloy cylinder provides maximum burst and collapse rating. The hydraulic-set liner hanger can incorporate a tapered roller bearing assembly, if required, which allows liner rotation in the set position while cementing the liner.

This high-performance, liner-top packer is suited for most applications and sets by applying set-down weight. The packer provides an effective annular seal between the top of the liner and parent casing, which prevents formation breakdown, loss of cement slurry, and gas migration above the liner top during the life of the well. The liner-top packer features holddown slips, which makes it suitable for use in deviated or horizontal wells. Connection to accept an upper tieback receptacle is standard.

The hanger is set by applying pressure through the drillpipe. A setting ball is circulated or dropped to the ball seat in the landing collar or running tool. Applied pressure acts on an internal piston and moves the slips up the cones to the set position. Once the cement job is completed and the running tool released, weight down is applied to energize the liner-top packer.

Product Designation

- (R)HLHP

Features

- Liner-top packer
- Weight-energized elements
- Anchoring holddown slips
- Liner hanger
- Hydraulic set
- Rotating and non-rotating versions
- Integral anti-preset mechanisms
- Flow area maintained in unset and set position
- Adjustable setting initiation pressure

Static piston seals during cementing rotation.

Teflon® is a registered trademark of The Chemours Company.

MatchSet® liner hanger with integral liner-top packer

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT	MATERIAL
4 1/2	7	23 to 38	L80, P110, and Q125
5	7	23 to 38	
5 1/2	7 5/8	29.7 to 45.3	
7	9 5/8	40 to 58.4	
7 5/8	9 5/8	40 to 53.5	
9 5/8	13 3/8	54.5 to 72	

Please contact your Halliburton Liner Hanger representative for additional sizes and weight ranges.

MatchSet® liner-top packer

HCT2518-028

MatchSet® liner-top packer

The high-performance liner-top packer is suited for most liner applications and sets by applying set-down weight. The packer provides an effective annular seal between the top of the liner and the parent casing, which prevents formation breakdown, loss of cement slurry, and gas migration above the liner top during the life of the well. The liner-top packer features integral holddown slips that prevent liners from being moved uphole by hydraulic or frictional forces. Integral connection to accept a tieback receptacle and setting sleeve is standard.

Product Designation

- LTP

Features

- Weight-energized elements
- Anchoring holddown slips

MatchSet® liner-top packer

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT	MATERIAL
4 1/2	7	23 to 38	L80, P110, and Q125
5	7	23 to 38	
5 1/2	7 5/8	29.7 to 45.3	
7	9 5/8	40 to 58.4	
7 5/8	9 5/8	40 to 53.5	
9 5/8	13 3/8	54.5 to 72	

Please contact your Halliburton representative for additional sizes and material grades.

MatchSet® integral tieback packer and tieback seal

HCT2518-029

MatchSet® integral tieback packer and tieback seal

The MatchSet® tieback packer is a liner-top packer used to prevent micro-annular gas leaking at the liner top. The packer is run on drillpipe using a mechanical setting tool, tieback receptacle (TBR), and liner setting sleeve with tieback extension.

The seal stem is inserted until seated, and pressure is tested down the drillpipe. Additional set-down weight shears the release pins and sets the packer seal.

The tieback stem on the MatchSet tieback packer has three sets of chevron-type premium seals for severe pressure and temperature applications. It features a ratchet lock in the setting shoulder to prevent premature setting while running in. Holddown slips and an internal body lock ring maintain seal compression and prevent floating of short liners. TBRs are available in different lengths, and the assembly can be configured with a mechanical or hydraulic-release running tool with rotational capability, if required.

Product Designation

- TBSNP

Features

- Contingency or planned isolation of an existing liner lap
- Premium elastomers
- Anti-preset mechanism
- Anchors in tension to secure loads from upward movement

MatchSet® integral tieback packer and tieback seal

LINER SIZE IN.	CASING SIZE IN.	CASING WEIGHT LB/FT	MATERIAL
4 1/2	7	23 to 38	L80, P110, and Q125
5	7	23 to 38	
5 1/2	7 5/8	29.7 to 45.3	
7	9 5/8	40 to 58.4	
7 5/8	9 5/8	40 to 53.5	
9 5/8	13 3/8	54.5 to 72	

Please contact your Halliburton representative for additional sizes and material grades.

MatchSet® hydraulic latch landing collar with ball catcher

HCT2518-030

MatchSet® hydraulic latch landing collar with ball catcher

The MatchSet® hydraulically activated landing collar is used when running hydraulic-set liner hangers or other hydraulic-activated components in a liner string. A setting ball lands in the ball seat allowing application of pressure to the hanger to set the slips. This releases the hydraulic running tool from the liner at a higher pressure prior to shearing pre-installed shear pins and removing the seat from the flow path.

Product Designation

- HLCC

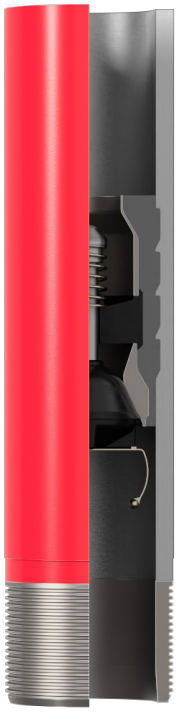
Features

- Retained ball-seat design prevents the sheared-out cage and ball assembly from interfering with float equipment installed below the landing collar
- Easily converted to provide a latch for the wiper plug and baffle for catching ball when running ball seat within the MatchSet running tools
- Large, milled slots provide an unrestricted flow area during cementing
- Internal components are constructed of wrought aluminum and are compatible for drillout

MatchSet® hydraulic latch landing collar with ball catcher

LINER SIZE IN.	MATERIAL
4 1/2	L80, P110, and Q125
5	
5 1/2	
7	
7 5/8	
9 5/8	

Please contact your Halliburton representative for additional sizes and material grades.



Super Seal II® float equipment

HCT2518-032b

Float equipment for expandable and conventional liner hangers

Super Seal II® float equipment

Super Seal II® floating equipment is installed in and becomes an integral part of the casing string. This equipment helps float and cement the casing in the well, and its basic backpressure and temperature ratings (5,000 psi and 400°F) enable use in most wells. Plastic valve materials and surrounding shear and shock-load-resistant concrete exceed the strength requirements for landing cementing plugs. The valve assembly and the cement holding the valve assembly in place can be drilled out easily with roller-cone rock bits or polycrystalline diamond compact bits after cementing operations. All casing-size Super Seal II float shoes and collars are supplied with an autofill feature.

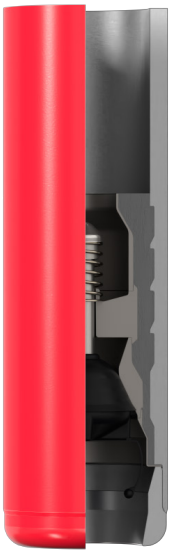
Customers can request Super Seal II float equipment for any casing grade or premium thread.

Float collar

The Super Seal II float collar includes the Super Seal II backpressure valve, which prevents cement pumped into the casing/wellbore annulus from re-entering the casing ID after cementing operations.

The float collar is normally installed one or two joints above the float or guide shoe.

All Super Seal II float collars use the same autofill strap to enable running the float open or closed.



High-port-up-jet float shoe

HCT2518-033b

High-port-up-jet float shoe

The high-port up-jet (HPUJ) float shoe jets the formation face to remove detrimental mud cake and cuttings and increase the likelihood of a successful cement-to-formation bond. The high circulation and cement flow rates that are possible with the Super Seal II float valve allow turbulent flow at the shoe without damaging the float valve. Approximately 40% of the fluid pumped through the equipment is discharged at a high velocity through the bottom of the float shoe.

All Super Seal II HPUJ float shoe casing sizes use the same autofill strap as the Super Seal II float valve.

Supporting References

Refer to the Halliburton Casing Equipment Catalog for a full range of casing equipment and accessories Halliburton offers to support cement operations.

Refer to WELLCAT™ and WellPlan® computer software for information on comprehensive modeling software Halliburton offers to support drilling and completions operations.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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