Liner Hanger Systems

NOV Completion & Production Solutions

NOV's Completion Tools business unit offers a wide range of customized and standard liner hanger systems for your well completion needs. Our extensive technical knowledge and experience in the oil and gas industry allow us to develop and provide innovative solutions for our customers.

Our offerings

- Liner top packers, liner hangers, hold down subs, and tieback seal stems for applications from 2⅞ to 16-in. liners
- Hydraulic and mechanical running tools, cement heads, and cementing plugs to fit a variety of applications
- Solutions to the most complicated well designs and conditions through innovative developments
- Short lead times
- Fast and reliable service

Our certifications

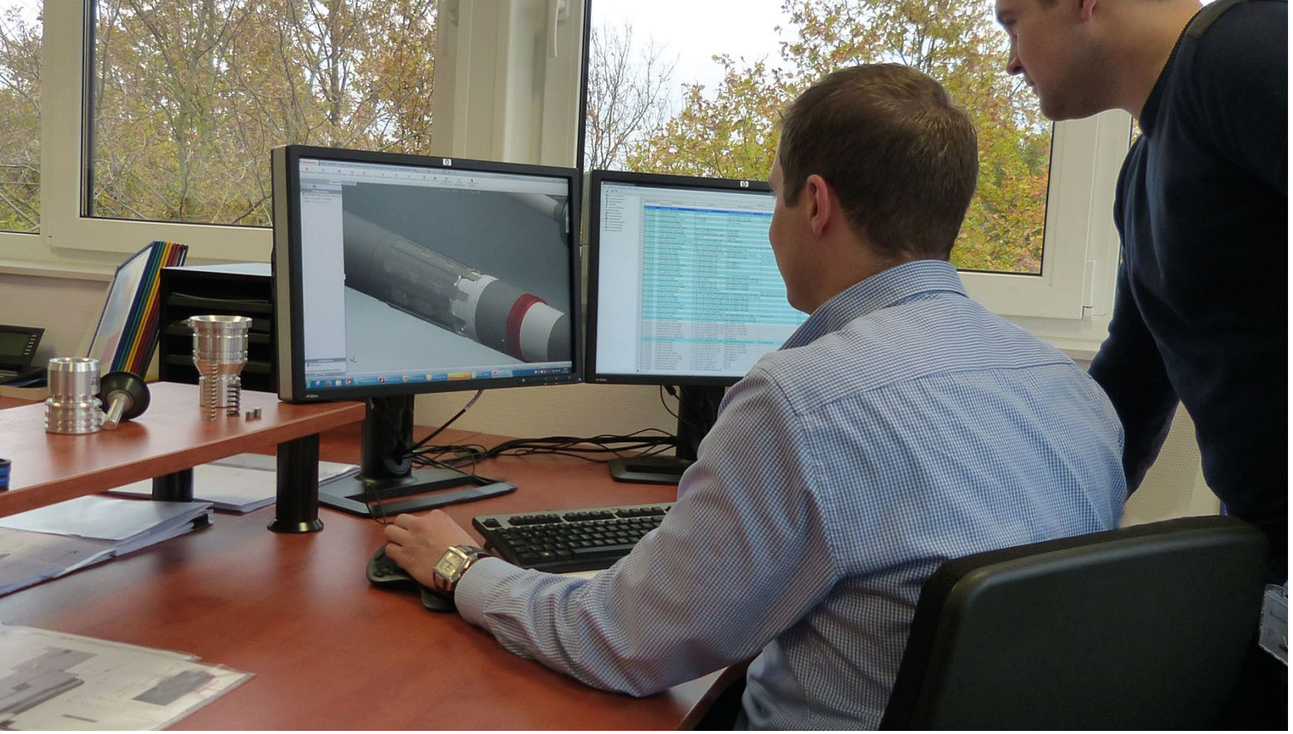
- ISO 9001:2015
- API Q1
- API 11D1
- API 7-1
- API 5CT
- We are also proud to be a VAM® Licensee

Global field-proven performance

Over 2,000 liner hanger systems installed worldwide in North America, Europe, Middle East, Russia, Africa, and Asia Pacific, including:

- 9.625-in. x 13.375-in. VXP liner top packer and GSP liner hanger for production liner system with fiberglass-reinforced casing in deep geothermal well, Netherlands
- 13.625-in. x 20-in liner hanger system—longest and heaviest 13.625-in. liner system in European geothermal market, Germany
- 7-in. x 9.625-in. API 11D1 V0 liner hanger system for Corrosion Resistant Alloy (CRA) application, Middle East
- 4.5-in. x 7-in. SURESET™ liner hanger packer system for fracturing and refrac applications with URFC-II and BPS, USA
- 5-in. x 7-in. SURESET liner hanger with PureFlow™ stage cementing tool, Canada and Middle East

Contents



Design and Development

Design and development

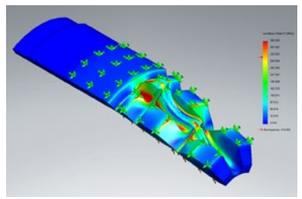
Our Design & Development Department innovates products and customer-specific components are designed by mechanical engineers. By using additional analysis tools, including Finite Element Analysis (FEA) or flow simulations, various calculations can be made that are important for verification and the ideal design of our products.

Finite Element Analysis

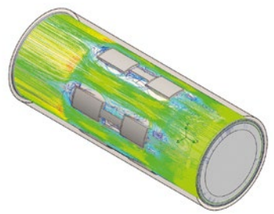
The FEA is a numerical method for solving complex calculations. It is used to calculate tension and displacement of components resulting from exterior loads, whereby each design step can be optimized. Nowadays, the FEA is an inherent part of our design process. In this way, it can be verified with virtual prototypes whether the requirements for stability and safety are fulfilled. Potential weak spots can thus be revealed and rectified. This makes it possible to reduce the periods and cost, since the number of necessary prototypes is reduced.

Flow simulation

Flow simulation is a numerical method for solving complex flow systems. This software enables our designers to simulate the liquid flow, heat transfer and flow force rapidly and in a straightforward manner. This numerical method is used during development for flow examination and optimization of relevant components, in order to ensure a perfect function of the products.



Finite element analysis



Flow simulation

Engineering and Modeling Capabilities

Engineering

Our engineering group is based locally and designs and develops our tailor-made client solutions. The team also conducts dedicated API 19LH or API 11D1 testing on our products. Our engineering group has completed API 19LH and/or API 11D1 testing up to 15,000 psi with gas-tight requirements over an extensive range of sizes. Our metallurgists work closely with our design engineering team to confirm that our designs will meet customer requirements as per API standards.

Modeling capabilities

Increasingly complex well designs solve customer challenges, but often create similarly increased complexities for their engineering groups. To aid the implementation of these well designs, we can run and model torque and drag simulations, swab and surge analyses, centralizer placement simulations, hydraulic simulations, tube move simulations, and more.

Torque and drag simulations

Torque and drag simulations are used to plan drilling and completion operations and assess the predicted torque and drag loading conditions on planned operations based on well design. The primary outputs considered are tension, torque, and fatigue loads, along with buckling conditions along the length of the string from the top-down over a range of friction factor conditions. Using torque and drag simulations helps ensure the drill string is set up to handle all potential contingency operations properly and that the liner can be run to depth on the first attempt.

Swab and surge analyses

Swab and surge analyses are useful when there is a narrow pore pressure/frac gradient window, a tight clearance completion string that may unexpectedly surge the formation and require slow run-in-hole times, or concerns of a ball seat or other shear pressure event that could fracture or otherwise disrupt a weak formation at the toe. It is essential to control the run-in-hole speed for tight-clearance completions and other factors such as position, and set shear pressure for shear events to avoid inducing formation damage due to excessive swab or surge pressures.

Centralizer, standoff, and placement simulations

Proper centralization of the casing and liner is crucial to ensuring the quality of a cement job by preventing mud channeling and poor zonal isolation. Centralizer placement simulations assist with optimization of centralizer type, placement position, and quantity used, all of which allow operators to achieve a good standoff profile. Our centralizer placement simulations predict casing standoff and torque and drag for ERD or deviated wellbores.

Hydraulic simulations

Hydraulic simulations allow us to calculate fluid pressure losses during liner installations, providing an accurate hydraulic liner equipment activation plan. The effects of changing mud weights and temperature effects may be modeled.

Tube move simulations

Tube move simulations are often used to determine the net forces on an installed and set packer, or to determine the movement of a tieback string to estimate the recommended tieback receptacle length, as well as for other useful scenarios. The tube move simulations consider the net combined results of the piston, buckling, ballooning, and temperature effects to determine the overall impact to relevant completion tools and assist with optimization of the overall well design.

Service

Experienced Staff

Operating worldwide, our field engineers excel in the most challenging environments, from the North Sea to the Kazakh steppe and Niger Delta's swamps.

Our service quality is the foundation of our success. We take pride in our highly experienced team, covering all aspects of the business - engineering, field service, sales, and support. Continuous learning, talent nurturing, and fostering expertise are at the core of our values.

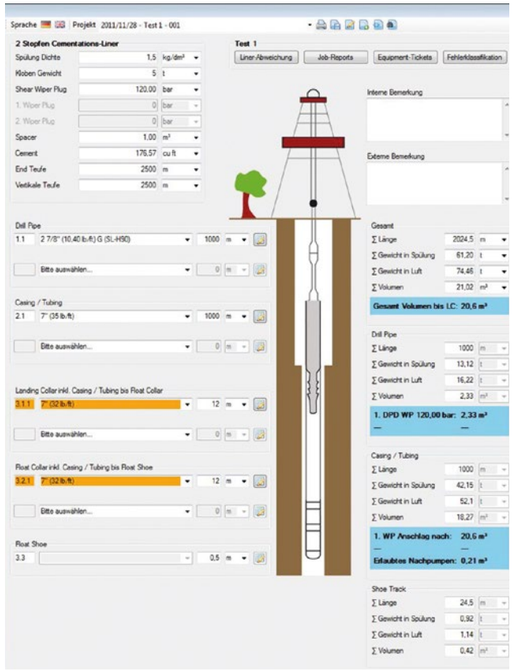
Our personnel benefit from specialized competency programs that keep them at the forefront of industry advancements, ensuring they possess the skills and knowledge required to deliver exceptional service.

To guarantee our new engineers' seamless integration into our workforce, they receive invaluable guidance from seasoned colleagues. This mentorship equips them for independent and successful operations, enabling them to excel in their responsibilities.

With our unparalleled global expertise and extensive years of experience, we proudly stand as the preferred partner for well construction in oil, gas, and geothermal domains. Irrespective of the project's location or complexity, we are fully prepared to provide top-tier solutions for your drilling and production requirements.

Running Procedure

The running procedure (RP) is a complete manual which documents the precise sequence description and installation instructions as well as the target values of the liner hanger installation. Prior to each operation the RP is discussed in a pre-job meeting by project manager and field engineer. During the installation of the liner hanger system, deviations between target values and actual values can be determined directly at the rig. The field engineer can react promptly and initialize appropriate measures in coordination with the customer. Any variation within the procedure is recorded in a new revision of the RP. Based on this audit-proof process, original documents can be compared with actual data and all changes can be retraced.



Operator Software

The specially designed operator software comprises several modules—calculating, investigating, or obtaining information can be done with the software. Necessary documents supporting the workflow and facilitating the subsequent analysis are also provided by this software.

The operator software provides the field engineer with access to the entire data sheets of all products. The data sheets include technical data and information on both sales and rental equipment.

End-of-Well Reports

After job completion, all data is summarized and discussed in a working group together with the project manager, design engineer, fitter, quality manager as well as the field engineer. The customer is provided with all relevant data for the order in an End-of-Well Report.

Liner Hanger System Products

Polished Bore Receptacle

The polished bore receptacle (PBR) is a high-quality honed pipe with tight manufacturing tolerances that guarantees best sealing properties. The top end has a special chamber to allow easier running-in of drilling tools. The lower PBR-end can be optionally connected with a liner packer or setting sleeve.

Length

- 6 to 30 ft available

Materials

- L80, T95, P110, Q125, 22Cr 125 ksi
- Other materials on request

Features and benefits

- To accommodate bottom-set tieback packer and tieback seal stem

VXP Liner Top Packer

Developed for high differential pressures, the VXP liner top packer is a gas-tight solution that is API 19LH V1 and ISO 14310 V0 certified. Providing additional sealing of the annular space between the liner and casing, the VXP packer is activated by means of setting a load through the drillpipe and the packer actuator. After setting, the packer element is held in position by controlled deformation of the support rings. In addition to the internal snap ratchet, the additional external hold down slips keep the VXP packer in position so that movement of the packer element does not occur with high differential pressures. The packer element of the VXP packer is available in various elastomers for different well requirements.

Thread connections

- Standard VAM 21/VAM TOP Premium connection
- Other thread connections per customer's request

Materials

- L80, T95, P110, Q125 and CRA Options
- Other materials on request

Features and benefits

- High differential pressure rating from below and above
- Mechanical lock to avoid premature setting while running liner
- Full bore offers no restrictions for subsequent tool runs
- Hardened hold-down slips
- Internal body lock ring positively locks in applied setting force
- Can be run with the hydraulic or mechanical set liner hanger
- API 19LH and ISO 14310 Qualified

SURESET Liner Hanger Packer

Designed for high differential pressures, the SURESET™ liner hanger packer is a complete liner hanger system built on a one-piece mandrel with no internal connections. The SURESET includes a packing element, an integral packoff nipple profile, and the hanger.

Most sizes of the SURESET liner hanger packer have successfully completed multiple API 19LH tests including liner top packer, combined load and pressure, and unsupported casing tests to 10,000 psi API 19LH VS2 requirements.

The hanger may be set using a hydraulic cylinder or, in some sizes, a mechanical set option is available. The SURESET packing element is available in multiple elastomer options for various applications and is activated with set-down weight using a packer actuator. In addition to the internal snap ratchet, the hold-down slips keep the SURESET element in position against high differential pressures.

The hanger portion of the SURESET contains slips that are fully recessed into a special profile in the rotating body to ensure trouble-free installation and uniform load distribution in the setting section. In both the set and un-set positions, the SURESET liner hanger packer allows for high bypass, ensuring low equivalent circulating densities (ECD).

Thread connections

- Standard VAM 21/VAM TOP
- Other premium connections available upon request
- BTC, LTC

Materials

- L80, L80 13Cr, T95, C110, P110, Q125, SM2535/VM28
- Other materials available upon request

Features and benefits

- Hydraulic set hanger as standard; mechanical set available
- Eliminates potential leak path between hanger and packer
- Fully pocketed slips for running in challenging conditions
- Non-rotating and rotating during cementing options available
- 10,000 psi API 19LH VS2 tested rating in most sizes
- Integrated packoff nipple
- Large annular flow area in set and unset positions
- Internal body lock ring positively locks in applied setting force to packing element
- Capable of hanging long, heavy liners with enhanced hanging capacity and multi-cone options

GSP II Hydraulic Liner Hanger

Designed for deviated and horizontal wellbores, the GSP II liner hanger contains slips that are fully recessed into a special profile at the rotating body. This ensures trouble-free installation and uniform load distribution in the setting section. In the set and non-set states, the GSP II liner hanger allows a very high bypass, ensuring a high flow rate with low pressure loss.

Thread connections

- Standard VAM TOP/VAM 21
- Other thread connections per customer's request

Materials

- L80, T95, P110, Q125, 22Cr 125 ksi
- Other materials on request

Features and benefits

- Non-weld design, one-piece body with premium threads
- Slips are fully recessed and pocketed into a special profile at the rotating body to prevent from premature setting during running
- Slips and cone are designed to minimize casing stress
- Slips are designed and tested to hang inside large range of casing weights
- All hydraulic seals remain stationary during rotation of the liner
- Improved seal stack in the hydraulic cylinder; HP/HT seals
- Capable of hanging long, heavy liners with enhanced hanging capacity
- Large annular flow area in set and unset positions
- Lock of slips prevents premature setting during running
- Rotating/non-rotating (optional)

GSP Liner Hanger

The GSP liner hanger is a highly versatile tool designed specifically for deviated and horizontal boreholes. It operates as a hydraulically activated system, offering exceptional performance and reliability in challenging wellbore conditions.

One of the key features of the GSP liner hanger is its innovative slip design. The slips are recessed into a specialized profile on the rotating body, ensuring seamless installation and facilitating uniform load distribution within the setting section. This unique design eliminates potential issues and enhances overall operational efficiency.

The GSP liner hanger provides optional rotating capabilities. This feature enables operators to optimize their well construction strategies and enhance the overall success of the operation.

Furthermore, the GSP liner hanger incorporates a robust mechanical locking feature. This feature serves as an additional safeguard, preventing the slips from unintentionally activating downhole, even in the presence of debris buildup. The mechanical locking mechanism minimizes the risk of operational challenges and reduces the need for costly interventions.

With its high bypass design, the GSP liner hanger allows for a significantly increased flow rate while maintaining low-pressure loss. This exceptional flow capacity ensures efficient fluid circulation.

The GSP liner hanger offers a comprehensive solution for deviated and horizontal holes, combining advanced slip design, optional rotating capabilities, and a robust mechanical locking feature. Its reliable and efficient performance, along with its ability to handle high flow rates and minimize pressure loss, makes it an ideal choice for a wide range of wellbore applications.

Thread connections

- Standard VAM 21/VAM TOP Premium connection
- Other thread connections per customer's request

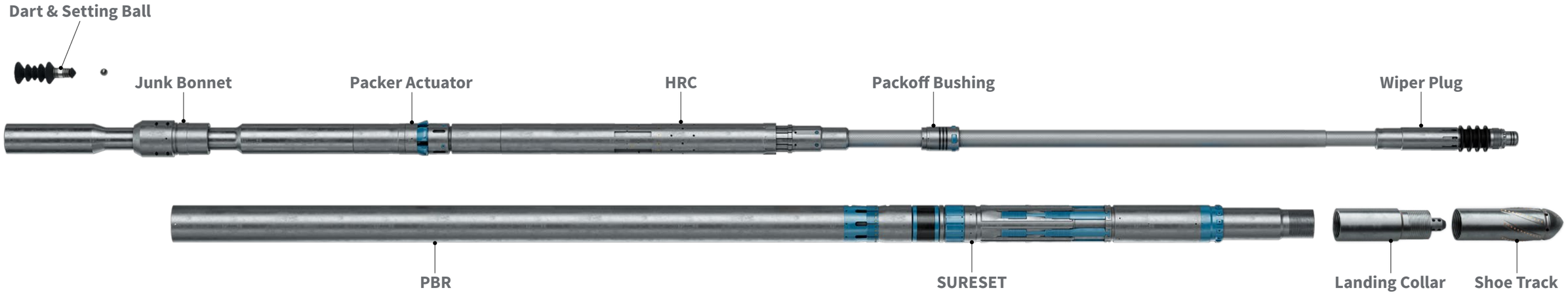
Materials

- L80, T95, P110, Q125 and CRA Options
- Other materials on request

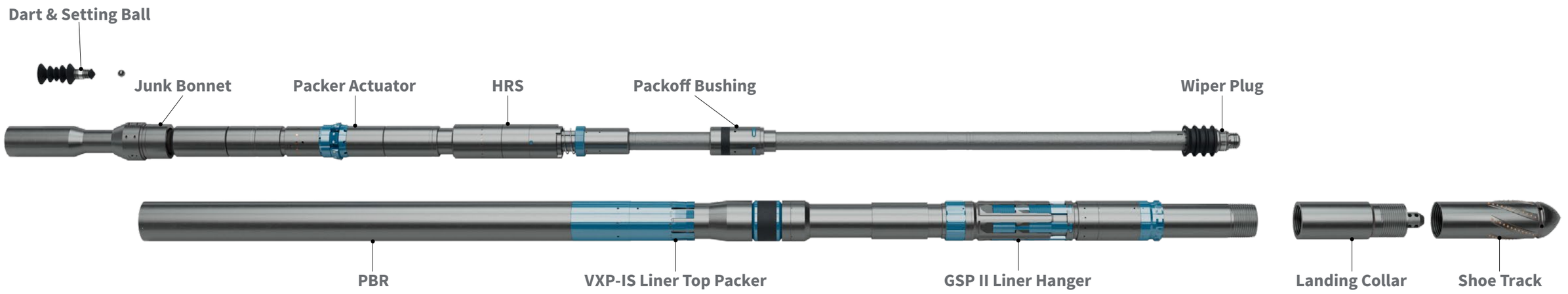
Features and benefits

- Non-weld design, one-piece body with premium threads
- Slips are recessed into a special profile at the rotating body to prevent premature setting during running
- Slips and cone are designed to minimize casing stress
- All hydraulic seals remain stationary during rotation of the liner
- Improved seal stack in the hydraulic cylinder; HP/HT seals
- Capable of hanging long, heavy liners
- Large annular flow area in set and unset position
- Optional Hydraulic lock of slips prevents premature setting during running
- Optional Rotating or non-rotating options

SURESET Liner Hanger Packer



VXP-IS & GSP II Full System



GSL Liner Hanger

Designed for tight clearance, the GSL liner hanger may be used for the hanging of an intermediate liner. Its slips are recessed into a special profile at the body, ensuring trouble-free installation and uniform load distribution in the setting section. Due to the tight clearance, the GSL liner hanger is only available as a non-rotating version. The robust, sturdy body with cone is made of one piece

Thread connections

- VAM FJL/VAM SLIJ-II
- Other thread connections per customer's request

Materials

- L80, T95, P110, Q125, 22Cr 125 ksi
- Other materials on request

Features and benefits

- Non-weld design, one-piece body
- Hangs short and medium liners without distorting the cone or body
- Large annular flow area in set condition ensures minimum pressure drop during cementing
- Suitable for short liner in highly deviated wells
- Non-rotating during cementing

GSP II Mechanical Liner Hanger

Designed for vertical and slightly deviated holes where rotational string manipulation is possible, the GSP II mechanical set liner hanger contains fully recessed slips, ensuring trouble-free installation and uniform load distribution in the setting section. The GSP II mechanical liner hanger utilizes a solid one-piece body that is not compromised by a hydraulic cylinder or any ports. Thus, allowing the liner hanger to have an overall enhanced performance rating that matches or exceeds the customer's casing mechanical properties. In addition, the GSP II mechanical liner hanger allows a very high bypass area, ensuring a high flow rate with low pressure loss.

Thread connections

- Standard VAM® TOP/VAM® 21 or customer's request

Materials

- L80, T95, P110, Q125, 22Cr 125 ksi
- Other materials on request

Features and benefits

- Non-weld, one-piece solid body design (no ports for hydraulics) with premium threads
- Enhanced overall performance ratings due to no need for hydraulic cylinder or hydraulic seals
- Standard right-hand mechanical set and release with left-hand option available upon request
- Slips are fully recessed and pocketed into a special profile at the rotating body to prevent the premature setting during running
- Slips and cone are designed to minimize casing stress
- Slips are designed and tested to hang inside a large range of casing weights
- Lock of slips prevents premature setting during running
- Large annular flow area in the set and unset positions

Hold Down Sub

The Hold-Down Sub is designed for use in oil, gas, and geothermal liner hanger operations with short, cemented, or slotted liners. Its main purpose is to serve as an anchor within the liner hanger system, preventing the liner string from floating upward due to frictional or hydraulic forces and allowing for verification of the setting. This sub is particularly useful in situations where it is difficult to observe the liner weight loss. It provides an additional indication by enabling the string to be overpulled while the setting tool is still connected.

In a simplified and synchronized operation, the Hold-Down Sub is installed alongside the liner hanger and is hydraulically activated, typically at the same time as the hydraulic liner hanger. Once the Hold-Down Sub is set, the string can be lifted, allowing an overpull indication that establishes a reference point before releasing the setting tool. This feature provides a better weight reference once the setting tool is released which would provide validation that the liner system is accordingly installed. Additionally, the Hold-Down Sub includes an integrated bearing that allows rotation of the liner after it has been set. This rotation capability enables necessary adjustments without compromising the anchoring function.

Thread connections

- Standard VAM® 21/VAM TOP®
- Other premium connections available upon request

Materials

- L 80, T 95, P 110, Q 125, 22Cr 125ksi
- Other materials available upon request

Features and benefits

- Non-weld design, one-piece body with premium threads
- Capable to anchor liners of short and medium length
- Large annular flow area in set position ensures minimum pressure drop during cementing
- Suitable for short liner in highly deviated wells
- Rotating/non-rotating version

NG Liner Wiper Plug

The NOV NG Liner Wiper Plug System with collet style release - in combination with drillpipe dart - is designed to improve separation between cement and the displacement fluid using a reliable detachment mechanism.

The drill pipe dart is housed within the Cementing Manifold and launched upon completion of cement volume being pumped. The wiper fin configuration with multiple ODs is optimized for a range of drill string combinations to ensure separation and clean-out of cement through various IDs of drilling string including pipe IDs and tool joint IDs. Drill pipe dart nose engages into the Liner Wiper Plug ID profile and forms a latch and a seal. This enables a clear pressure indication on surface when the pressure rises to unlock the collet and release the Liner Wiper Plug. Together, the Drill Pipe dart and the Liner Wiper Plug, provide the needed separation and clean out of the Cement and Displacement fluid in the liner casing until the assembly lands, latches and seals into the specifically designed Landing Collar profile.

All the components of drill pipe dart and Liner Wiper plug are made with a rubber and aluminum core to allow for quick and reliable mill-out, as needed.

Materials

- Aluminum/rubber

Features and benefits

- Lead wiper fin on drill pipe dart safeguards seals on the nose to ensure reliable pressure isolation upon latching into the Liner Wiper Plug.
- Improved rotational lock mechanism on Liner Wiper Plug and Landing Collar enables fast mill-out thereby reducing rig time.
- Liner Wiper plug retention mechanism at the bottom of the running tool assembly protects against premature release due to high surge forces from either rupturing of floatation devices or running tool ball seats.
- Multiple elastomer options available to cover the full range of high temperature requirements.
- Modular Liner Wiper design including dual-length option allowing for increased wiping efficiency in long liners or ERDs.

Applications

- Cemented liners
- Long production liner strings
- Floated liner strings

Duo Wiper Plug

The duo wiper plug system ensures a bilateral separation of the cement column in the drillpipe and liner. Attached to the setting tool, it is located in the first liner casing joint below the liner hanger. The lower part of the duo wiper plug is released by the first drillpipe dart and pumped to the landing collar. A short pressure increase occurs by the landing on the landing collar, further displacing cement. A second drillpipe dart releases the upper part of the duo wiper plug, pumping it down to the landing collar. The duo wiper plug interlocks in the landing collar, allowing an optimized drilling out.

Materials

- Aluminum/rubber

Features and benefits

- No contamination of the cement with mud
- Simple and reliable duo wiper plug system
- Emergency release feature for the top plug
- No risk of a stuck inner sleeve of the top wiper plug
- High strength design allows high bump pressure
- Anti-rotating mechanism to reduce drill-out time

Drill Pipe Darts and Setting Ball

Drill pipe darts (DPD) separate the cement column in the drillstring and activate and release the wiper plugs. For the duo wiper plug system, one drillpipe dart is pumped respectively before and behind the cement column. The drillpipe dart behind the cement column is used only with the single wiper plug.

Materials

- Aluminum/rubber

Features and benefits

- Available for all drillpipe sizes
- One-size string or combined string
- Available with lock feature

Tie-Back Stem

The tieback stem serves an important function by enabling a secure connection between the liner top and the surface through a landing string. Whether it is used as a temporary measure during stimulation or a more permanent solution to isolate surface casing from production fluids, the tieback stem plays a crucial role in preventing abrasive and corrosive wear on the surface casing. Additionally, the tieback stem provides versatility in scab liners, allowing it to effectively straddle damaged casing or serve as part of a secondary isolation system to address a leaking liner top.

To ensure optimal performance in various scenarios, the tieback stem can be configured to accommodate expected tube movement. This adaptability allows for seamless integration into different well conditions, providing a reliable solution. Moreover, a wide range of seal configurations is available, offering flexibility and compatibility tailored to specific applications. This ensures that the tieback stem can meet the unique sealing requirements of each project, enhancing its overall effectiveness and reliability in the field.

Thread connections

- Standard Premium and API connections available

Materials

- API 5CT and CRA material options available

Features and benefits

- Mule shoe configuration supports stabbing and facilitates re-entry with well intervention tools
- Available from 6 ft to 30 ft
- HP/HT seals
- Flow optimized gage/shear ring to protect the seal stack during installation
- Bonded Seal available
- API 19LH Validated

Cementing Head

The top drive cementing head is located between the top drive system of the drilling rig and the drillpipe. It also provides the interface through the top drive cementing head swivel to the cementing lines of the cementing unit.

The top drive cementing head consists of a solid body with an integral bypass system to displace mud, spacer, and cement slurry during the entire operation. Two drillpipe darts can be accommodated inside the top drive cementing head to avoid contamination of the cement slurry with mud. The liner can be rotated with the top drive cementing head depending on the liner hanger system provided to enhance the quality of the cement in the annulus.

Features and benefits

- Unrestricted bore after plug or ball has been dropped
- Large flow area accommodates high displacement rates
- Anti-rotation tie-off integral to swivel housing
- Drillpipe darts and setting ball are completely separated from the bypass
- High load capacity
- Flag-sub-indicator
- Non-top drive cementing head suitable for long and heavy liner

Packer Actuator

Primarily used to mechanically set weight on the liner top packer, the packer actuator is normally positioned between the lift nipple and the running tool as part of the setting tool string.

Once the running tool has been released and the cement job completed, the packer actuator can be picked up and positioned above the PBR. This will expose the springloaded packer setting dogs, allowing setdown weight to be transferred to the top of the PBR, thereby setting the liner top packer.

The Rotating Packer Actuator utilizes a bearing assembly allowing the drillpipe to be rotated while applying set-down weight to the liner top packer. Rotation of the drillpipe breaks the static friction and reduces buckling, transferring set-down weight more effectively when setting the liner top packer. This is especially useful for deviated and horizontal holes.

Thread connections

- Cemented drilling liners
- Cemented and uncemented production liners
- Tieback secondary isolation packers

Materials

- NC 50 / NC 38 / Grant Prideco EIS

Rotating Packer Actuator

Rotating Packer Actuator with Shear Indicator

Features and benefits

- Optimized dog design for maximum weight transfer to the packer
- Setting dogs of rotatable packer actuator supported by a bearing system for deviated and horizontal holes
- Uniform ID matched to the liner setting tool allows for trouble-free passage of drill pipe darts
- Tensile rating equal to or higher than the liner setting tool
- Shear indication feature (optional)

HRC Setting Tool

The HRC setting tool was designed for use in the most challenging hole conditions. The setting tool is fully hydraulic and requires no rotation of the running string for releasing the liner hanger system.

The HRC setting tool allows washing and reaming down the liner through tight spots and obstruction in the hole. The hydraulic release system is activated after shear pressure has been reached and the liner hanger has been set. Due to its solid design, a rotation of the liner when running or after setting the liner hanger during cementation is possible.

Features and benefits

- Push and ream the liner down to the bottom without the risk of premature release
- After the hanger has been set and the tool has been released, the liner can be rotated during cementing
- High torque rating for difficult well conditions
- Fully hydraulic release with mechanical secondary release
- Left-hand emergency release

HRS Setting Tool

The HRS setting tool was specifically designed for running rotatable liner hanger systems and for deviated or challenging holes. It allows washing and reaming down the liner through tight spots and obstructions in the hole.

The hydraulic lock is activated after shear pressure has been reached and the liner hanger has been set. The setting tool is released from the liner hanger system by clockwise rotation.

Moreover, the complete liner can be rotated with the HRS setting tool during cementation to ensure equal distribution of cement.

Features and benefits

- The liner can be pushed and reamed down to bottom without the risk of prematurely releasing
- The liner may be rotated after the hanger has been set and the tool released
- High torque rating for the toughest well conditions
- Secondary release function

MRS Setting Tool

The MRS setting tool supports the installation of rotating liner hanger systems.

The mechanical safety device allows the liner to rotate in tension and enables circulation simultaneously. When a preset load has been reached, the mechanical lock will be released through the shearing of shear pins. Clockwise rotation releases the MRS setting tool from the liner hanger system.

During the cementation, the complete liner can be rotated to enhance cementation quality.

Features and benefits

- Used to run right-hand mechanical and hydraulic set liner hangers
- Dependable roller bearing/floating nut system ensures positive release from the liner top
- High load capacity to carry long and heavy liners to target depth
- Liner can be rotated to improve the quality of the cement job

S Setting Tool

The S setting tool is a robust setting tool for running heavy non-rotating liners. Suitable for vertical and slightly deviated holes, the setting tool is released by rotation from the liner hanger system. Moreover, BST packers and special equipment can be run with this tool.

Features and benefits

- Suitable for hydraulic-set liner hangers and BST packers
- Dependable roller bearing/floating nut system ensures positive release from the liner top
- High load capacity to carry long and heavy liners

i-Con

The i-Con™ monitoring sub is a robust tool for gathering and understanding dynamic data recorded during well operations.

This compact, memory-based monitoring sub is equipped with an electronics package consisting of sensors, batteries, and memory for use in coiled tubing and drillpipe operations. Traditionally , the gathering of precise mechanical downhole dynamic data has been limited to the use of MWD tools during drilling operations. In most well operations during completions or intervention, the same downhole data would provide valuable input for operational verification, information, and diagnostics. The i-Con has drillpipe connections and a full-bore ID to ensure seamless integration into most work-string setups. The intelligent sub records tension, compression, torque, temperature, pressure, vibrations, and acceleration where it matters—downhole.

Once the i-Con has been retrieved from the hole, the data can be downloaded from the easily available data port. Downhole data can then be investigated and compared with surface measurements to provide improved understanding and learning.

Features

- Full-bore, short length, and robust construction
- Configurable sampling rates
- Cost effective
- No surface rig-up required

Benefits

- No flow restrictions and minimum interference with operations
- Possible to fine-tune data quality or extend logging period
- Suitable as surveillance device in most operations
- Limited footprint and low risk

Applications

- Installation of liner and lower completions
- Torque and drag model verification
- Fishing operations
- Plug setting and retrieval
- Shifting tool operations
- Cleanout operations
- Other critical drillpipe interventions
- Slot recovery operations
- Plug and abandonment operations

Technical data								Measuring range				
	Length in. (mm)	OD in. (mm)	ID in. (mm)	Tensile klbf (ton)	Pressure[1] psi (bar)	Torque lb-ft (N-m)	Threads	Tensile klbf (ton)	Compression klbf (ton)	Pressure psi (bar)	Temp. °F (°C)	Torque lb-ft (N-m)
L	88.43 (2.246)	5.750 (146.05)	2.250 (57.15)	422.0 (191.4)	15,000 (1,034)	26,000 (32,250)	Top: XT39 Box Bottom: XT39 Pin	150.0 (68.0)	150.0 (68.0)	15,000 (1,034)	266 (130)	15,000 (20,300)
XL[2]	121.10 (3.075)	7.600 (193.00)	3.000 (76.20)	844.0 (382.8)	19,400 (1,337)	79,210 (107,400)	Top: XT57 Box Bottom: XT57 Pin	480.0 (217.7)	480.0 (217.7)	19,400 (1,337)	266 (130)	60,000 (81,350)

[1] For combined loading working envelope, contact NOV Completion Tools
[2] Additional configurations available up request; consult our Engineering team

i-Con Real Time

Advanced monitoring tool for gathering live, dynamic data during well operations

A robust tool for gathering and understanding dynamic data recorded during well operations, the i-Con™ Real Time (RT) is a compact, real-time monitoring sub equipped with an electronics package consisting of sensors, batteries, and wired connection for use in drill pipe-conveyed operations. Traditionally, the gathering of precise mechanical downhole dynamic data has been limited to the use of measurement-while-drilling (MWD) tools during drilling operations. However, in most well operations in the completion and intervention phase, the same downhole data would provide valuable input for operational verification, planning, and diagnostics.

The i-Con RT has wired drill pipe connections to ensure seamless integration with the IntelliServ™ wired drill pipe and a full-bore inside diameter (ID) to allow for most work string setups. The intelligent sub records tension, compression, torque, temperature, pressure, vibrations, and acceleration where it matters—downhole. Most importantly, the wired drill pipe connection allows the i-Con RT to deliver the information when it counts—on the rig and in seconds. The IntelliServ wired drill pipe can convey the information in seconds and functions independently of tripping speed, pressure, or circulating speed. Downhole data can be reviewed in real time and compared with surface measurements. This provides improved understanding and learning and ensures optimal decision-making, allowing for reduced NPT without waiting to retrieve the data.

Features

- Records a wide range of vibration, RPM, pressure, weight, torque, and temperature data in real time
- Full bore and short length
- Cost effective
- Not dependent on flow rate, circulating pressures, or other mud pulse telemetry methods
- Measurements updated at ~80Hz (80 times per second)

Benefits

- Game changing valuable real-time data for completion operations
- No flow restrictions and minimum interference with operations
- Low Risk
- Accurate, detailed, live downhole data information always available on the rig
- Suitable as surveillance device in most operations

Applications

- Installation of liner and lower completions
- Torque and drag model verification
- Fishing operations
- Plug setting and retrieval
- Shifting tool operations
- Cleanout operations
- Other critical drill pipe interventions
- Slot recovery operations
- Plug and abandon operations

Technical data								Measuring range					
	Length in. (mm)	OD in. (mm)	ID in. (mm)	Tensile klbf (ton)	Pressure[1] psi (bar)	Torque lb-ft (N-m)	Threads	Tensile klbf (ton)	Compression klbf (ton)	Pressure psi (bar)	Temp. °F (°C)	Torque lb-ft (N-m)	RPM
XL[2]	121 (3,073)	8 (203.20)	3 (76.20)	550 (249.5)	20,000 (1,379)	48,000 (65,079)	Top: XT57 wired Bottom: XT57	400,000 (181.4)	600,000 (272.2)	20,000 (1,379)	302 (150)	± 60,000 (81,349)	±1,200

[1] For combined loading working envelope, contact NOV Completion Tools.
[2] Additional configurations available up request; consult our Engineering team.

Ultra Reach Flotation Collar II

Running production casing in extended reach wellbores becomes problematic due to high frictional forces created while running casing in the horizontal section. These forces make running casing inefficient and can prevent the ability to run casing to the target depth.

The Ultra Reach Flotation Collar II (URFC II) is a casing deployed flotation tool that allows air to be trapped inside the lower part of the production casing during deployment. The trapped air increases the buoyancy of the casing below the URFC II, reducing the frictional forces along the horizontal section of the wellbore.

The URFC II contains a glass barrier that allows fluid to be placed above the tool from surface while running in the wellbore. Once casing reaches the target depth, pressure is applied from surface, shattering the glass and establishing circulation for conditioning and cementing operations.

We determine the optimal location of the flotation collar based on the well trajectory, casing design and fluid types. This allows us to select the amount of applied pressure required to activate the tool prior to installation.

Features

- Full casing ID after opening
- No intervention requirement compared to deep-set/horizontal wireline plugs
- Circulation established hydraulically through differential pressure with predetermined burst pressure
- Installed as integral part of casing or liner string

Benefits

- No debris sub required due to small debris size
- Different settings are available to accommodate a large range of depths and mud weights
- Glass barrier shatters into fine particles, 5 - 10 mm in diameter

Applications

- Long laterals, also known as extended-reach laterals
- Laterals where casing is difficult to achieve target depth to ensure the wellbore integrity remains intact

Casing size in. (mm)	Casing weight range lb/ft (kg/m)	Max. OD in. (mm)	Min. ID in. (mm)	Overall Length in. (mm)	Rupture Glass Differential Pressure psi (kPa)	Temp. rating °F (°C)
4.500 (114.3)	11.6 - 15.1 (17.26 - 22.47)	5.440 (138.2)	Compliant with casing	24.50 (622.3)	2,500 - 9,500 (17,236.9- 65,500.2)	250 (121.11)
5.000 (127.0)	18.0 (26.79)	5.880 (149.4)	Compliant with casing	26.60 (675.6)	5,500 - 7,500 psi (37,921.2 - 51,710.7)	250 (121.11)
5.000 (127.0)	24.10 (35.87)	6.000 (152.4)	Compliant with casing	26.60 (675.6)	5,500 - 7,500 psi (37,921.2 - 51,710.7)	250 (121.11)
5.500 (139.7) Slimhole	17.0 - 23.0 (25.30 - 34.22)	6.500 (165.1)	Compliant with casing	28.60 (726.4)	2,500 - 9,500 psi (17,236.9- 65,500.2)	250 (121.11)
5.500 (139.7)	17.0 - 23.0 (25.30 - 34.22)	7.090 (180.1)	Compliant with casing	28.60 (726.4)	2,500 - 9,500 psi (17,236.9- 65,500.2)	250 (121.11)

NOTE: For the 4.500-in. and 5.500-in. versions, the rupture glass is offered in differential pressure increments of 500 PSI for pressures under 7,500-psi and increments of 1,000-psi for pressures above 7,500-psi.

NWS Wet Shoe Sub

The NWS wet shoe sub is designed to provide a positive indication of cement displacement, and the ability to have a wet shoe for first-zone injection eliminates the need for a costly perforating run. The wiper plug is pumped down the casing behind the cement to the seat in the wet shoe sub. A pressure increase indicates the plug is on seat; continued increase in pressure shears the plug seat, which moves it down to allow circulation around the wiper plug, creating a ‘wet shoe’ for first zone injection.

Features

- Large flow area around the wiper plug after shear-out
- Positive indication wiper plug is on seat
- Circulation through tool after plug seat shear-out
- No explosives required on location
- Exchangeable wiper plug seat insert to accommodate cemented frac sleeve dart system

Benefits

- Time and cost efficiency compared with traditional TCP operations
- Ability to employ continuous pumping operations
- Reduces HSE risk by eliminating need for dedicated coiled tubing operations
- Decreases amount of water used compared to traditional toe initiation

Applications

- Fracturing/stimulation
- Production
- Injection

Casing		Wet Shoe Sub								
Size in. (mm)	Weight lb/ft (kg/m)	Max. OD in. (mm)	Min. ID (seat) in. (mm)	Burst rating psi (MPa)	Collapse rating psi (MPa)	Tensile rating lbf (KN)	Flow area before wiper plug in² (mm²)	Flow area after wiper plug in² (mm²)	Shear value per screw psi (MPa)	Qty. of shear screws
3.500 (88.90)	9.2 - 9.3 (13.69 - 13.84	3.530 (89.66)	1.630 (41.40)	16,000 (110.32)	14,000 (96.53)	156,000 (693.92)	2.09 (1,346.27)	2.09 (1,346.27)	249-ea (1,717-ea.)	12
4.000 (101.6)	9.5 - 11.6 (14.14 - 17.26)	4.250 (107.95)	1.630 (41.40)	15,000 (103.4)	15,000 (103.4)	401,000 (1,783.7)	2.09 (1,346.27)	2.09 (1,346.27)	250-ea. (1,724-ea.)	12
4.500 (114.30)	13.5 (20.09)	5.650 (143.51)	3.375 (85.73)	11,695 (80.63)	10,450 (72.05)	503,000 (2,237.46)	8.95 (5,771.71)	4.40 (2,892.00)	488-ea. (3,365-ea.)	10
5.500 (139.70)	20.0 (29.76)	7.000 (177.80)	3.375 (85.73)	12,693 (87.52)	11,380 (78.46)	608,000 (2,704.52)	8.95 (5,771.71)	6.84 (4,411.05)	539-ea. (3,716-ea)	10

Note: LTC & BTC standard connections, premium threads available on request.

JIG 23-CAPS-CT-1024

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