

PRODUCT CATALOGUE



Safety, Excellence & Quality with Integrity

*Manufacture, Supply & Services of Oilfield Drilling,
Cementing & Completion Equipment*

Liner Hanger System | Packer System | Bridge Plugs | Floating Equipment | Centralizers

LINER HANGER SYSTEM & RUNNING TOOLS



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HYDRAULIC ROTATING LINER HANGER MODEL: GR-RHLH



GR-RHLH

Hydraulic Liner Hanger is used to hang a liner in the well. It is set hydraulically by applied pressure through the run-in string, and is designed to support medium to heavy liner loads. The hanger is widely used in deep and high angle wells, where actuation of mechanical-set hangers may not be preferred. A setting ball is dropped and/or circulated to a ball seat in the landing collar or running string. Differential pressure acts on the hydraulic cylinder, moving slips up to the set position.

Application :

- Offshore and Deviated Wells with tight turns.
- High pressure and High temperature wells.

Features:

- No tubing manipulation required during setting.
- Large multi slot design provides excellent bypass area for proper cementing.
- Available in Single Cone, Double Cone, and multi cone Dovetail type.
- Available in Non Rotating type design.
- High performance Roller bearing enables rotation during running and Cementing for proper cementing operation.
- Faster Running speed with Dovetail design.
- Dovetail Slip cone Design delivers lower and more uniform stresses on Casing and mandrel enhance hanging capacity.

This LH has two types Multi cone pocket slip type or Dovetail type with rotating or non-Rotating mechanism. Multi cone design provides excellent fluid bypass for proper cementing. Hydraulic liner hanger is couple with running tools, pack off bushing, hydraulic landing collar, float collar (if required), and float shoe and other tools. In this document we include dimensional details of liner hanger, parts of liner hanger and operation of liner hanger.

- Well application requiring hanging heavy liners.
- Drill down applications.
- Vertical and horizontal wells.
- Manufactured from a heavy walled integral Tube which eliminates the no. of internal connections and provide maximum differential pressure rating and liner hanging capacity.
- Case hardened Slips having 50-56 HRc hardness are suitable to set inside all API casing grade.
- Protected type Slips are suitable for highly deviated well operations.
- Available in all metallurgical conforming to NACE MR 0175 or H2S, and suitable for standard normal/H2S, CO2 well services requirements.
- Available in All API & Premium thread connections and type.
- High Burst and collapse pressure ratings.

Specification guide (GR- NRHLH-PS) :

Liner x Casing Size	Casing Weight (lbs/ft)	Liner Hanger Max OD	**Liner Thread connection
4-1/2" x 7"	17-26	6.21"	4-1/2", 9.5-15.10# casing thread
	29-38	5.680"	
5" x 7"	23-26	6.050"	5", 11.5-24.1# casing thread
	29-32	5.780"	
	35-38	5.680"	
5-1/2" x 7"	17-26	4.781"	5-1/2", 14-23# casing thread
	29-32	4.641"	
5" x 7-5/8"	33.7 - 39	6.250"	5", 11.5-24.1# casing thread
5-1/2" x 7-5/8"	24.0-29.70	6.620"	5-1/2", 14-23# casing thread
	33.70-39	6.370"	
7" x 9-5/8"	36-43.5	8.430"	7", 17-35# casing thread
	40-47	8.380"	
	47-53.5	8.250"	
	58.40	8.120"	
7-5/8" x 9-5/8"	36-43.50	8.5"	7-5/8", 24-47.10# casing thread
	47-53.50	8.310"	
9-5/8" x 13-3/8"	54.50-68	12.00	9-5/8", 32.30-58.40# casing thread

** Threads shown above are standard for the respective Liner Hanger Mandrel sizes other threads Can be supply on request when ordering.

HYDRAULIC SET DOUBLE CONE NON-ROTATING LINER HANGER MODEL: GR-NRHLH-2



GR-NRHLH-2

Hydraulic Liner Hanger is used to hang a liner in the well. It is set hydraulically by applied pressure through the run-in string, and is designed to support medium to heavy liner loads. The hanger is widely used in deep and high angle wells, where actuation of mechanical-set hangers may not be preferred. A setting ball is dropped and/or circulated to a ball seat in the landing collar or running string. Differential pressure acts on the hydraulic cylinder, moving slips up to the set position.

Application:

- Offshore and Deviated Wells with right turns.
- High pressure and High temperature wells.

Features:

- No tubing manipulation required during setting.
- Large bypass area for proper cementing.
- Available in Single Cone, Double Cone.
- Available in Rotating Non Rotating type design.
- High performance Roller bearing enables rotation during running and Cementing for proper cementing operation.
- Manufactured from a heavy walled integral Tube which eliminates the no. of internal connections and provide maximum differential pressure rating and liner hanging capacity.

This LH has two types single cone / double cone type with rotating or non-Rotating mechanism. Hydraulic liner hanger is couple with running tools, pack off bushing, hydraulic landing collar, float collar (if required), and float shoe and other tools. In this document we include dimensional details of liner hanger, parts of liner hanger and operation of liner hanger.

- Well application requiring hanging heavy liners.
- Drill down applications.
- Vertical and horizontal wells.

- Case hardened Slips having 50-56 HRc hardness are suitable to set inside all API casing grade.
- Slips are protected with Split rings suitable for highly deviated well operations.
- Available in all metallurgical con forming to NACE MR 0175 or H2S, and suitable for standard normal/ H2S, CO2 well services requirements.
- Available in All API & Premium thread connections and type.
- High Burst and Collapse pressure ratings.

Specification guide (GR-NRHLH-2) :

Liner x Casing Size	Casing Weight (lbs/ft)	Liner Hanger Max OD	**Liner Thread connection
4-1/2" x 7"	17-26	6.21"	4-1/2", 9.5-15.10# casing thread
	29-38	5.680"	
5" x 7"	23-26	6.050"	5", 11.5-24.1# casing thread
	29-32	5.780"	
	35-38	5.680"	
5-1/2" x 7"	17-26	4.781"	5-1/2", 14-23# casing thread
	29-32	4.641"	
5" x 7-5/8"	33.7 - 39	6.250"	5", 11.5-24.1# casing thread
5-1/2" x 7-5/8"	24.0-29.70	6.620"	5-1/2", 14-23# casing thread
	33.70-39	6.370"	
7" x 9-5/8"	36-43.5	8.430"	7", 17-35# casing thread
	40-47	8.380"	
	47-53.5	8.250"	
	58.40	8.120"	
7-5/8" x 9-5/8"	36-43.50	8.5"	7-5/8", 24-47.10# casing thread
	47-53.50	8.310"	
9-5/8" x 13-3/8"	54.50-68	12.00	9-5/8", 32.30-58.40# casing thread

** Threads shown above are standard for the respective Liner Hanger Mandrel sizes other threads can be supply on request when ordering.

MECHANICAL SET DOUBLE CONE NON-ROTATING LINER HANGER MODEL: GR-MLHD



GR-MLHD

Gradwell Liner Hanger is set mechanically with either right or left-hand rotation, depending on the type of setting tool or design. Staggered cone design gives maximum bypass area to ease running in and circulation. Automatic J- cage allows hanger to return to the run-in position, should the hanger set prematurely while running in the well. The slip cage contains a “J” slot and high strength drag springs to manage the movement of the slips into contact with the cones. Mechanical Set Liner Hanger are set through

manipulation of the work string (pick-up & 1/4 right hand turn) line up the cones and the slips, and a further slack off sets the slips onto the casing wall.

This LH has two types Single cone / Double cone type with rotating or non-Rotating mechanism. Hydraulic liner hanger is couple with running tools, pack off bushing, float collar (if required), and float shoe and other tools.

Features:

- Automatic J- cage, allows hanger to return to run-in position constraining hanger preset while running in.
- Open-bottom J-cage, available in right or left-hand set.
- Large bypass area in run-in and set position.
- Slips profile provide more biting area to increase hanging capacity and reduce the possibility of damage while running in.
- Single or multiple cone designs available to match hanging capacity with liner strength, minimizing stress in supporting casing.
- Complete wells with less weight landed on wellheads.
- Give rise to improved cementing jobs.
- Prevent lost circulation.
- Provide good well control while drilling and completing.
- Impart more completion flexibility.
- Afford low-cost liner on appraisal wells.
- Liner Hangers are available with all API and premium thread connections.
- Case hardened Slips having 50-56 HRC hardness are suitable to set inside all API casing grade.
- Slips are protected with Split rings suitable for highly deviated well operations.
- Available in all metallurgical con forming to NACE MR 0175 or H2S, and suitable for standard normal/ H2S, CO2 well services requirements.
- Available in All API & Premium thread connections and type.
- High Burst and Collapse pressure ratings.

Specification guide (GR-MLH-2) :

Liner x Casing Size	Casing Weight (lbs/ft)	Liner Hanger Max OD	**Liner Thread connection
4-1/2" x 7"	17-26	6.21"	4-1/2", 9.5-15.10# casing thread
	29-38	5.680"	
5" x 7"	23-26	6.050"	5", 11.5-24.1# casing thread
	29-32	5.780"	
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5-1/2" x 7"	17-26	4.781"	5-1/2", 14-23# casing thread
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5" x 7-5/8"	33.7 - 39	6.250"	5", 11.5-24.1# casing thread
5-1/2" x 7-5/8"	24.0-29.70	6.620"	5-1/2", 14-23# casing thread
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7" x 9-5/8"	36-43.5	8.430"	7", 17-35# casing thread
	40-47	8.380"	
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9-5/8" x 13-3/8"	54.50-68	12.00	9-5/8", 32.30-58.40# casing thread

** Threads shown above are standard for the respective Liner Hanger Mandrel sizes other threads can be supply on request when ordering.

TIE BACK RECEPTACLE MODEL: GR-TBR

The Polished Bore Receptacle (PBR) is run as a part of the liner. This PBR comes as a means to tie-back to an existing liner with either a seal assembly or tie-back packer for remedial work.

This PBR is a means to Tie-Back to the liner system should it be needed. This can be accomplished with a seal nipple or with a Tie-Back packer



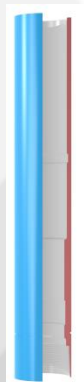
GR-TBR

SETTING COLLAR MODEL: GR-SC-HR

Setting Collar can be provided with HR profile to run the spring with HRT Running tool, Setting Collar having receptacle profile for retrieval pack off bushing. The model "SC" setting collar is used to carry the liner into the well. It is used when using a rotating liner hanger. The setting collar has right hand releasing threads which are made up with the threads of the setting tool.

The Setting Collar is made up on top of the Liner Hanger and generally used when a liner extension is not planned.

The fluted top guide assures centering of the liner in the hole and its shape provides an internal guide for smooth running of the tools into the liner



GR-SC-HR

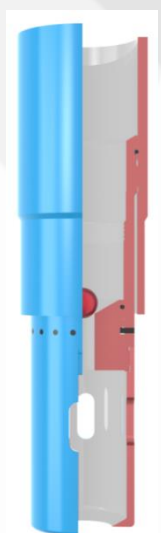
LANDING COLLAR MODEL: GR-LCL-BC

Landing Collar is used when setting liner hanger prior to cementing. A setting ball seat in the shear seat allowing pressure to be applied to the hanger to set the slips. Increasing the pressure after setting the hanger shears the ball seat allowing full circulation for cementing operations. The shear rating of the ball seat is adjustable to meet the requirements of the hanger. It incorporates a latch with Non-rotational Mechanism to accept, lock and seal the Liner Wiper Plug upon completion of cementing. Internal components are manufacture from

PDC drillable Material and are compatible for drill out. We retained ball seat design prevents the sheared out cage and ball assembly from interfering with float equipment run below the landing collar. Large, milled slots provide an unrestricted flow area while cementing. Shears/setting balls are available in bronze, aluminum or phenolic materials of varying specific gravity for use in vertical, high angle or horizontal wells or for specific cement weights. All seals are of standard.

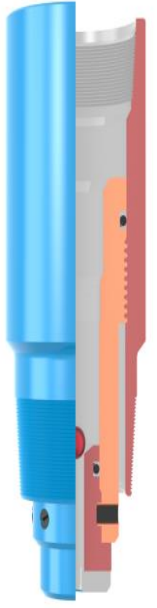
Features:

- Anti-rotation feature for wiper plugs.
- Available in thread connection per ordered.
- Available in all API material grades.
- PDC drillable material use for drill out items.
- Brass shear pins loaded Ball seat.
- Suitable for H₂S & CO₂ service.
- High Burst and collapse pressure.



GR-LCL-BC

HYDRAULIC LATCH LANDING COLLAR MODEL: GR-LHA



GR-LHA

Gradwell Landing Collar provide a means to both set hydraulic tools and to catch a liner wiper plug in a string of pipe.

Application :

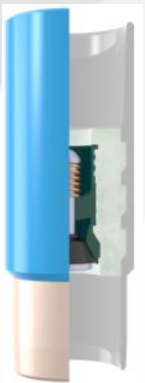
When hydraulically actuated tools are incorporated in the liner, Landing Collar is used as a ball seat to facilitate the setting of these tools. It is also used to catch and lock (rotationally) the liner wiper plug.

Features:

- Ceramic Ball Seat - A ceramic insert has been incorporated into the ball seat of most standard sizes in order to eliminate erosion of the critical sealing area during high rates of circulation.
- Drillable - The inserts in these tools are made of drillable cast aluminium for easy drill out, and are compatible with all bit types including PDC.
- Shear Pin Visibility - Shear pins can be adjust after tool assembled.
- Thread Integrity Maintained – for premium threads manufacturer's outside and inside diameters can be maintained.
- Positive Latch - A latch thread in the insert assures that the wiper plug will not move after it has bumped.

A ball dropped from surface seats on the ball seat in the Landing Collar and allows the hydraulic tool to actuate by applied pressure. The ball and seat are then sheared and fall to a Ball Catcher Sub.

CONVENTIONAL SINGLE VALVE FLOAT COLLAR MODEL: GR-CFC-1



GR-CFC-1

Float Collar is a cylindrical steel section with box and pin threads. Float Collar generally uses one string above the Float Shoe. It contains a check valve to permit fluid to pass

Features:

- Fast Drill Out.
- Internal Parts are PDC drillable.
- Float Collar is available in all API grade material.
- Float Collar can be furnished in API threads as well as in Premium threads.
- Float Collar can be furnished with non rotating feature.
- Valve is tested as per API RP 10F Category III C.
- Maximum Back Pressure rating 5000 psi @400°F.
- Tubing Float Collar for high pressure up to 10000 PSI.
- Orifice float collar for Tie-back application.
- Ball Catcher/Ball Deflector is available upon request.
- Flat surface provides platform to bump the bottom plug.
- Baffle plate float collar is available upon request.
- Inner String float collar is available for larger size casing.

downward but not upward through the casing and provides a flat landing surface for cementing plugs.

DOUBLE VALVE FLOAT SHOE WITH DOWN JET PORTS MODEL: GR-DJFS-2



GR-DJFS-2

This design ensures positive sealing in vertical, deviated & horizontal well. They have a back-pressure valve that prevents fluids from entering the casing while the pipe is lowered into hole and prevents cement from flowing back into the casing after displacement, while enabling circulation down through casing. Double Valve helps maximum protection against back flow of cement.

Features:

- Down-jet ports increase bonding strength of cement.
- Provide passage of fluid with added assurance that flow will not be interrupted when casing rests at bottom.

Note: It is available in Single & Double Valve design.

There are three down-jet ports located below float valve in side of the float shoe shell to help to increase cement bonding strength due to swirl effect by cementing.

Sometimes, it provides landing point for cementing plugs when Collar is not used.

It is available with Down-jet, Up-jet & Side-jet ports as well.

- Easy PDC drillable.
- Cost effective.
- Maximum protection against back flow of cement.

HANDLING NIPPLE MODEL: GR-HN



GR-HN

The Handling Nipple is a heavy weight Drill Pipe Pup Joint for handling the Liner Hanger assembly and for using the Slips and elevator once the assembly below table. It is located above Packer Setting Tool usually the Handling Nipple is equipped with Junk Bonnet

Features:

- Available in all API drill pipe thread connections.
- Available in different lengths from 10 feet to 20 feet
- Suitable for H2S & CO2 service
- Better Cementing wiping

DEBRIS JUNK SCREEN MODEL: GR-DSC



GR-DSC

The Junk Bonnet Sub consists of two metal cups installed around Lifting Sub with two bolts.

The Liner Hanger junk screen should be run as part of the setting tool assembly to prevent debris from damaging the polished bore of Tieback Receptacle.

HYDRAULIC RELEASE RUNNING TOOL MODEL: GR-HRT



GR-HRT

Gradwell - HR Running Tool connects with the HR Liner Setting sleeve and provides a means to carry a Liner Down hole, set a Liner Hanger and release from the liner prior to or, if desired after cementing. The primary releasing mechanism

is hydraulic with an emergency mechanical back-up release system. This tool carries the weight of the liner on a fully supported collet assembly with no threads that could back off and drop the liner while running in the hole.

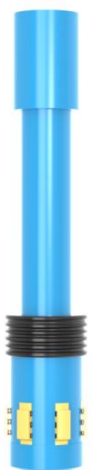
Application :

- Offshore and Deviated Wells with tight turns.
- High pressure and High temperature wells.
- Well application requiring hanging heavy liners.
- Vertical and horizontal wells.

Features :

- Push Pull and rotate while running the liner down hole. The design of this tool allows right hand rotation of the work string and liner with the tool in tension, compression or neutral.
- Rotation after release when running a rotating liner hanger. Multiple torque fingers permit rotation of the liner during cementing after the hanger is set and the running tool released from the liner.
- Easy stub-up to load the HR setting tool into the HR liner Setting sleeve. Simply push straight in and setting tool automatically latches
- into the profile. Maximum 1/3 turn engages the torque fingers.
- No Rotation to release after actuating the hydraulic cylinder, the tool is retrieved by straight pick-up. The collet is retained in the released position by an internal body lock ring to prevent re-engagement into the setting sleeve profile.
- Emergency mechanical release in the event the primary hydraulic releasing mechanism fails to operate, the setting tool may be released mechanically by 1/4 turn to left.

SETTING TOOL ROTATING FOR LINER HANGER MODEL: GR-STLH



GR-STLH

The Model GR-STLH ,Setting Tool is used in setting Rotating Liner Hanger. The Setting Tool is provided with spring loaded Rotating Dog Sub that mates with splines located in the setting collar. This dog sub transfers torque from drill string, to the liner, while in tension or compression for

the purpose of setting Mechanical liner Hanger, Rotating liner Hanger during cementing operation, or insuring setting tool engagement during run-in. the model GR_STLH also utilizes the retrievable Pack off bushing and seal Joint.

MECHANICAL RELEASE RUNNING TOOL MODEL: GR-RTRM



GR-RTRM

Mechanical release setting tool is a full feature, mechanical release running tool and packer setting assembly. With no rotational drive capability, this simply conveys the liner assembly and then is released with right-hand rotation after the hanger has been set. Designed to release in compression, this tool may be run in vertical, high-angle or horizontal wells with a high degree of confidence. The bearing system facilitates both easy release of the liner, and also aids in the setting of weight set, liner top packer assemblies by allowing the weight to be applied

under a rotational load, more evenly distributing weight and ensuring that maximum setting force reaches the packer assembly.

As a service tool, the mechanical release setting tool features heavy-duty design and construction for a long, usable service life. Standard configuration is with API drill pipe box for direct connection to a retrievable seal joint, drillable seal joint, solid bushing or inverted cup tool.

PACKER SETTING TOOL MODEL: GR-RPST



GR-RPST

The Gradwell - Packer setting tool is used to set the Liner top Packer after setting of Liner Hanger. Setting Dog

Section is spring loaded to set on top of the Packer to allow setting force to be transmitted to the Packer.

Features :

- High strength Spring loaded Dogs Apply set down weight to set Liner Top Packer.
- Available in all API material grades.
- Available in all API Drill Pipe Threads.
- Suitable for H2S & CO2 service

RETRIEVABLE PACK OFF BUSHING MODEL: GR-RPOB



GR-RPOB

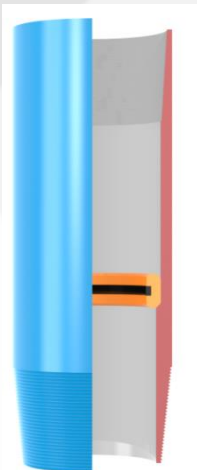
The Gradwell Retrievable Packoff Bushing provides a positive seal between the setting tool and the liner, securely holding all cementing and plugs bumping pressures. It features temperature and pressures resistant seals which are designed to hold differential pressure from either direction. It also reduces piston force on the drill pipe during cementing operations. After the completion of the cementing, it is retrieved

with the setting tool, leaving the liner top unrestricted. The Retrievable Packoff Bushing with polished nipple is installed in the setting collar and then the setting tool can be made up. When installed, the polished extension nipple locks the retaining dogs into the RPOB Profile. When the setting tool is retrieved, a recessed/undercut section on the bottom of the

Features:

- Eliminates reverse differential failures.
- Redressable in the field.
- Reduces the piston effect due to the small cross sectional area of the Polished Nipple end.
- Provides a positive seal for high pressure and/or for high temperature.

DRILLABLE PACK OFF BUSHING SUB MODEL: GR-DPOB



GR-DPOB

Drillable Pack Off Bushing Sub Provide the seal between stinger and Liner Hanger body to set the liner Hanger.

Features:

- Available in thread connection on order
- Available in all API material grades
- PDC drillable material use for drill out items
- Suitable for H₂S & CO₂ service
- High Burst and collapse pressure

SLICK JOINT MODEL: GR-SJ



GR-SJ

Seal stinger with grounded ODs is to provide a sealing surface for the retrievable/drillable Pack-off Bushing. These are manufactured from higher group of API 5CT standard materials as well as furnished with end connections in compliance to API standard and CRA materials suited for H₂S or CO₂ service are available on request.

A groove is provided at the bottom end to attach the Liner Wiper Plug. Our seal joint manufactured from high grade alloy material and surface would be chrome plated so as to possess resistance for corrosive environments.

Features:

- Available in all API thread connections
- Available in different lengths from 10 feet to 20 feet
- Polished Bore high finished OD for better sealing with Pack Of Bushing Seals
- Suitable for H₂S & CO₂ service Better Cementing wiping

TIE BACK SEAL NIPLLE MODEL: GR-TSN



GR-TSN

The Tieback Seal Nipple with Chevron seal is designed for high pressure liner tieback completions. This honed bore, Tieback seal nipple allows for future extension of the liner casing string to surface for production, testing or remedial operations during the life of the well. This provides mono bore access to the reservoir.

It may be used temporarily or permanently. To facilitate both ease

of entry and cementing operations. It is equipped with a standard mule guide nose with circulations ports. Standard seal configurations is four units in fabric reinforced NBR with optional seals in HNBR. Nipples are designed with ODs compatible for Liner Tieback Packers and Tieback Receptacles with varying in lengths form 6 feet to 40 feet depending on the applications.

Features :

- One-piece mandrel for high burst and collapse properties.
- Glass filled chevron seals rated at 10,000 PSI at 400 F
- Available in lengths from 6 ft to 40 ft.
- Optional seal packages available for severe well conditions.
- Available in all metallurgical con forming to NACE MR 0175 or H₂S, and suitable for standard normal/H₂S, CO₂ well services requirements.
- Available in All API thread connections and type.
- High Burst and Collapse pressure ratings.

DRILL WIPER PLUG MODEL: GR-DWP



GR-DWP

Gradwell inner-string Pump Down Plug is pumped behind cement and wipes the inside of drill pipe or tubing strings, providing a mechanical barrier between cement and spacer fluids or between mud and cement.

It wipes cement from the drill pipe and lands in Liner Wiper Plug. When this happens the pressure increases and shears the LWP. Allowing both plug to

be displaced as an unit to the Landing Collar.

The "PDP" is designed for use with Gradwell inner-string stab-in float equipment to cement large-diameter casing strings. The stinger dart is launched from cementing head, displacing fluids through the drill pipe or tubing string while preventing cement contamination.

LINER WIPER PLUG MODEL: GR-LWP



GR-LWP

The Liner Wiper Plug, commonly shear pinned to the Liner setting Tool, has a hollow internal diameter that allows fluids and cement to pass through the plug until the PDP latches into the Upper part of the LWP.

Application:

- Wiping drill pipe or tubing in conjunction with Gradwell inner-string float equipment.

Features:

- Composed entirely of PDC- (polycrystalline diamond composite) drillable materials, the stinger dart enables trouble-free drill out, conserving rig time.
- Seal ring provides a positive bidirectional seal when latched into float equipment with the corresponding aluminum snap ring, enabling the device to withstand exceptionally high backpressures.
- PDP acts as a mechanical barrier between displacement fluids to prevent cement contamination, resulting in a clean pipe ID.

The PDP is then mechanically and hydraulically sealed to the LWP, and the two plugs are sheared from the Liner setting Tool. After wiping the liner, the LWP is latched and sealed to the landing collar preventing the back flow of cement.

- Large-diameter casing strings requiring inner-string cementing Features

- Angled, aluminum nose prevents the dart from hanging up in the drill pipe or tubing string, ensuring proper functionality of the device.
- Polyurethane fins offer superior abrasion resistance and excellent wiping action, resulting in a clean casing ID after passage.
- Fin design enables versatility, stability, and superior wiping action for drill pipe and tubing strings, providing operational flexibility.

LINER TOP PACKER MODEL: GR-LTP-IS



GR-LTP-IS

Gradwell Liner top Packer is used to prevent gas migration through the cement as it begins to set stopping any micro-annulus that may form without the packer in the well bore. It is run as an integral part of the original liner string. Designed to be set after the liner is cemented, the packer is set by picking up the running string, placing the setting dogs in the setting

tool assembly above the liner top / TBR and slacking off weight. Excess cement above the liner top packer can be circulated out after the packer is set.

Gradwell LTP is available with or without hold down slips and with or without clutch profile on the top of the packer used with Rotating or Non rotating Liner Hanger

Application :

- Offshore and Deviated Wells with tight turns.
- High pressure and High temperature wells.
- Well application requiring hanging heavy liners.
- Liner Hanger application requiring Drill down Capabilities.
- Vertical and horizontal wells.

Features :

- Can be rotated during run-in and cementing operation.
- Available with or without hold down slips and can be pulled if needed in heavy oil applications.
- Optimizes chemical resistance to completion and production fluids with a variety of elastomer options for packer element and seal assemblies.
- Maintains element setting with mandrel lock ring.
- Facilitates high circulating rates with enhanced packer element de-sign without risk of element washout.
- Anti-swab while running or reciprocating allows to achieve high running speeds.
- Eliminates extra components and connections with integral retrievable cementing bushing profile.
- Available in Rotating Non Rotating Clutch type design features.
- Manufactured from a heavy walled integral Tube which eliminates the no. of internal connections and provide maximum differential pressure rating and liner hanging capacity.
- Case hardened Slips having 50-56 HRc hardness are suitable to set inside all API casing grade.
- Hold down Slips prevents upward movement against differential pressure.
- Available in all metallurgical and Elastomers conforming to NACE MR 0175 or H2S, and suitable for standard normal/H2S, CO2 well services requirements.
- Available in All API & Premium thread connections and type.
- High Burst and Collapse pressure ratings.

specification guide (GR-LTP-IS) :

Liner x Casing Size	Casing Weight (lbs/ft)	Liner Hanger Max OD	Liner Top Packer Min ID*	**Liner Thread connection
4-1/2" x 7"	17-26	6.21"	3.826	4-1/2", 9.5-15.10# casing thread
	29-38	5.680"		
5" x 7"	23-26	6.050"	4(24.1ppf)	5", 11.5-24.1# casing thread
	29-32	5.780"		
	35-38	5.680"		
5-1/2" x 7"	17-26	4.781"	4.670(23ppf)	5-1/2", 14-23# casing thread
	29-32	4.641"		
5" x 7-5/8"	33.7 - 39	6.250"	4(24.1ppf)	5", 11.5-24.1# casing thread
5-1/2" x 7-5/8"	24.0-29.70	6.620"	4.670(23ppf)	5-1/2", 14-23# casing thread
	33.70-39	6.370"		
7"x 9-5/8"	36-43.5	8.430"	6.276(26ppf) 6.184(29ppf)	7", 17-35# casing thread
	40-47	8.380"		
	47-53.5	8.250"		
	58.40	8.120"		
7-5/8" x 9-5/8"	36-43.50	8.5"	6.875(29.7ppf) 6.375(47.10ppf)	7-5/8", 24-47.10# casing thread
	47-53.50	8.310"		
9-5/8" x 13-3/8"	54.50-68	12.00	(8.435ppf)	9-5/8", 32.30-58.40# casing thread

**TIE BACK SEAL NIPPLE PACKER
MODEL: GR-TSNP-IS**



GR-TSNP-IS

The Model “TSNP” is used mostly in vertical well application. It can be used as Liner Top isolation Packer in case of annulus leakage. It commonly used when there is a leak in the exiting packer or casing. It provides secondary seal to prevent annular gas migration and protect sensitive zones. It is a weight set packer and packing elements are locked in place by the internal ratchet. The mandrel of the tie back packer seals into the polished bore receptacle of an existing liner top packer or liner. The seal mandrel provides a pressure competent sealing by engaging in the tie back receptacle. There are different seal material available for different well conditions.

The Seal O.D is compatible with Tie back Receptacle. It is provided with a bottom mule shoe with circulation ports for circulation and cementing if required.

Features :

- To isolate the liner top after the hanger is set and cementing operations are completed
- Isolate formation pressure below the liner top from the casing ID above
- Isolate treating pressures below the liner-top during fracture or acid work
- It can be used as a tie-back completion or production packer.

Specification guide (GR-TSNP-IS) :

Packer Size (Casing X Packer) (In.)	Casing Weight (lbs/ft)	Packer Max. OD (In.)
5 3/4 X 4	18	4.940
7 X 4	35	5.819
7 X 4 1/2	23.0 -26.0	6.061
	29.0 – 32.0	5.910
	35.0 – 38.0	5.705
7 X 5	23.0 – 26..0	6.061
	29.0 - 32.0	5.910
7 5/8 X 5	33.7 -39	6.440
9 5/8 X 7	40.0 – 47.0	8.435
	47.0 – 53.5	8.312
	53.5 - 58.4	8.188
9 5/8 X 7 5/8	53.5	8.334
10 3/4 X 7	55.5 – 60.7	9.445
10 3/4 X 7 5/8	45.1 – 51.0	9.625
	55.5 - 60.7	9.438
	65.7 – 73.2	9.160
	79.2 – 86.36	8.937
11 3/4 X 9 5/8	60.0 – 65.0	10.375
13 3/8 X 9 5/8	61 -72	12.125
13 3/8 X 10 3/4	54 -61	12.300
	61 - 72	12.130
16 X 13 3/8	75 – 84	14.700
	84 - 109	14.375

SWAB CUP ASSEMBLY

MODEL: GR-SWAB



GR-SWAB

Gradwell Swab Cup Assembly Run together with a hanger setting ball seat, the swab cup pack off. Assembly allows for a hanger to be set an Released Running Tool without increasing the risk of formation damage which occurs when pressuring the entire liner for setting the hanger and expanding the setting ball. The ball seat in the running tool string, in concert with the swab cup packoff assembly, allows for pressure to be maintained only in the work-string, therefore decreasing surge on

Features:

- Available in NBR, HNBR, Viton elastomers
- All Rubber cup designed for maximum lifting capacity and extra-long life.
- Abrasion resistant
- High swabbing speeds, Deep wells, rough tubing.
- Ball seat catcher hold the Ball seat and Ball no need to left in well

the formation when the setting ball is expended. The Ball Seat assembly consist of Ball seat which is supported by Shear Pins. The shear value of Seat sub is always keep higher than the Setting pressure of Liner hanger and releasing pressure of Running Tool by changing the No. of shear pins. After shearing of Ball seat the Flo rate can be establish for cementing or wash over operation.

- Setting Ball is available in Steel and Brass material.
- Available in all metallurgical con forming to NACE MR 0175 or H2S, and suitable for standard normal/ H2S, CO2 well services requirements.
- Available in All API thread connections and type.
- High Burst and Collapse pressure ratings.

LINER SWIVEL SUB

MODEL: GR-LSS



GR-LSS

The liner Swivel Sub is normally used when running mechanical set liners in highly deviated wells in which rotating to set the liner may be a problem. The swivel allows rotation of the hanger

Features :

- The Liner Swivel allows rotation of the anger without having to rotate the total Liner.
- A clutch system in the swivel allows easy release of the running nut from the liner, if the liner has to be set on bottom.

without rotating the total liner. A clutch system in the swivel (feature may be detected if required) allows easy re- lease of running nut from the liner, if the liner has to be set on bottom.

- Available in all metallurgical con forming to NACE MR 0175 or H2S, and suitable for standard normal/ H2S, CO2 well services requirements.
- Available in All API & Premium thread connections and type.
- High Burst and Collapse pressure ratings.

TOP DRESS MILL
MODEL: GR-TDM

The Top Dress Mill has a tungsten carbide NO-go which dresses off the TBR top very effectively. It has 4-1/2" regular Pin x Box connections.

All parts are made of AISI 4140 ht high tensile material for heavy duty.

The Polish / Dress Mill assembly is normally spaced out and made up in the Gradwell Workshop

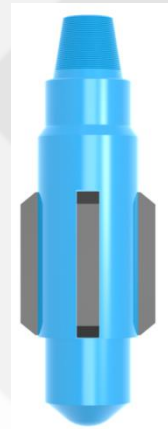


GR-TDM

CLEAN OUT BLADE MILL
MODEL: GR-CBM

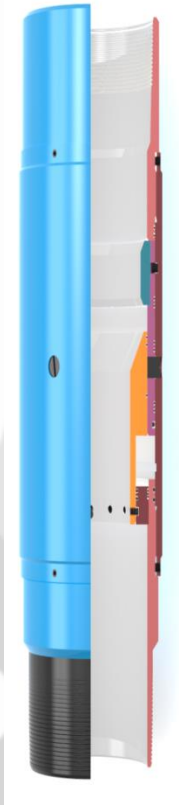
The Clean Out Mill assembly is used to clean the excess cement from the tie back receptacle after the cement job is performed. This is to prevent seal damage for and allow for good sealing of the seal stem run in thereafter.

The POLISH Mill is designed with metal blade, which measure 1/16" less than the I.D of the TBR sleeve. It has an REG pin up and 2-7/8" REG 3-1/2" REG or 4-1/2" REG down depending on the size.



GR-CBM

**HYDRAULIC STAGE CEMENTING TOOL
MODEL: GR-HSC**



GR-HSC

Operation Sequence :

- Installation of Gradwell Baffle Plate (When thread connection is 8RD or Buttress) or Gradwell Baffle Collar (When thread connection is premium) along with Hydraulically Operated stage cementing tool in the casing string.
- Run the casing string to the bottom Establish circulation. Mix and pump first stage cement.
- Launch First Stage Cementing Plug : it lands on Baffle plate or Baffle Collar. It displaces the cement.
- First Stage Cementing Plug seals the ID of Baffle collar.
- Increment of pressure upto opening pressure breaks.
- Down screws, thus opening sleeve is moved downwards.
- As opening sleeve is moved downwards, cementing ports are now in open state.
- Establish circulation. Mix and pump second stage cement.
- Launch Closing Plug, it lands upon closing seat.
- It displaces cement.
- Apply closing pressure, Closing sleeve moves down and main sleeve slips down with it to close cementing ports.

Features:

- Hydraulically Operated Stage Cementing Tool overcomes the drawback of Mechanically Operated Stage Cementing Tool as it can be used in Horizontal wells too.
- Hydraulically Operated Stage Cementing Plug can be converted into mechanically operated stage cementing plug by using a free fall opening plug.
- Adjustable Opening and Closing Pressure.
- It is featured with Anti-rotation features for reducing drilling time.
- No fluid is trapped during any operation.

Specification guide :

Casing Size	Max Diameter	Weight	Drill-out I.D	Overall Length	Opening		Closing		Opening Pressure W/Free-fall Device(p.S.I)
					Pressure (Psi)	Force (L.B.S)	Pressure (Psi)	Force (Lbs)	
5"	6.125	15-18	4.400	29"(approx)	3000	14,000	1500	25,000	1100
7"	8.275	26-29	6.200	31"(approx)	2600	28,000	1500	57,000	1000
9 5/8"	11.125	43.5-53.5	8.600	32"(approx)	2400	50,000	1500	111,000	1000
13 3/8"	15.000	61-72	12.375	35"(approx)	2100	83000	1500	19500	900

MECHANICAL STAGE CEMENTING TOOL MODEL: GR-MSC



GR-MSC

Operation Sequence :

- Installation of Gradwell Baffle Plate (When thread connection is 8RD or Buttress) or Gradwell Baffle Collar (When thread connection is premium) along with Mechanically Operated stage cementing tool in the casing string.
- Run the casing to the bottom at desired location.
- Location of Cementing Tool depends upon the depth of the well, location of lost circulation zones or weak formations etc.
- Establish circulation. Mix and pump first stage cement.
- Launch First Stage Cementing Plug to displace cement. It sits on Gradwell Baffle Float Collar.
- Launch Free Fall Opening Plug. It sits on Opening Sleeve.
- Apply Opening Pressure, Opening Seat slips down and cementing ports are opened.
- Establish circulation, Mix and pump second stage cement.
- Launch Closing Plug, it sits on closing seat and displaces the cement.
- Apply closing pressure; closing seat is adjusted to close cementing ports.

Features:

- Mechanically Operated Stage Cementing Tool is designed to be used in vertical wells.
- Opening and closing pressure is adjustable by changing no. of screws.
- Its design is featured such that no hydraulic locking is there during opening and closing phase of the tool.
- Both Opening and Closing Seats consist of anti-rotation features which makes it easier to drill during drilling operation.
- It is a non-welded tool.
- O-ring Seals are provided for prevention of leakage of fluid.
- Snap Ring is provided to lock closing seat in closing position.
- Stage Collar is a proven design that is manufactured in sizes 4 1/2" through 20" .

Specification guide :

Casing Size	Max Diameter	Weight	Drill-out I.D	Overall Length	Opening		Closing		Opening Pressure W/Free-fall Device(p.S.I)
					Pressure (Psi)	Force (L.B.S)	Pressure (Psi)	Force (Lbs)	
5"	6.125	15-18	4.400	29"(approx)	3000	14.000	1500	25,000	1100
7"	8.275	26-29	6.200	31"(approx)	2600	28,000	1500	57,000	1000
9 5/8"	11.125	43.5-53.5	8.600	32"(approx)	2400	50,000	1500	111,000	1000
13 3/8"	15.000	61-72	12.375	35"(approx)	2100	83000	1500	19500	900

TWO STAGE THREE PLUG CEMENTING



CLOSING PLUG



TRIP PLUG



SHUT OFF PLUG

The standard two stage cementing procedure uses conventional floating equipment, either standard valve or filling float valves on the bottom of the casing string. The rubber baffle plate is installed on top of the float collar. The stage collar is installed in the casing string at the position where second stage cement is to be pumped into the annulus. If a casing packer is being used the stage collar will be located above the packer. The operation of the stage collar is illustrated in sequence.

- Running in and First Stage Cementing, Flexible First Stage Plug will pass through stage collar while displacing first stage cement, landing on Baffle Plate located in Float Collar.
- Second Stage Cement Opening Trip Bomb has landed in and opened Stage Cementing Collar allowing second stage cement to be displaced.
- Second Stage Cement complete, Second Stage Closing / Displacement Plug landed in Stage Collar. Application of pressure will close the Stage Collar Ports. Two Stage Cementing job is complete.

TWO STAGE FOUR PLUG CEMENTING



CLOSING PLUG



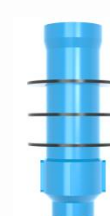
TRIP PLUG



SHUT OFF PLUG



BAFFLE PLATE



BY PASS PLUG

Two Stage Wiper plug system is a very effective means of wiping in two stages with liner hanger & ECP Packer. Top Liner Wiper Plug is a flexible type rubber plug, which is assembled with the Top Liner Wiper Plug with the help of shear pins. The plugs have Non-Rotational features, which allow easy PDC drilling after cementing. The Bottom Liner Wiper Plug releases from the Top Liner Wiper Plug by bumping of lower releasing dart and it travels through the Hydraulic Stage.

Cementing Collar without any effect and seats into the BFC Landing Collar. The pressure rises against Bottom Liner Wiper Plug which actuate ECP Packer then opens the ports of the stage tool. The upper dart bump in to Top Liner wiper plug and release the Top Liner Wiper Plug, seats in the closing seat of the hydraulic stage-cementing collar. It closes the ports by shearing the shear pin and shifting the closing sleeve after second stage cementing job.

SEQUENCE OF OPERATION

Step-1 Stage collar in 'running-in' and first stage cementing position. First stage shut-off plug will pass through stage cementing collar while displacing first stage cement, landing on baffle plate located in float collar.

Step-2 HYDRAULIC opening: Opening sleeve is shifted down by applying hydraulic casing pressure, allowing second stage cement to be displaced through the ports.

Step-2 MECHANICAL opening: Opening dart is dropped (free-fall), and landed in the opening seat. casing pressure is applied, the opening sleeve is shifted to the open position allowing second stage cement to be displaced through the ports.

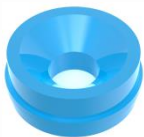
Step 3 Once the second stage cement job is complete, the closing plug lands in the stage cementing collar closing seat. Application of casing pressure shears the shear screws and pushes the closing sleeve to the closed and locked position, sealing off the ports. This completes the two stage cement job. (Hydraulic operation works the same, but no opening dart will be present).

BAFFLE COLLAR



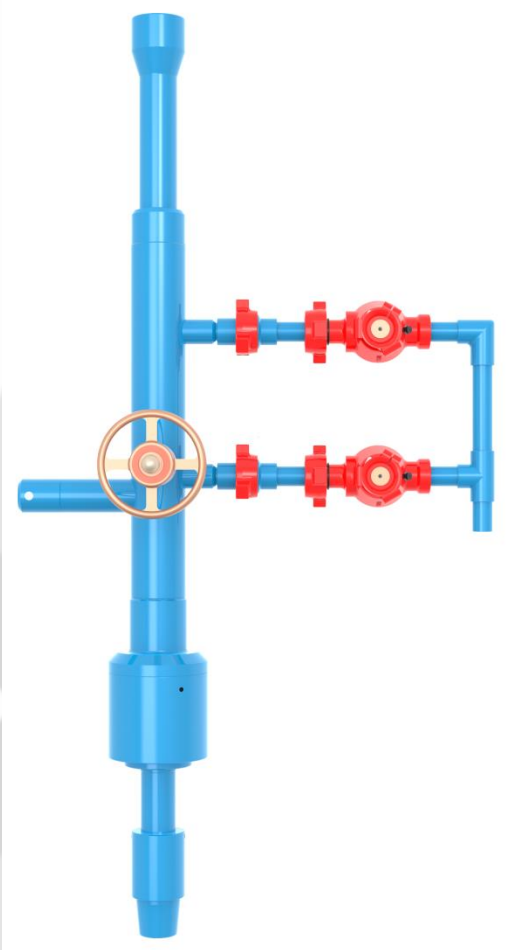
Baffle Collar is used for landing cementing plugs at specific points in the casing string. It is used when no float collar on shoe is being run and for linear cementing application. It is easily drillable.

BAFFLE PLATE



Baffle Plate is used for landing cementing plugs and is designed to be installed in the center of a casing coupling. These are available in both aluminum and plastic materials, and come in threaded and flush outside diameter configurations. Baffle Plates are available in sizes 4 1/2" through 13 3/8".

CEMENTING HEAD MODEL: GR- CTHD



This type cementing head is used when the rigs are not equipped with a top drive. It is commonly used with drilling and service rigs which are conventional land based, and also with offshore rigs that using a conventional manifold.

The Cementing Manifold connects the cementing lines to the running string during liner operations. It consists of an integral heavy duty swivel which allows easy drill pipe string manipulation with the cementing lines connected to the manifold.

For unobstructed operation, the swivel mechanism and drill pipe plug retainer are built in below the elevators
Cementing Manifold is available with single or multi plug drop capabilities.

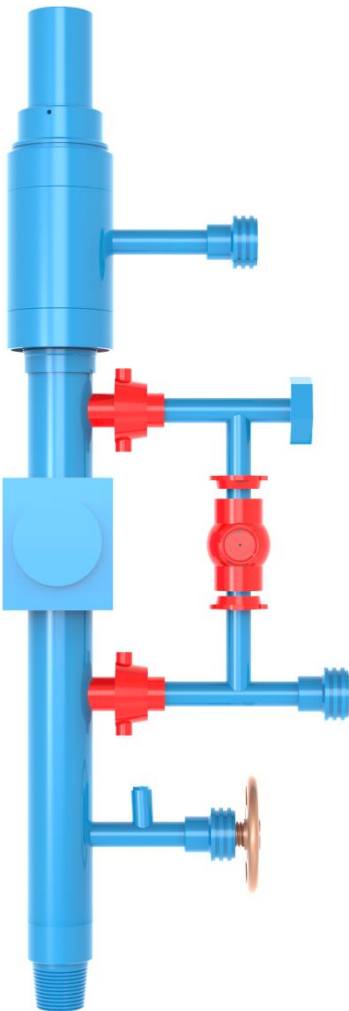
Application:

- Used for cementing liner and inner string.
-
- It consist of built-in rotary swivel for rotating applications
-
- Designed for high pressure applications up to 10,000 PSI
-
- It's Small bore makes it is suitable for drill pipe cementing and liner wiper plugs.
-
- It consist of Pick-up sub for handling and installing cement head and Replaceable bottom sub

Configuration:

- Ball dropping Sub.
- Plug release Plunger Assembly.
- Manifold, Downward union.
- Plug valves threaded connection.
- The cement heads are available in sizes 2 7/8" through 5 1/2"

TOP DRIVE CEMENTING HEAD MODEL: GR-TDHD



A power swivel or a top-drive drilling system as the drill string power source is required if, Top Drive Cementing head is to be used. It is most beneficial to use Top drive cementing head with rotational and reciprocating liner assemblies for best results during cementing operations. It consist of integral swivel which allows rotation.

Top Drive Cementing Head commonly have 4-1/2" I.F. Box up and Pin down connections for 10,000 PSI Cementing Line and Tensile Strength of 400 Ton.

It is also available in 3-1/2" IF B X P connections.

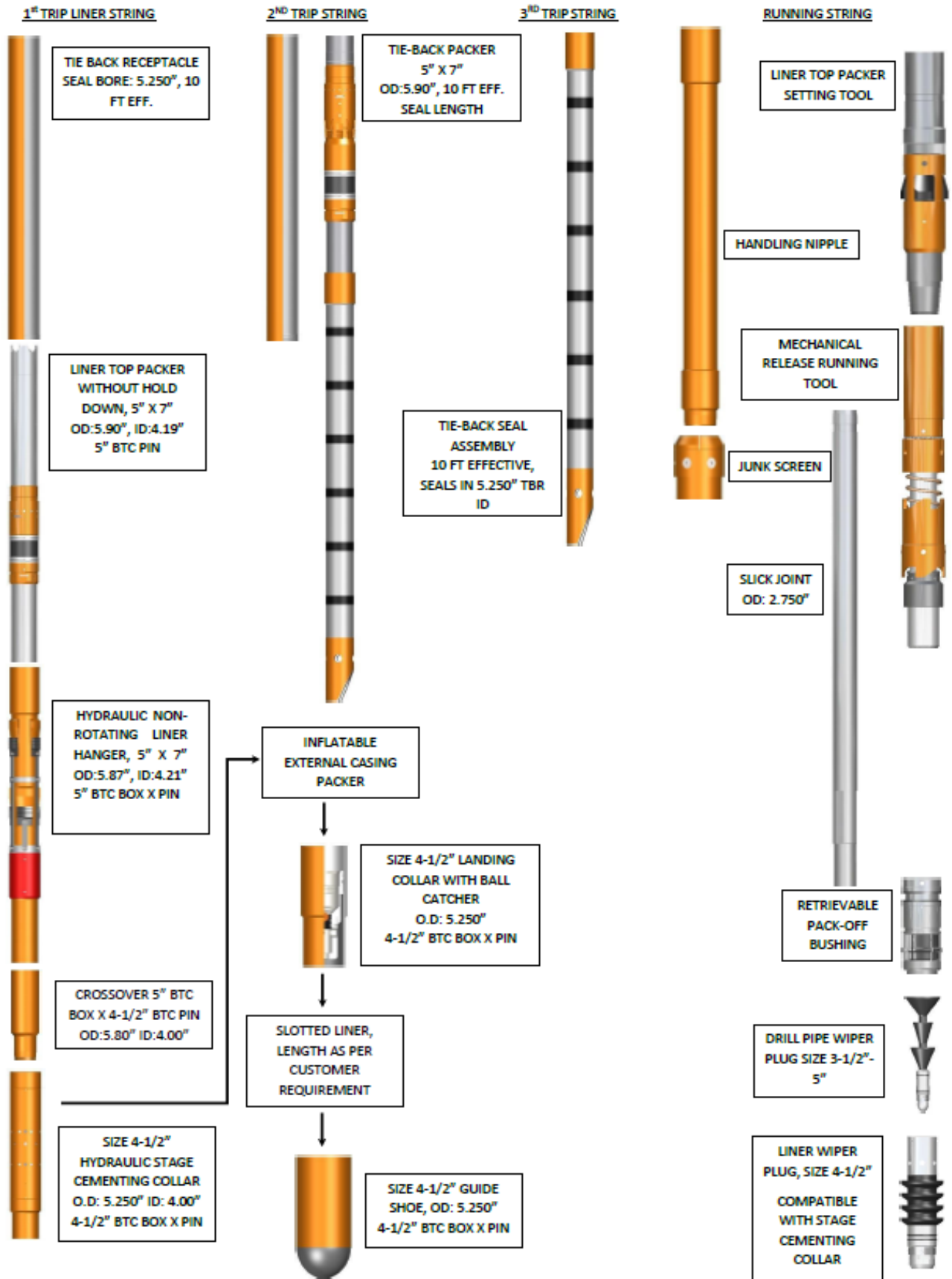
Application:

- Used for liner and inner string cementing where top drive is available.
- It is reliable when high circulation and rotation at high RPMs for longer periods of time is required.
- Designed for high pressure applications up to 10,000 PSI
- Indication of successful landing of ball or plug is got at the Flag sub indicator .
- It consist of Ball Dropping Sub from which various sizes of setting balls can be released
- It consist of small bore which makes it suitable for drill pipe cementing and liner wiper plugs.

Configuration:

- Ball dropping Sub.
- Plug release Plunger Assembly.
- Flag sub indicator.
- Plug valves threaded connection.
- The cement heads are available in sizes 2 7/8" through 5 1/2"

HOOK - UP : HYDRAULIC NON-ROTATING WITH LINER HANGER W / LINER TOP PACKER, STAGE COLLAR, LCHB, ECP NAD MECH RELEASE RUNNING TOOL





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