Offshore Technical Marketing

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• Manual single joint elevators
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• Iron Roughnecks - sheet 1 & 2
• Casing module CM 22 torque turn
• Casing running tools
• O-series hydraulic power units
• HE-series hydraulic power units
• Parallel racking system
• XY racking pipe handling
• HTV, VDM, PLS-5, PLS-7
• Stabber arms
• Service access baskets
• UHT 1200 and drill floor manipulator arms
• Catwalk machines - tubular
• Catwalk machines - tubular & riser
• Mousehole MHH3
• Pipe handling cranes
The TDX-1500™ combines the best of the NOV leading top drive brands with new technology, the TDX includes high reliability systems like water-cooled, flameproof motors with quick decouple drive connections, easily removable main shaft with a huge NGC4 connection, and a massive 1,236 ton API main bearing in a wet-sump gearbox. These all add up to improved reliability and increased uptime. The TDX also brings many revolutionary innovations such as the “FlexFit” link.

The TDX-1250™ combining the best of the NOV leading top drive brands with new technology, the TDX includes high reliability systems like water-cooled, flameproof motors with quick decouple drive connections, easily removable main shaft with a huge NGC4 connection, and a massive 1,236 ton API main bearing in a wet-sump gearbox. These all add up to improved reliability and increased uptime. The TDX also brings many revolutionary innovations such as the “FlexFit” link.

The TDX-1000™ combining the best of the NOV leading top drive brands with new technology, the TDX includes high reliability systems like water-cooled, flameproof motors with quick decouple drive connections, easily removable main shaft with a huge NGC4 connection, and a massive 1,236 ton API main bearing in a wet-sump gearbox. These all add up to improved reliability and increased uptime. The TDX also brings many revolutionary innovations such as the “FlexFit” link.

The TDX-85A™ combining the best of the NOV leading top drive brands with new technology, the TDX includes high reliability systems like water-cooled, flameproof motors with quick decouple drive connections, easily removable main shaft with a huge NGC4 connection, and a massive 1,236 ton API main bearing in a wet-sump gearbox. These all add up to improved reliability and increased uptime. The TDX also brings many revolutionary innovations such as the “FlexFit” link.
The TDS-4 is our prime large bore DC top drive. It has built its reputation over 350 units have been in service since that time. Although considered a mature product, its high demand in the top drive market today is a tribute to its robust and reliable reputation built up on years of drilling experience.

The TDS-4S is our prime large bore DC top drive. It has built its reputation over 350 units have been in service since that time. Although considered a mature product, its high demand in the top drive market today is a tribute to its robust and reliable reputation built up on years of drilling experience.

Developed for use in deep drilling applications, the TDS-1000 provides an immense torque output of 30,000 ft-lbs to make and break even the highest torque connections. Because of the broad speed and torque range available, the TDS-1000 Top Drive is driven by a Variable Frequency Drive (VFD) control system for a greater range of torque and speed performance.

The NOV Washpipe System is a patented design that utilizes a set of proprietary ultra-hard mechanical face seals to provide superior life. The ongoing challenge to solve high pressure, high temperature washpipe life has finally been met with this robust and innovative design. These durable maintenance-free seals can be changed out in 10 minutes or less without removing the upper and lower nuts and with only a single-hand wrench. This advantage vastly improves seal change-out time and increases crew safety. The system works on most major brand top drives with no special modifications. The key value to the washpipe system is the confidence to keep drilling. Success with hundreds of units operating in many of the highest pressure, high temperature wells across the world has proven the washpipe system to be the answer to premature washpipe failures:

- Extrema long-life service
- Simple mechanical seal design
- Seals change in minutes with single, standard hand tool
- Small and large-bore top drive application
- No maintenance required
- Fewer and lighter components for change-out (10 lbs vs. 120 lbs)
- Reduces risk of dropped objects
- Significant reduction in man-handling events
- Eliminates use of a dolly hammer

**Mechanical Seal Washpipe**
The BX 3, 4, and 5 elevators improve both rig safety and efficiency. Since the introduction of the BX 1 and 2 elevators in 1996, our engineers have continuously strived to improve the operations reliability and safety of its design, resulting in the present BX 1, 3, 4, and 5 design.

- One door bushing is spring loaded with link age connecting it to a locking pin
- Rotator for easier handling
- Hydraulically actuated elevator
- Hydraulic cylinders
- Quick and easy change of changeable bushings
- Trigger mechanism

## Technical specifications

### BX3™
- **Control system**: Automatic remote controlled (stand-alone control panel or dsl)
- **Dimension overall**: 26 x 13 x 18 ft
- **Weight**: 2,445 lbs
- **Flow rate**: 5 to 7 gpm
- **Power down force**: N/A
- **Manpower interfering**: No
- **Load rating**: Up to 350 tons
- **Link size**: 2 in
- **Greasing**: Hand
- **Use of rotator**: Yes
- **Dimensions**: LxWxH 26.43” x 40.99” x 17.90”

### BX4-35™
- **Control system**: Automatic remote controlled (stand-alone control panel or dsl)
- **Dimension overall**: 36 x 14 x 19 ft
- **Weight**: 2,278 lbs
- **Flow rate**: 5 to 7 gpm
- **Power down force**: N/A
- **Manpower interfering**: No
- **Load rating**: Up to 500 tons
- **Link size**: 2 in
- **Greasing**: Hand
- **Use of rotator**: Yes
- **Dimensions**: LxWxH 30.43” x 42.26” x 20.50”

### BX4-50™
- **Control system**: Automatic remote controlled (stand-alone control panel or dsl)
- **Dimension overall**: 36 x 14 x 19 ft
- **Weight**: 2,292 lbs
- **Flow rate**: 5 to 7 gpm
- **Power down force**: N/A
- **Manpower interfering**: No
- **Load rating**: Up to 750 tons
- **Link size**: 2 in
- **Greasing**: Hand
- **Use of rotator**: Yes
- **Dimensions**: LxWxH 35.67” x 48.0” x 26.45”

### BX4-75™
- **Control system**: Automatic remote controlled (stand-alone control panel or dsl)
- **Dimension overall**: 40 x 19 x 20 ft
- **Weight**: 3,586 lbs
- **Flow rate**: 5 to 7 gpm
- **Power down force**: N/A
- **Manpower interfering**: No
- **Load rating**: Up to 1,000 tons
- **Link size**: 2 in
- **Greasing**: Hand
- **Use of rotator**: Yes
- **Dimensions**: LxWxH 40.75” x 20.6” x 24.15”

### BX5™
- **Control system**: Automatic remote controlled (stand-alone control panel or dsl)
- **Dimension overall**: 40 x 19 x 20 ft
- **Weight**: 3,608 lbs
- **Flow rate**: 5 to 7 gpm
- **Power down force**: N/A
- **Manpower interfering**: No
- **Load rating**: Up to 1,000 tons
- **Link size**: 2 in
- **Greasing**: Hand
- **Use of rotator**: Yes
- **Dimensions**: LxWxH 40.75” x 20.6” x 24.15”
### BX7™: Elevators

**Construction of deepwater and ultra-deepwater drilling rigs created demand for equipment with a greater capacity. The BX7 has a rating of 1,000 short tons for drill pipe and landing strings, and 1,250 short tons for riser handling and square shouldered couplings.**

- Body, doors and latch of the elevator are forged to provide more homogeneous properties with increased impact so load resistance is obtained.
- Double rotor for easier handling.
- Elevator provides a signal which can be used for interlocking.
- BX7 operates with standard BX controls.
- Changeable bushings.
- Trigger mechanism.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control system</td>
<td>Automatic, remote controlled (stand-alone control panel or drill)</td>
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<tr>
<td>Dimension (LxWxH)</td>
<td>45.5” x 45.5” x 45.5”</td>
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<tr>
<td>Weight</td>
<td>3,300 lbs</td>
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<tr>
<td>Tubular types</td>
<td>Drill pipe, 45° shoulder, tubing, square shoulder, riser</td>
</tr>
<tr>
<td>Changing slips</td>
<td>Manually</td>
</tr>
<tr>
<td>Hydraulic pressure</td>
<td>2,000 - 2,500 psi (hydraulic)</td>
</tr>
<tr>
<td>Ambient temp. range</td>
<td>-4°F up to 131°F (-20°C up to +55°C)</td>
</tr>
</tbody>
</table>

### SBX™: Elevators

**Construction of deepwater and ultra-deepwater drilling rigs created demand for equipment with a greater capacity. The SBX is a manual operated single door solid body elevator. It has a rating of 1,250 short tons for riser handling with square shouldered couplings.**

- Body, doors and latch of the elevator are forged to provide more homogeneous properties with increased impact so load resistance is obtained.
- Double rotor for easier handling.
- Elevator provides a signal which can be used for interlocking.
- SBX operates with standard BX controls.
- Changeable bushings.
- Trigger mechanism.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>Control system</td>
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<tr>
<td>Dimension (LxWxH)</td>
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<td>Weight</td>
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<td>Tubular types</td>
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<td>Changing slips</td>
<td>Manually</td>
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<tr>
<td>Hydraulic pressure</td>
<td>2,000 - 2,500 psi (hydraulic)</td>
</tr>
<tr>
<td>Ambient temp. range</td>
<td>-4°F up to 131°F (-20°C up to +55°C)</td>
</tr>
</tbody>
</table>

### BX9™: Elevators

**Construction of deepwater and ultra-deepwater drilling rigs created demand for equipment with a greater capacity. The BX9 has a rating of 750-1,250 short tons for 18° shoulder, 750-1,500 short tons for 90° (square) shoulder.**

- Body, doors and latch of the elevator are forged to provide more homogeneous properties with increased impact so load resistance is obtained.
- Double rotor for easier handling.
- Elevator provides a signal which can be used for interlocking.
- BX9 operates with standard BX controls.
- Changeable bushings.
- Trigger mechanism.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
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<td>Automatic, remote controlled (stand-alone control panel or drill)</td>
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<td>Dimension (LxWxH)</td>
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<td>Tubular types</td>
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<td>Changing slips</td>
<td>Manually</td>
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<tr>
<td>Hydraulic pressure</td>
<td>2,974 lbs</td>
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<td>Ambient temp. range</td>
<td>-4°F up to 131°F (-20°C up to +55°C)</td>
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<tr>
<td>Flow rate</td>
<td>5 to 7 gpm</td>
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</table>

### BXS™: Elevators

The BXS allows a safe way to run a small upset and special clearance tubulars with the new BXS elevator. This tool enables rigs to handle flush or near flush tubulars without manual intervention. The BXS provides reliable operation and is suitable for use with the FMS 275 Flush Mounted Slip.

- Hydraulically powered, remote controlled elevator which supports non-force operation.
- BXS comes equipped with an automated “slip set” function, or the slip down function can be operated when using the optional BX Hook-up kit.
- Simplified hydraulic system provides reliable operation.
- Redundant “slip set” signals provide positive feedback to the driller that the elevators are set on the pipe.

**Technical Specifications**

<table>
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<th>Feature</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Control system</td>
<td>Automatic, remote controlled (stand-alone control panel or drill)</td>
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<tr>
<td>Dimension (LxWxH)</td>
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<tr>
<td>Weight</td>
<td>2,974 lbs</td>
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<td>Changing slips</td>
<td>Manually</td>
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<td>Hydraulic pressure</td>
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<tr>
<td>Ambient temp. range</td>
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<tr>
<td>Power down force</td>
<td>5,000 lbs</td>
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<tr>
<td>Flow rate</td>
<td>5.37 gpm</td>
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rig@nov.com
The X-series elevators handle all sizes of collar-type tubing, drill pipe and casing. The SMX has a patented latch & lock arrangement mounted on the elevator door. The handle protects the latch from accidental opening. Both latched operate from a single handle:

- 8C qualified
- For handling collar type casing, collar type tubing, and drill collars
- Tool is fit for manual operation
- Lock and unlock one-hand operation
- Latching/locking by closing door
- Latched and locked verification; separate action and incorporated in design
- Round ears for easy rotating in links
- Easy to rig up
- Hinge up bushings
- Lower link ears are 8C rated for 5 ton slings
- Handling group on elevator back for easy handling
- Handling handle for link mount is available (part number 5006435), (optional; can also be used for other applications)
- SMX series (8 frames) replaces SLX, SSD and SX type elevators (15 frames)

The SX-series elevators handle all sizes of collar-type tubing, drill pipe and casing. The SMX has a patented latch & lock arrangement mounted on the elevator door. The handle protects the latch from accidental opening. Both latched operate from a single handle:

- 8C qualified
- For handling collar type casing, collar type tubing, and drill collars
- Tool is fit for manual operation
- Lock and unlock one-hand operation
- Latching/locking by closing door
- Latched and locked verification; separate action and incorporated in design
- Round ears for easy rotating in links
- Easy to rig up
- Hinge up bushings
- Lower link ears are 8C rated for 5 ton slings
- Handling group on elevator back for easy handling
- Handling handle for link mount is available (part number 5006435), (optional; can also be used for other applications)
- SMX series (8 frames) replaces SLX, SSD and SX type elevators (15 frames)

### Technical Specifications

<table>
<thead>
<tr>
<th>Load Rating</th>
<th>Min. Size (in.)</th>
<th>Max. Weight (lbs.)</th>
<th>Link Size Min. (in.)</th>
<th>Link Size Max. (in.)</th>
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<tbody>
<tr>
<td>SMX 8/16</td>
<td>3 1/2 - 5 3/4</td>
<td>578 (260)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<tr>
<td>SMX 16/24</td>
<td>6 - 13</td>
<td>1361 (613)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<tr>
<td>SMX 24/36</td>
<td>9 - 13.3/8</td>
<td>1361 (613)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<tr>
<td>SMX 36/48</td>
<td>13.1/2 - 17.7/8</td>
<td>1505 (680)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<th>Load Rating</th>
<th>Min. Size (in.)</th>
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<td>SX 8/16</td>
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<td>SX 16/24</td>
<td>6 - 13</td>
<td>1361 (613)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<tr>
<td>SX 24/36</td>
<td>9 - 13.3/8</td>
<td>1361 (613)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<tr>
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<th>Load Rating</th>
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<th>Max. Weight (lbs.)</th>
<th>Link Size Min. (in.)</th>
<th>Link Size Max. (in.)</th>
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<td>SLX 8/16</td>
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<td>3.1/2 (89)</td>
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<td>SLX 16/24</td>
<td>6 - 13</td>
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<td>3.1/2 (89)</td>
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<tr>
<td>SLX 24/36</td>
<td>9 - 13.3/8</td>
<td>363 (165)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<td>SLX 36/48</td>
<td>13.1/2 - 17.7/8</td>
<td>470 (205)</td>
<td>2.1/4 (57)</td>
<td>3.1/2 (89)</td>
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<td>SLX 48/64</td>
<td>18 - 24.1/2</td>
<td>562 (253)</td>
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<td>3.1/2 (89)</td>
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### Technical Specifications

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<th>Load Rating</th>
<th>Min. Size (in.)</th>
<th>Max. Weight (lbs.)</th>
<th>Link Size Min. (in.)</th>
<th>Link Size Max. (in.)</th>
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<td>SLX-DX 8/16</td>
<td>3 1/2 - 5 3/4</td>
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<td>SLX-DX 16/24</td>
<td>6 - 13</td>
<td>563 (255)</td>
<td>2.3/4 (70)</td>
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<td>SLX-DX 24/36</td>
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<td>2.3/4 (70)</td>
<td>3.1/2 (89)</td>
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<td>SLX-DX 36/48</td>
<td>13.1/2 - 17.7/8</td>
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<td>2.3/4 (70)</td>
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<tr>
<td>SLX-DX 48/64</td>
<td>18 - 24.1/2</td>
<td>705 (320)</td>
<td>2.3/4 (70)</td>
<td>3.1/2 (89)</td>
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</table>
The S.JH horizontal pick-up elevator is designed to pick up tubulars lying flat on a surface without having to lift the tubulars prior to closing the elevator. The elevator is capable of lifting drill pipe, recessed top drill collars and casing. It will handle single joints of pipe straight from cardNeyes to off-line stand building systems.

S.L and SPL single-joint, center latch elevators are designed to replace unsafe rope slings for hoisting collar-type pipe into position. The S.JL, 90° elevator enables the crew to handle pipe properly, help avoid damage to pipe threads and reduce the chances of accident or injury. The SPL elevator is the same as the S.JL elevator except that the SPL elevator is designed for use on tapered pipe, conforming to API specifications for extreme line casing.

The S.JL horizontal pick-up elevator is designed for running single joints of tubing and casing from V-door to well center. The elevator is double hinged with cast-on stop pins to prevent the lifting sling shackles from pinching hands. Suitable for loads up to 12 ST./10.9 Tonnes.

The S.XJ single joint elevator is designed for running single joints of tubing and casing from V-door to well center. It is double hinged for use with the CRT Casing Running Tool, or any other stabbless operation. Ergonomically designed handles with cast-on stop pins prevent the lifting sling shackles from pinching hands. Suitable for loads up to 5 ST./4.5 Tonnes.

**Load Rating (ST./Tonnes) | Size Range inches (mm) | Max. Weight Range lbs. (kg.)**

| S.JH | 2.7/8-7.1/2 (60.3-190.5) | 79-89 (36-40) |
| S.L | 4.1/2-10.3/4 (100.8-273.1) | 132-60 (55-27) |

**Load Rating (ST./Tonnes) | Size Range inches (mm) | Max. Weight Range lbs. (kg.)**

| S.JX | 2.7/8-13.1/2 (60.3-114.3) | 45-55 (20-25) |
| S.PL | 2.3/8-6.5/8 (60.3-168.3) | 79-94 (36-43) |
| S.PL | 2.3/8-13.1/2 (60.3-114.3) | 79-108 (36-49) |
| S.PL | 2.3/8-16.5/8 (60.3-423.9) | 121-183 (55-84) |
### BJ-250

**Description**
The BJ-250 elevator/spider tool is designed for lifting and suspending tubular goods, from light tubing to heavy wall pipe and drill collars. The 250 ton model is designed for medium to long strings of smaller casing. The main body of these units can be dressed as a casing elevator or a spider. The upper unit is dressed as an elevator, using a bottom guide and a bell guide. The lower unit is dressed as a spider, using a top guide to aid in centering the casing. The unibuilt design of the slip assembly allows the tool to grip casing with uniform circumferential pressure, ensuring a safe hold while minimizing the possibility to damage the pipe. The unit is either manual or air operated. A double hinged door permits the unit to be rapidly installed on the casing or removed.

**Technical Specifications**
- **Max. weight slips set w/ inserts (lbs/kg)**: 550 / 250
- **Max. weight slips set w/ inserts (lbs/kg)**: 550 / 250
- **Casing size ranges (inches)**: 2 7/8 – 7 5/8
- **Allowable weight/temperature**: +75 / -20°F

### BJ-350

**Description**
The BJ-350 elevator/spider tool is designed for lifting and suspending tubular goods, from light tubing to heavy wall pipe and drill collars. The main body of these units can be dressed as a casing elevator or a spider. The upper unit is dressed as an elevator, using a top guide to aid in centering the casing. The unibuilt design of the slip assembly allows the tool to grip casing with uniform circumferential pressure, ensuring a safe hold while minimizing the possibility to damage the pipe. The unit is either manual or air operated. A double hinged door permits the unit to be rapidly installed on the casing or removed.

**Technical Specifications**
- **Max. weight slips set w/ inserts (lbs/kg)**: 550 / 250
- **Max. weight slips set w/ inserts (lbs/kg)**: 550 / 250
- **Casing size ranges (inches)**: 2 7/8 – 7 5/8
- **Allowable weight/temperature**: +75 / -20°F

### FMS275

**Description**
The FMS275 is a hydraulic operated near-flush mounted slip for running completion strings eliminating the need for scaffolding, it enables rigs to handle completion strings and casing up to 7", diameter with large umbilicals or control lines. The unit is a companion tool to the “BJ” style 250 ton elevator/spider. The slip power down force generated allows the FMS to take the torque reaction of the tong when the string weight is not sufficient to resist rotating, and it eliminates the need for a manual tong. The powered down slips allow the first joint of casing to be run with the FMS. The replaceable slip and insert carriers are set/raised by the operator using remote controls.

**Technical Specifications**
- **Weight FMS without slips and guides (lbs/kg)**: 3,300 / 1,497
- **Weight FMS with slips and guides (lbs/kg)**: 3,500 / 1,587
- **Casing size ranges (inches)**: 2 7/8 – 7 5/8
- **Allowable weight/temperature**: +75 / -20°F

### FMS375

**Description**
The FMS375 is mounted flush with the rig floor, allowing the casing connection height to be lowered 1 meter (39") and eliminating the need for scaffolding. This gives the rig crew more room to work by removing the spider body from the top of the rig floor. The unit is designed to fit standard 37" rotary tables and can be used in combination with the 350 ton 24" Varco type elevator spider. The slip power down force generated allows the FMS to take the torque reaction of the tong when the string weight is not sufficient to resist rotating, and it eliminates the need for a manual tong. The powered down slips allow the first joint of casing to be run with the FMS. The replaceable slip and insert carriers are set/raised by the operator using remote controls.

**Technical Specifications**
- **Weight FMS without slips and guides (lbs/kg)**: 3,500 / 1,587
- **Weight FMS with slips and guides (lbs/kg)**: 3,700 / 1,681
- **Casing size ranges (inches)**: 2 7/8 – 7 5/8
- **Allowable weight/temperature**: +75 / -20°F
### Varco-750 14" Specifications
- **Max. pressure slips down (psi/kPa):** 2,500 / 13,790
- **Recommended inlet pressure slips up (psi/kPa):** 500 - 750 / 3,447 - 5,171
- **Normal operating pressure (psi/kPa):** 2,000 / 13,790
- **Min. inlet pressure (psi/kPa):** 1,500 / 10,342
- **Max. operating pressure (psi/kPa):** 125 / 861
- **Weight without slip assembly (lbs/kg):** 5,000 / 2,268
- **Size range (inches):**
- **Load rating (ST on/Tonne):** 500 / 454

### Varco-750 24½" Specifications
- **Max. pressure slips down (psi/kPa):** 2,500 / 13,790
- **Recommended inlet pressure slips up (psi/kPa):** 500 - 750 / 3,447 - 5,171
- **Normal operating pressure (psi/kPa):** 85 / 585
- **Min. inlet pressure (psi/kPa):** 1,500 / 10,342
- **Max. operating pressure (psi/kPa):** 125 / 861
- **Weight without slip assembly (lbs/kg):** 7,500 / 3,402

### Varco-1000 24½" Specifications
- **Max. pressure slips down (psi/kPa):** N/A
- **Recommended inlet pressure slips up (psi/kPa):** N/A
- **Normal operating pressure (psi/kPa):** N/A
- **Min. inlet pressure (psi/kPa):** N/A
- **Max. operating pressure (psi/kPa):** N/A
- **Weight without slip assembly (lbs/kg):** N/A

### Description
The elevator/spider tool is designed for lifting and suspending tubular goods, from light tubing to heavy wall pipe and drill collars. The main body of these units can be dressed as a casing elevator or as a spider. The upper unit is dressed as an elevator, using a bottom guide and bell guide. The lower unit is dressed as a spider, using a top guide to aid in centering casing.

### Technical Specifications
- **Max. weight slips set w/ inserts (lbs/kg):**
- **Normal operating pressure (psi/kPa):**
- **Min. inlet pressure (psi/kPa):**
- **Max. operating pressure (psi/kPa):**
- **Weight without slip assembly (lbs/kg):**
- **Size range (inches):**
### PS-15

**Technical specifications**

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<td>Fits in Master Bushing</td>
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<tr>
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<td>Drill pipe</td>
</tr>
<tr>
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<tr>
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<td>Manually</td>
</tr>
<tr>
<td><strong>Load rating</strong></td>
<td>Up to 750 tons</td>
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<tr>
<td><strong>Memory device</strong></td>
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</tr>
<tr>
<td><strong>Top set back</strong></td>
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<td><strong>Thread spacing with slips</strong></td>
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<td><strong>Fluid type</strong></td>
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<tr>
<td><strong>Slip up signal confirmation</strong></td>
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<td><strong>Top cover</strong></td>
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<td>Manually</td>
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<td><strong>Load rating</strong></td>
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<tr>
<td><strong>Memory device</strong></td>
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### PSF

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<td><strong>Load rating</strong></td>
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</tr>
<tr>
<td><strong>Memory device</strong></td>
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</tr>
<tr>
<td><strong>Top set back</strong></td>
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</tr>
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<tr>
<td><strong>Required running time</strong></td>
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<tr>
<td><strong>Slip up signal confirmation</strong></td>
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<td><strong>Top cover</strong></td>
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<td>Rotary configuration</td>
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<td>Slip set back</td>
<td>Comply</td>
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<tr>
<td>Thread opening / slip</td>
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<tr>
<td>Height above rig floor</td>
<td>7”</td>
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<tr>
<td>Required pressure</td>
<td>2,300 - 2,500 psi (hydraulic)</td>
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<td>Slip-up signal confirmation</td>
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<tr>
<td>Top cover</td>
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<tr>
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### PS-30

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<tr>
<td>Thread opening / slip</td>
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<td>Required pressure</td>
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### SLT

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### PS-495

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<td>Control system</td>
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<tr>
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<tr>
<td>CE</td>
<td>No</td>
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*For reference only, please contact your local sales contact for more information.

rig@noy.com

*For reference only, please contact your local sales contact for more information.
### RST-375

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<td>Control station</td>
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<td>Latching</td>
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<td>CE</td>
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<td>ATEX</td>
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### RST-495-F

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<td>Fluid area (gpm)</td>
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**AR3200™**

The AR3200 ensures safe and effective make-up and break out of drill string connections. The compact size and light weight is suitable on applications with limited drill floor space. Track type travel allows for clearance around well center when tool is brought to parked position.

- **Gateless wrench**
- **Economy of rig floor space – no hanging tools**
- **Track mounted**
- **Spinning wrench may counter-rotate to seat threads, then safely spins-in**
- **Available with remote options: distancing personnel from the drill floor hazards**

**Technical specifications**

<table>
<thead>
<tr>
<th>Options</th>
<th>5’ or 8’ reach (manual/remote)</th>
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<td>Remote controlled from Puller cable</td>
<td>Yes</td>
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<tr>
<td>Mount</td>
<td>Track mounted</td>
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<td>Rotation angle</td>
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<td>Tubular connection OD range</td>
<td>4” to 9 ¾”</td>
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<td>Spin speed</td>
<td>80 RPM min. (nominal on 5” DP, 45 GPM, 170 LPM)</td>
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<td>Spin torque</td>
<td>1,466 lbs. (663 NM)</td>
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<tr>
<td>Assembly weight</td>
<td>17,000 lbs. (7,690 kg) (installed weight)</td>
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<td>Maximum make-up torque</td>
<td>165,000 lbs. (73,880 NM)</td>
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<td>Maximum break-out torque</td>
<td>120,000 lbs. (52,420 NM)</td>
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<td>Vertical adjustment</td>
<td>36” (914 mm)</td>
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<tr>
<td>Casing ready</td>
<td>Yes</td>
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**HYDRAULIC REQUIREMENTS**

- Minimum: 35 GPM @ 2,500 psi (132 LPM @ 172 bar)
- Maximum: 55 GPM @ 3,000 psi (208 LPM @ 207 bar)

**ST-100™**

The ST-100 sets the standard for performance and reliability. Incorporating modern technology with the field proven AR3200 Torque Wrench and the ST-120/ MPT200 Spin Wrench, our performance and quality is unmatched. The ST-100 ensures fast and reliable handling of all your drilling connections.

- **Compact with virtually any drill floor and comes with 5’ or 8’ reach option**
- **Transfer barrier allows a manual machine to deploy to same location every time while still fully retracting, taking full advantage of small footprint**
- **Soft Clam feature extends the life of the tool joint and make up in a single bit**
- **Equipped with slinging capabilities to operate at well center and mousehole**
- **Available with remote options: distancing personnel from drill floor hazards**

**Technical specifications**

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<th>Options</th>
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<td>Maximum break-out torque</td>
<td>120,000 lbs. (52,420 NM)</td>
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<td>Vertical adjustment</td>
<td>36” (914 mm)</td>
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<tr>
<td>Casing ready</td>
<td>Yes</td>
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**HYDRAULIC REQUIREMENTS**

- Minimum: 45 GPM @ 2,000 psi (170 LPM @ 135 bar)
- Maximum: 45 GPM @ 2,500 psi (170 LPM @ 172 bar)

**ST-120™**

The ST-120 combines compact design with maximized reach and takes it to an unprecedented level. Completely retractable, the tool extends just over 5 feet from the pivot, minimizing its footprint and leaving more room on the rig floor.

- **Travels a full 12 feet, allowing versatile layout configurations**
- **Full 60 degrees of rotation and 3 point bite for better grip, quicker make-up**
- **Easy replacement with compact size**
- **Maximum vertical height of 120 inches**
- **Fully automated controls from either the driller’s control console or remote available**

**Technical specifications**

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<td>Rotation angle</td>
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<td>Spin speed</td>
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<td>Casing ready</td>
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**HYDRAULIC REQUIREMENTS**

- Minimum: 45 GPM @ 2,000 psi (170 LPM @ 135 bar)
- Maximum: 45 GPM @ 2,500 psi (170 LPM @ 172 bar)
### Technical specifications

**ST-160™**

- **Options**
  - Mud bucket, doper, bit breaker, casing module, rotation table
- **Remote control from dicer cable**
  - Yes
- **Connection hoses**
  - Complete including loop bracket
- **Mount**
  - Track mounted
- **Rotation angle**
  - 45° (module plate optional)
- **Tubular connection OD range**
  - 3⅞” to 10” (2⅞” kit optional)
- **Spin speed**
  - 0-100 RPM (nominal on 5” DP)
- **Rotation speed**
  - 20 RPM max. (nominal on 5” DP)
- **Maximum break-out torque**
  - 2943 lb-ft (395 Nm)
- **Maximum make-up torque**
  - 2308 lb-ft (311 Nm)
- **Horiz. travel**
  - 4000 (2050) (extreme position)
- **Height**
  - 2800 (1810) (parked height):
    - Min / Max: 2475 / 4712
- **Casem-ready**
  - Yes

**MPT-270™**

- **Options**
  - Mud bucket, doper, bit breaker, casing module, rotation table
- **Remote control from dicer cable**
  - Yes
- **Connection hoses**
  - Complete including loop bracket
- **Mount**
  - Track mounted
- **Rotation angle**
  - 60° (limitation only by service loop hoses)
- **Tubular connection OD range**
  - 3⅞” to 10” (2⅞” kit optional)
- **Spin speed**
  - 80 RPM min. (nominal on 5” DP)
- **Rotation angle**
  - 90° (limited only by service loop hoses)
- **Spin torque**
  - 750 ft-lb (1030 Nm) min.
- **Maximum make-up torque**
  - 2943 lb-ft (395 Nm)
- **Maximum break-out torque**
  - 2943 lb-ft (395 Nm)
- **Horiz. travel**
  - 3500 (2100) (full extension)
- **Height**
  - 3520 (2300) (parked height):
    - Min / Max: 3300 / 5500
- **Casem-ready**
  - Yes

**ARN-270™**

- **Options**
  - Mud bucket, doper, bit breaker, casing module, rotation table
- **Remote control from dicer cable**
  - Yes
- **Connection hoses**
  - Complete including loop bracket
- **Mount**
  - Side mounted
- **Rotation angle**
  - N/A (rotation plate optional)
- **Tubular connection OD range**
  - 3⅞” to 10” (2⅞” kit optional)
- **Spin speed**
  - 0-100 RPM (nominal on 5” DP)
- **Rotation speed**
  - 20 RPM max. (nominal on 5” DP)
- **Maximum break-out torque**
  - 2943 lb-ft (395 Nm)
- **Maximum make-up torque**
  - 2943 lb-ft (395 Nm)
- **Horiz. travel**
  - 3500 (2100) (full extension)
- **Height**
  - 3520 (2300) (parked height):
    - Min / Max: 3300 / 5500
- **Casem-ready**
  - Yes

---

The ST-160 fully extended travels 13.5 ft, allowing versatile layout configurations. With its trackless design, the new ST-160 continues to improve drill floor safety. The addition of a quick disconnect Drill Pipe Module to a universal casing hanger provides the customer and casing crews a safe alternative for operating casing tongs.

- More torque for connections requiring a higher than normal break-out torque
- Full 60 degrees of rotation and 3 point bite which means better grip, quicker make-up
- Height adjustable spinning wrench
- Equipped to handle today’s high performance drill pipe connections
- Fully automated controls from either driller’s control console or wireless remote control

The HydraTong multi-purpose tong concept ensures safe and effective make-up of drill pipe, collars, and casing. The modular design allows tool frames to be interchanged to run drill pipe or various casing sizes. It includes the latest Torque Wrench design, which allows 60 degrees rotation ensuring efficiency during make-up and break-out of connections.

- High torque self-aligning spinning wrench
- High accuracy control possibilities
- Robust and maintenance optimized torque wrench
- Dual elevators for spinner and torque wrench
- Sensors for anti-collision system and MMC
- Tool joint finder and stabbing guide

---

Iron Roughnecks - Sheet 2 of 2

NoY Rig Technologies
The casing module consists of up to ten, backup top and a stabbing guide. It is easily and quickly hooked on to the roughneck by use of hydraulic and electric quick connectors. Being fully automated, integrated into NOV control systems, zone management and safely systems including NOV Torque Turn casing logging system, it ensures efficient, safe and reliable make-up and break-out performances.

**Features**
- High Torque
- High accuracy
- Wide range
- High resolution electric torque cell
- Gear on the fly (high speed/low speed)
- High resolution electric torque cell
- Roughneck models compatibility:
  - Stabbing guide
  - Sensors for ACS, MMC and PIM
- Easy to operate
- Support: NOV Training courses

**Torque Turn**

**The Torque Turn Logging System** is a system designed to monitor and log data from casing pipe spin-in and make-up operations and to perform data analysis according to given criteria for an acceptable connection.

**Features**
- Casing pipe make-up and spin-in operations monitoring
- Real-time connection trend display
- Shoulder torque point identification
- Casing joint assembly evaluation
- Full historical data retrieval and analysis display
- Casing job execution reports
- Easy configuration with interactive operator interface
- High speed data logger (10Hz)

**Operation modes**
- Monitoring
- Operation
- Historical

**Benefits**
- Enables rig crew to perform all pipe handling
- Assists casing operator decisions
- Provides reporting services, ref. to IS05801:2008
- Decreases drilling contractor’s costs
- Reduces casing connection failures
- Contributes to high-integrity casing string
- Easy to operate

**Other Specifications**
- System compatible with NOV hydraulizing systems
- No additional sensors needed
- Seemless integration with existing NOV Hydraulizing systems
- Can be operated from NOV control and monitoring screens

**Report Comments:**
- For reference only, please contact your local sales contact for more information.
To streamline your casing operations and better protect your crew’s safety, the Casing Running Tool (CRT) combines the casing handling functionalities of the top drive, Flush Mounted Spider (FMS) or PS21/PS30, fill-up and circulation tool and hydraulic single joint extractor. Connected directly to the top drive main shaft, the CRT simultaneously hoists and lowers casing, and additionally, makes the casing connection. It also enables you to rotate, reciprocate and circulate the casing string. Combining all these functions into one tool translates to less time spent on casing operations and more time spent drilling towards your pay load, all while still keeping your crew safe.

**Benefits:**

- Eliminates stabbing-board operations - less manual handling in the V-door and fewer safety hazards.
- Reduces size of needed casing crew - minimized stand by costs associated with weather or problematic well conditions.
- Increases possibility of setting casing at target depth through CRT’s ability to push, circulate and rotate the casing simultaneously.
- Eliminates need for links with a single load-path design.
- Balances out the weight of the CRT through cushioned weight compensation.
- Enables fast change out of seal and guide elements when mixed strings are run.
- Decreased downtime due to FAC tool issues.
- Allows CRT to pick up a new joint from the V-door.
- The CRT has an air operated compensator to enable soft stabbing, allowing for thread compensation and minimizes the risk of thread damage.
- Diller controls and determines the running/tripping speed, spin-in and make-up torques.
- A pipe sensor detects the casing coupling in order for the slips to set automatically at correct position, ensuring casing connection integrity.

### CRT350

<table>
<thead>
<tr>
<th>Description</th>
<th>CRT350</th>
</tr>
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<tbody>
<tr>
<td>API 8C Hoist Rating (s Ton)</td>
<td>350</td>
</tr>
<tr>
<td>Casing Size</td>
<td>4½” to 9⅞”</td>
</tr>
<tr>
<td>Fill-Up and Circulation</td>
<td>4½” to 9⅞” circulation and fill-up, spool, circulate, and recovery over the full range</td>
</tr>
<tr>
<td>Maximum Mud Circulation Pressure [psi/kPa]</td>
<td>up to 5,000 / 34,474 (size dep.)</td>
</tr>
<tr>
<td>Rotational speed [rpm]</td>
<td>0-20 intermittent</td>
</tr>
<tr>
<td>Weight, Fully Dress</td>
<td>10,500 / 4,762</td>
</tr>
<tr>
<td>Maximum Push Down Force [lbs/kg]</td>
<td>20,000 / 9,072 (static)</td>
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<tr>
<td>Ambient Temperature Range [°C]</td>
<td>-20° to 40°</td>
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<tr>
<td>Diameter of CRT Body</td>
<td>32”</td>
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<tr>
<td>Width of CRT Assembly</td>
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</table>

### CRT500

<table>
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<tbody>
<tr>
<td>API 8C Hoist Rating (s Ton)</td>
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<tr>
<td>Casing Size</td>
<td>4½” to 14”</td>
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<tr>
<td>Fill-Up and Circulation</td>
<td>4½” to 14” circulation and fill-up, spool, circulate, and recovery over the full range</td>
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<tr>
<td>Maximum Mud Circulation Pressure [psi/kPa]</td>
<td>up to 5,000 / 34,474 (size dep.)</td>
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<tr>
<td>Rotational speed [rpm]</td>
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<td>Weight, Fully Dress</td>
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<td>Maximum Push Down Force [lbs/kg]</td>
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<tr>
<td>Ambient Temperature Range [°C]</td>
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<td>Diameter of CRT Body</td>
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<tr>
<td>Width of CRT Assembly</td>
<td>53.5”</td>
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*For reference only, please contact your local sales contact for more information.*
The Hydraulic Power Unit (HPU) is a skid mounted free-standing unit designed to feed high pressure hydraulic oil, with appropriate cleanliness, to both drilling equipment ring line system (open loop type) and Active Heave Compensator (AHC). The HPU skid is a self-bearing steel frame with lifting brackets. This design eases deck interface, installation and handling. The unit is designed for locations in both safe zones or hazardous areas and may be operated locally or remotely from driller's cabin.

### O-series Hydraulic Power Units

#### Technical specifications

**HPU-O-2**

- **Technical specifications**
  - **DENIS/HYA**
    - Area classification: 5474 A46A (option for End users 2 – 867.4)
  - **Consumers**
    - 220V 50Hz 2.5 KW, 3 phase 4 wire
  - **Oil Temperature**
    - 40 – 100 degrees Celsius
  - **Weight, dry (kg)**
    - 1,200 kg
  - **Equipment size (L x W x H) (mm)**
    - 1,800 x 2,080 x 2,220
  - **Normal Oil level (l)**
    - 1,000 – 1,500
  - **Normal operating pressure (bar)**
    - 207
  - **Max. Oil flow (l/min)**
    - 2 x 300
  - **Max. Pressure (bar)**
    - 10
  - **Max. Heat transfer at max Oil temperature (kW)**
    - 2 x 100
  - **Cooling medium/Type**
    - Air
  - **Frequency (Hz)**
    - 50
  - **Voltage (V)**
    - 400 - 690
  - **Electric power - Motor heating (kW)**
    - 204.3 + 18 (2 x 99 + 6.3) 230 V (100 W)
  - **Max. inlet temperature**
    - 28 degrees Celsius
  - **Cooling medium/Type**
    - Sea water
  - **Required cooling medium flow rate (l/min)**
    - 100

#### HPU-O-3

- **Technical specifications**
  - **DENIS/HYA**
    - Area classification: 5474 A46A (option for End users 2 – 867.4)
  - **Consumers**
    - 220V 50Hz 2.5 KW, 3 phase 4 wire
  - **Oil Temperature**
    - 40 – 100 degrees Celsius
  - **Weight, dry (kg)**
    - 1,200 kg
  - **Equipment size (L x W x H) (mm)**
    - 1,800 x 2,080 x 2,220
  - **Normal Oil level (l)**
    - 1,000 – 1,500
  - **Normal operating pressure (bar)**
    - 207
  - **Max. Oil flow (l/min)**
    - 2 x 300
  - **Max. Pressure (bar)**
    - 10
  - **Max. Heat transfer at max Oil temperature (kW)**
    - 2 x 100
  - **Cooling medium/Type**
    - Air
  - **Frequency (Hz)**
    - 50
  - **Voltage (V)**
    - 400 - 690
  - **Electric power - Motor heating (kW)**
    - 204.3 + 18 (2 x 99 + 6.3) 230 V (100 W)
  - **Max. inlet temperature**
    - 28 degrees Celsius
  - **Cooling medium/Type**
    - Sea water
  - **Required cooling medium flow rate (l/min)**
    - 100

#### HPU-O-4

- **Technical specifications**
  - **DENIS/HYA**
    - Area classification: 5474 A46A (option for End users 2 – 867.4)
  - **Consumers**
    - 220V 50Hz 2.5 KW, 3 phase 4 wire
  - **Oil Temperature**
    - 40 – 100 degrees Celsius
  - **Weight, dry (kg)**
    - 1,200 kg
  - **Equipment size (L x W x H) (mm)**
    - 1,800 x 2,080 x 2,220
  - **Normal Oil level (l)**
    - 1,000 – 1,500
  - **Normal operating pressure (bar)**
    - 207
  - **Max. Oil flow (l/min)**
    - 2 x 300
  - **Max. Pressure (bar)**
    - 10
  - **Max. Heat transfer at max Oil temperature (kW)**
    - 2 x 100
  - **Cooling medium/Type**
    - Air
  - **Frequency (Hz)**
    - 50
  - **Voltage (V)**
    - 400 - 690
  - **Electric power - Motor heating (kW)**
    - 204.3 + 18 (2 x 99 + 6.3) 230 V (100 W)
  - **Max. inlet temperature**
    - 28 degrees Celsius
  - **Cooling medium/Type**
    - Sea water
  - **Required cooling medium flow rate (l/min)**
    - 100

#### HPU-O-5A

- **Technical specifications**
  - **DENIS/HYA**
    - Area classification: 5474 A46A (option for End users 2 – 867.4)
  - **Consumers**
    - 220V 50Hz 2.5 KW, 3 phase 4 wire
  - **Oil Temperature**
    - 40 – 100 degrees Celsius
  - **Weight, dry (kg)**
    - 1,200 kg
  - **Equipment size (L x W x H) (mm)**
    - 1,800 x 2,080 x 2,220
  - **Normal Oil level (l)**
    - 1,000 – 1,500
  - **Normal operating pressure (bar)**
    - 207
  - **Max. Oil flow (l/min)**
    - 2 x 300
  - **Max. Pressure (bar)**
    - 10
  - **Max. Heat transfer at max Oil temperature (kW)**
    - 2 x 100
  - **Cooling medium/Type**
    - Air
  - **Frequency (Hz)**
    - 50
  - **Voltage (V)**
    - 400 - 690
  - **Electric power - Motor heating (kW)**
    - 204.3 + 18 (2 x 99 + 6.3) 230 V (100 W)
  - **Max. inlet temperature**
    - 28 degrees Celsius
  - **Cooling medium/Type**
    - Sea water
  - **Required cooling medium flow rate (l/min)**
    - 100
HE-series Hydraulic Power Units

The Hydraulic Power Unit (HPU) is a skid mounted free-standing unit designed to feed high pressure hydraulic oil, with appropriate cleanliness, to the drilling equipment ring line system (open loop type). The HPU skid is a self-bearing steel frame with lifting brackets. This design eases deck interface, installation and handling. The unit is designed for locations in both safe zones or hazardous areas and may be operated locally or remotely from driller’s cabin.

HE-150VHP-150G-AC

- **Technical specifications**
  - **DESIGN DATA**
    - Area classification: Explosion proof UL Class 1 Div.
    - Cleanliness: ISO 17/15/12 (NAS 1638 Class 6)
    - Ambient rating: -20 to 55 degrees Celsius
    - Weight, dry [kg]: 5,900 approx
  - **UTILITY CONSUMPTION**
    - Usable oil volume [liter]: 1,890 (500 gal)
    - Max. hydraulic flow rate [l/min]: 795 (3 x 265) (210 gpm)
    - Normal operating pressure [bar]: 207 (3,000 psi)
    - Voltage [V]: 460
    - Frequency [Hz]: 60
  - **COOLER**
    - Cooling medium/type: Air
    - Cooling oil flow [l/min]: 76 (20 gpm)
    - Max heat transfer at max oil temperature [kW]: 25

HE100-2-150VHP-300G-AC

- **Technical specifications**
  - **DESIGN DATA**
    - Area classification: Explosion proof UL Class 1 Div.
    - Cleanliness: ISO 17/15/12 (NAS 1638 Class 6)
    - Ambient rating: -20 to 55 degrees Celsius
    - Weight, dry [kg]: 3,630 approx
  - **UTILITY CONSUMPTION**
    - Usable oil volume [liter]: 1,135 (300 gal)
    - Max. hydraulic flow rate [l/min]: 530 (2 x 265) (140 gpm)
    - Normal operating pressure [bar]: 207 (3,000 psi)
    - Voltage [V]: 460
    - Frequency [Hz]: 60
  - **COOLER**
    - Cooling medium/type: Air
    - Cooling oil flow [l/min]: 57 (15 gpm)
    - Max heat transfer at max oil temperature [kW]: 25

HE100-4-150VHP-600G-AC

- **Technical specifications**
  - **DESIGN DATA**
    - Area classification: Explosion proof UL Class 1 Div.
    - Cleanliness: ISO 17/15/12 (NAS 1638 Class 6)
    - Ambient rating: -20 to 55 degrees Celsius
    - Weight, dry [kg]: 2,200 approx
  - **UTILITY CONSUMPTION**
    - Usable oil volume [liter]: 570 (150 gal)
    - Max. hydraulic flow rate [l/min]: 265 (70 gpm)
    - Normal operating pressure [bar]: 207 (3,000 psi)
    - Voltage [V]: 460
    - Frequency [Hz]: 60
  - **COOLER**
    - Cooling medium/type: Air
    - Cooling oil flow [l/min]: 57 (15 gpm)
    - Max heat transfer at max oil temperature [kW]: 25

HE100-3-150VHP-500G-AC

- **Technical specifications**
  - **DESIGN DATA**
    - Area classification: Explosion proof UL Class 1 Div.
    - Cleanliness: ISO 17/15/12 (NAS 1638 Class 6)
    - Ambient rating: -20 to 55 degrees Celsius
    - Weight, dry [kg]: 8,620 approx
  - **UTILITY CONSUMPTION**
    - Usable oil volume [liter]: 2,270 (600 gal)
    - Max. hydraulic flow rate [l/min]: 1,060 (4 x 265) (280 gpm)
    - Normal operating pressure [bar]: 207 (3,000 psi)
    - Voltage [V]: 460
    - Frequency [Hz]: 60
  - **COOLER**
    - Cooling medium/type: Air
    - Cooling oil flow [l/min]: 76 (20 gpm)
    - Max heat transfer at max oil temperature [kW]: 25

For reference only, please contact your local sales contact for more information.
Hydraracker III™

The Hydraracker III is a manual, semi-automatic and automatic three-arm system. Two trolleys carry the column. The lower trolley runs on rail on main deck, the upper trolley runs on beam attached to the derrick. A Hoisting Winch, sited on the upper part of the column, performs the hoisting by lifting the Main Arm. The Main is equipped with a clamping Grip Head for lifting the stand during building / break down. The Tail Arm is fixed in the lower section of the column and is equipped with a Guide Head for horizontal guiding. All components are designed for offshore duty in a highly saline atmosphere with high humidity.

Hydraracker IV ER™

The Hydraracker IV ER is a manual, semi-automatic and automatic three-arm system. Two trolleys carry the column. The lower trolley runs on rail on drillfloor, the Upper Trolley runs in beam attached to the derrick. A Hoisting Winch, sited on the upper part of the column, performs the hoisting by lifting the Main Arm. The Main Arm is equipped with a clamping Gripper Head for lifting the stand and a Guide Claw to support the stand when head changing grip at the stand building / break down. The Tail Arm is fixed in the lower section of the column and the Upper Guide Arm is fixed in the upper section of the column. All components are designed for offshore duty in a highly saline atmosphere with high humidity.

PRS-6™

The PRS-6 consists of a vertical column assembly that traverses the rig floor between well center and pipe setback area to support tripping operations. The column rides on a lower drive assembly, which guides and drives the column along a drive track mounted on the rig floor. The upper end of the column is guided on a similar track, which spans the rig and is pinned at both ends to customer supplied derrick mounting structures. The lower drive assembly turns a shaft in the center of the column that has gears on each end to engage into their respective drive track. Drilling time between the lower and upper portion of the column is achieved through this drive shaft, keeping the column vertically aligned. The PRS-6 uses two arm assembly for guiding tubular stand and singles. Pipe handling operations between well center and the setback area, and within the setback area are performed by extending or retracting the arms, hoisting or lowering the upper arm, rotating the column and driving the column laterally across the drill floor.

PRS-4™

The PRS-4 consists of a vertical column assembly that traverses the rig floor between well center and pipe setback area to support tripping operations. The column rides on a lower drive assembly, which guides and drives the column along a drive track mounted on the rig floor. The upper end of the column is guided on a similar track, which spans the rig and is pinned at both ends to customer supplied derrick mounting structures. The lower drive assembly turns a shaft in the center of the column that has gears on each end to engage into their respective drive track. Drilling time between the lower and upper portion of the column is achieved through this drive shaft, keeping the column vertically aligned. The PRS-4 uses two arm assembly for guiding tubular stand and singles. Pipe handling operations between well center and the setback area, and within the setback area are performed by extending or retracting the arms, hoisting or lowering the upper arm, rotating the column and driving the column laterally across the drill floor.

**Technical Specifications**

- **Utility Requirements**
  - Prime Mover: Electric
  - Hoisting Mechanism: Single Hydraulic Winch
  - Thrust Comp: Y
  - Riser Handling: Y
  - Stand Building: Y

- **Dimensions**
  - Arm Ext: 204-INCH (520 CM)
  - Hoist Capacity: 22000 LBS (10,000 KG)
  - Vertical Travel: 180° (350º)
  - Cylinder Rotation: 180 Degrees

- **Tubular Capacities**
  - Pipe Size: 2 7/8" – 14"
  - Utility Requirements: 3 Electric

- **Technical Data**
  - SWL: 139,902 LBS (63,459 KG)
  - Max. Column Height: 139'
  - Weight: 137,342 LBS (62,297 KG)

- **Technical Data**
  - SWL: 118,002 LBS (53,512 KG)
  - Max. Column Height: 98'
  - Weight: 116,562 LBS (52,875 KG)

- **Technical Data**
  - SWL: 87,001 LBS (39,438 KG)
  - Max. Column Height: 145'
  - Weight: 85,521 LBS (38,795 KG)

*For reference only, please contact your local sales contact for more information.

rig@nov.com
### PRS-8

The PRS-8 is a pipe racking system that utilizes modular and robust PRS design standards to ensure uniformity and optimum flexibility. A modern AC control system delivers consistent reliability with high performance, enabling operators to maintain safe, high-speed operations across its functional range. The PRS-8 offers both automated tripping and a hand stroke for offline stand building. Compact design, XY Racking Configuration. A traditional X-Y fully latched fingerboard layout is used with the PRS-8. This compact design maximizes available drill pipe storage area while being suitable for retrofit into many of today’s MODU derricks.

- Engineered for durability and reliability
- Ease of installation, commissioning, and operation
- Suitable for dynamic applications

### PRS-8 Specifications

<table>
<thead>
<tr>
<th>TONS</th>
<th>MTERS</th>
<th>INCHES</th>
</tr>
</thead>
<tbody>
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</tr>
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<td>14.4</td>
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<td>393.7</td>
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### PRS-8 SWL Maximum Reach

<table>
<thead>
<tr>
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### PRS-8 LR SWL Maximum Reach

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<td>9.98</td>
<td>393.7</td>
</tr>
</tbody>
</table>

### PRS-8 TUBULAR CAPACITIES

- **Pipe Size**: Triple Range II
- **Diameter (in)**: 2 7/8 in. to 9 3/4 in.

### SWL Maximum Reach Specifications

<table>
<thead>
<tr>
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<tr>
<td>14.4</td>
<td>9.98</td>
<td>393.7</td>
</tr>
</tbody>
</table>

### SWL Specifications

- **Weight**: 49,796 lbs (22,569 kg)
- **Max. Column Height (vertical)**: 83' (25.3 m)
- **Max. Reach Out (m)**: 10' (3.05 m)
- **Max. Vertical Travel (m)**: 73'
- **Max. Vertical Arm Rotation**: ± 1125 Degrees
- **Hoisting Mechanism**: Dual Electric Motor
- **Thread Comp N**: Riser Handling Y, Stand Building Y
- **Number of Motors**: 4 Electric
- **Torque Arm**: Y
- **Heating Mechanism**: Dual Electric Motor
- **Column Trolley**: Mechanical/Manual Shift

### Star Racker

The Star Racker is designed to provide a remote operated machinery for moving tubular stands between well center and setback storage area. The machine is horizontally supported to the derrick at 22' of the derrick and at the fingerboard level. The Star Racker has also a positioning arm for Iron Roughneck.

The Star Racker consists of the following main parts:

- Column with supports and rotation system
- Lower racking arm with hoist
- Upper racking arm
- Iron Roughneck positioning arm
- Fingerboard for DP and casing finger
- Electrical control cubicles inclusive PLC and AC drive for remote control
- Casing guiding claw
- Single joint tool with soft stapping - casing

### PRM 3i

This automated pipe handling machine system handles up to 98 ft stands of pipe or drill collars during drilling or tripping. The PRM-3i system eliminated the need for rig floor hands and a derrickman to manually handle pipe. One attendant can manage normal pipe handling procedures using the supplied control panels.

- Engineered for durability and reliability
- Ease of installation, commissioning, and operation

### PRM 3i Specifications

<table>
<thead>
<tr>
<th>沖載</th>
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### SWL Maximum Reach Specifications

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<tr>
<td>14.4</td>
<td>9.98</td>
<td>393.7</td>
</tr>
</tbody>
</table>

### SWL Specifications

- **Weight**: 49,796 lbs (22,569 kg)
- **Max. Column Height (vertical)**: 83' (25.3 m)
- **Max. Reach Out (m)**: 10' (3.05 m)
- **Max. Vertical Travel (m)**: 73'
- **Max. Vertical Arm Rotation**: ± 180 Degrees
- **Hoisting Mechanism**: Dual Electric Motor
- **Thread Comp N**: Riser Handling Y, Stand Building Y
- **Number of Motors**: 4 Electric
- **Torque Arm**: Y
- **Heating Mechanism**: Dual Electric Motor
- **Column Trolley**: Mechanical/Manual Shift
- **Column Trolley**: Mechanical/Manual Shift

### TUBULAR CAPACITIES

- **Pipe Size**: Triple Range II
- **Diameter (in)**: 2 7/8 in. to 9 3/4 in.
The Horizontal To Vertical machine (HTV) is a remotely controlled machine designed to bring tubulars from a horizontal Catwalk Machine to a vertical position and position the tubulars in the mousehole for building stands. The HTV guide the upper part of the complete stand for handover to the bridge racker. It can also reverse the operation and bring tubulars from a vertical position to the Catwalk Machine.

<table>
<thead>
<tr>
<th>Technical Specifications</th>
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<tbody>
<tr>
<td>HTV DESIGN DATA</td>
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<tr>
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<td>Design pressure</td>
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VDM

The V-Door Machine (VDM) is a remotely controlled machine primarily designed to trip drill pipe from pipe chute to well center. It can also be used for bringing tubulars from a horizontal Catwalk Machine to a vertical (inside the derrick) position, and position the tubulars in the mousehole for building stands. The machine is remotely operated from the drillers (inside the derrick) position, and position the tubulars in the mousehole by a hydraulic cylinder. The arm can accommodate both an elevator or gripper head. The elevator is primarily used during tripping of drill pipe, but can also be used during stand building of drill pipe up to 6 ⅝". The gripper heads are used during stand building and casing handling up to 22". The machine travels vertically inside the V-door and is hoisted by an electrical winch with a dual drum. It is guided by two guide rails mounted on the derrick wall.

<table>
<thead>
<tr>
<th>Technical Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDM DESIGN DATA</td>
</tr>
<tr>
<td>Service</td>
</tr>
<tr>
<td>Level classification</td>
</tr>
<tr>
<td>Design standards</td>
</tr>
<tr>
<td>Rules and regulations</td>
</tr>
<tr>
<td>Safe Working Load (kN)</td>
</tr>
<tr>
<td>Weight, dry</td>
</tr>
</tbody>
</table>

PLS-5

The Pickup Laydown System with 5 metric ton capacity (PLS-5) is a pick up and lay down arm for transferring tubulars from a horizontal position on a conveyor to a vertical position either at the well center or at the mousehole and return.

<table>
<thead>
<tr>
<th>Technical Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLS-5 DESIGN DATA</td>
</tr>
<tr>
<td>Service</td>
</tr>
<tr>
<td>Boom extension reach</td>
</tr>
<tr>
<td>Rotor extension reach</td>
</tr>
<tr>
<td>Tubular size</td>
</tr>
<tr>
<td>Electric power</td>
</tr>
<tr>
<td>Hydroelectric power</td>
</tr>
</tbody>
</table>

PLS-7

The PLS-7 is a component of a stand building system that is used to deliver single range II or range III tubulars from a horizontal position on a conveyor to a vertical position either at the well center or at the mousehole.

<table>
<thead>
<tr>
<th>Technical Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLS-7 DESIGN DATA</td>
</tr>
<tr>
<td>Service</td>
</tr>
<tr>
<td>Boom extension reach</td>
</tr>
<tr>
<td>Rotor extension reach</td>
</tr>
<tr>
<td>Tubular size</td>
</tr>
<tr>
<td>Electric power</td>
</tr>
<tr>
<td>Hydroelectric power</td>
</tr>
</tbody>
</table>

For reference only, please contact your local sales contact for more information.

rig@nov.com nov.com

*(Please contact your local sales contact for more information.*)
Casing Stabbing Arm
The Casing Stabbing Arm (CSA) is mounted on the derrick structure at the required height above the drill floor. The purpose of the CSA is to bring tubular into position in the well center. The CSA is made of square steel profiles. An external hydraulic cylinder mounted underneath the telescopic boxes provides telescoping. There is a claw at the front tip of each telescope arm. The telescope arm can be tilted to the upright position. The CSA is operated from a control stand located nearby the CSA.

Standbuilding Guide Arm - Hydraracker
The Standbuilding guide arm - Hydraracker (SB-GA-HR) is mounted on the derrick structure approximately 9.3 meters above the drill floor. The purpose of the SB-GA-HR is to stabilize pipe stands during stand building when the Hydraracker changes gripper position. The SB-GA-HR can also be designed for stabbing operations. It has a telescopic arm with guide claws mounted at the tip. The SB-GA-HR is normally operated from the driller's cabin, but for maintenance and emergency operations it should be operated from the hydraulic control panel. It is parked in a vertical position to avoid collisions with other drilling equipment.

Standbuilding 3-Guide Arm System
The standbuilding 3-guide arm system consists of a lower and upper telescopic guide arm and guide frame. The guide frame is mounted in the derrick structure at the required height above the drill floor. The purpose of the lower telescopic guide arm is to guide the upper part of a double pipe during make-up. The purpose of the upper telescopic arm is to guide the upper part of a triple stand during make-up. The guide frame's purpose is to guide the wire when handling stands. The standbuilding 3-guide arm system is operated from the control stand located on the drill floor.

Technical specifications
<table>
<thead>
<tr>
<th>Machine</th>
<th>Vertical Stabbing and Guiding Tubular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design classification</td>
<td>FEM “rules for the design of hoisting appliances”</td>
</tr>
<tr>
<td>Design standards</td>
<td>EEM “rules for the design of hoisting appliances”</td>
</tr>
<tr>
<td>Temperatures</td>
<td>°C 20-60</td>
</tr>
<tr>
<td>Weight, dry</td>
<td>kg 470</td>
</tr>
<tr>
<td>Weight, operation</td>
<td>kg 260</td>
</tr>
</tbody>
</table>

PERFORMANCE DATA
Guide frame tip reach mm (in.) 2,589 - 3,389
Weight lower arm kg 470
Weight upper arm kg 470
Weight control valve unit, operation kg 130
Weight control valve unit, dry kg 130
Weight guide frame kg 260

Utility Consumption
Hydraulic flow rate l/min 25
Hydraulic oil pressure, max bar 207

PERFORMANCE DATA
Claw range mm (in.) 90 - 140 (3-5.5"
Weight lower arm kg 470
Weight upper arm kg 470
Weight control valve unit, operation kg 130
Weight guide frame kg 260

Technical specifications
<table>
<thead>
<tr>
<th>Machine</th>
<th>Standbuilding Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design classification</td>
<td>FEM “rules for the design of hoisting appliances”</td>
</tr>
<tr>
<td>Design standards</td>
<td>EEM “rules for the design of hoisting appliances”</td>
</tr>
<tr>
<td>Temperatures</td>
<td>°C 20-60</td>
</tr>
<tr>
<td>Weight, dry</td>
<td>kg 780</td>
</tr>
<tr>
<td>Weight, operation</td>
<td>kg 750</td>
</tr>
<tr>
<td>Design temperature</td>
<td>°C -20 to +45</td>
</tr>
</tbody>
</table>

DESIGN DATA
Service Vertical stabbing and guiding tubular
Design classification FEM “rules for the design of hoisting appliances”
Design standards EEM “rules for the design of hoisting appliances”
Temperatures °C 20-60
Weight, dry kg 470
Weight, operation kg 260

Utility Consumption
Hydraulic flow rate l/min 25
Hydraulic oil pressure, max bar 140

DESIGN DATA
Service Stabbing and guiding operations during pipe make-up
Design classification FEM “rules for the design of hoisting appliances”
Design standards EEM “rules for the design of hoisting appliances”
Temperatures °C 20-60
Weight, dry kg 470
Weight, operation kg 260

Utility Consumption
Hydraulic oil pressure, max bar 207

DESIGN DATA
Service Handling and stabbing operations during pipe make-up
Design classification FEM “rules for the design of hoisting appliances”
Design standards EEM “rules for the design of hoisting appliances”
Temperatures °C 20-60
Weight, dry kg 750
Weight, operation kg 780

Utility Consumption
Hydraulic oil pressure, max bar 207

*For reference only, please contact your local sales contact for more information.
Features and Benefits

Our service and access baskets are designed to be compatible with a variety of applications by utilizing several different mounting, travel, boom, and basket slow options. We provide lift for purpose solutions to make maintenance on your assets safer and more convenient:

- Vertical rail system designed to provide access to the drillfloor, top drive, and column racker upper bridge/trilley
- Horizontal rail system designed for end-to-end access of the moonpool area
- Knuckleboom model uses compound motion to achieve a smaller footprint and is suited for navigating tighter spaces on the drillfloor
- Kingpost pedestal installation on the x-mas tree skid provides access to the BDP while in the moonpool or the x-mas tree
- Baskets can be mounted to your existing substructure or derrick using stationary adapter plates
- Basket slow options provide added versatility
- All baskets are rated for Zone 1 compliance
- ABS or DNV notation available for each model

Stationary Adapter Plate

### Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>SAB-90</th>
<th>SAB-180</th>
<th>SAB-360</th>
<th>SAB-HT</th>
<th>SAB-VT</th>
<th>SAB-VT-KB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Load (kg)</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>SWL, Basket</td>
<td>300 kg</td>
<td>300 kg</td>
<td>300 kg</td>
<td>300 kg</td>
<td>300 kg</td>
<td>300 kg</td>
</tr>
<tr>
<td>Hydraulic Flow Rate (Max)</td>
<td>75 l/min</td>
<td>75 l/min</td>
<td>75 l/min</td>
<td>75 l/min</td>
<td>145 l/min</td>
<td>200 l/min</td>
</tr>
<tr>
<td>Hydraulic Operating Pressure (Min)</td>
<td>180 bar</td>
<td>180 bar</td>
<td>180 bar</td>
<td>180 bar</td>
<td>180 bar</td>
<td>180 bar</td>
</tr>
<tr>
<td>Hydraulic Operating Pressure (Max)</td>
<td>207 bar</td>
<td>207 bar</td>
<td>207 bar</td>
<td>207 bar</td>
<td>207 bar</td>
<td>207 bar</td>
</tr>
<tr>
<td>Equipment Shipment Size (L x W x H) (SAB placed in transport frame)</td>
<td>5900 mm x 1500 mm x 2000 mm</td>
<td>7100 mm x 1500 mm x 2000 mm</td>
<td>7100 mm x 1500 mm x 1800 mm</td>
<td>7500 mm x 1500 mm x 1900 mm</td>
<td>6600 mm x 1460 mm x 1890 mm</td>
<td>15,500 mm x 2300 mm x 3000 mm</td>
</tr>
<tr>
<td>Weight, SAB, dry (kg)</td>
<td>2700 kg</td>
<td>3620 kg</td>
<td>4800 kg</td>
<td>6400 kg</td>
<td>6480 kg</td>
<td>14000 kg</td>
</tr>
<tr>
<td>Swing Drive</td>
<td>Swing by cylinder</td>
<td>Swing by gear</td>
<td>Swing by gear</td>
<td>Swing by gear</td>
<td>Swing by gear</td>
<td>Swing by gear</td>
</tr>
<tr>
<td>Swing Motion</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
</tr>
<tr>
<td>Tilt Motion</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
<td>± 90°</td>
</tr>
<tr>
<td>Max Outreach</td>
<td>10.9 m</td>
<td>13 m</td>
<td>11.5 m</td>
<td>13 m</td>
<td>10.7 m</td>
<td>13.1 m</td>
</tr>
<tr>
<td>Boom Telescopic Stroke</td>
<td>5 m</td>
<td>6 m</td>
<td>5 m</td>
<td>6 m</td>
<td>5 m</td>
<td>2 m</td>
</tr>
<tr>
<td>Vertical Rail</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 m</td>
</tr>
<tr>
<td>Horizontal Rail</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Basket Slow Option</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Tilt Slow Option</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Mounting Interface</td>
<td>Stationary adapter plate</td>
<td>Stationary adapter plate</td>
<td>Stationary adapter plate</td>
<td>Kingpost pedestal</td>
<td>Horizontal rail</td>
<td>Vertical rail</td>
</tr>
</tbody>
</table>
UHT

Description
The Utility Handling Tool (UHT) is a telescopic, multi-axis knuckle boom type lifting arm. It enables hands-free and safely lifting and guiding of equipment like subs, crossovers and small pipes on the drill floor area. The UHT head rotation enables handling from horizontal to vertical position and vice versa. The Utility Handling Tool is remote controlled, hydraulically driven and equipped with a lifting hook. Both the gripper and guide heads are equipped with hydraulic self clamping connectors enabling hands-free head swapping.

DFMA-U

Description
The Drill Floor Manipulator Arm (DFMA-U) is a heavy duty guide and lifting arm that handles large horizontal static and dynamic loads. It is designed for hands-free, safe and efficient handling of various equipment and large range of tubular dimensions. Normal working area is between wall-center, V-door and lay down area (like riser catwalk etc.). The DFMA-U is understanding mounted, hydraulically driven, with local control stand and electric remote operation.

DFMA-P

Description
The Drill Floor Manipulator Arm (DFMA-P) is a heavy duty guide and lifting arm that handles large horizontal static and dynamic loads. It is designed for hands-free, safe and efficient handling of various equipment and large range of tubular dimensions. Normal working area is between wall-center, V-door and lay down area (like riser catwalk etc.). The DFMA-P is pedestal mounted, hydraulically driven, with local control stand and electric remote operation.
**The Pipe Transfer Conveyor (PTC-LD)** is a light duty conveyor with an attached Tailing Arm Assembly. The PTC transports drilling tubulars between their storage location on the main pipe deck and well-center without manual intervention from the rig crew. It can be remotely operated from the rig’s main control cabin through integrated controls or operated locally from a local control station. The PTC has two main sections: Conveyor & Tailing Arm Assembly.

The control system processes all data from the operator controls to the PTC and all feedback from the tool. The processed data is used to control all tool functions and inform the operator of its operations and status. Local operator controls are provided on a PTC V-door control panel J-box. Hydraulic services to the PTC are directed by a hydraulic interface panel (HIP). Both components are installed on the derrick structure near the PTC.

### Technical Specifications

**PTC-LD**

<table>
<thead>
<tr>
<th>Service</th>
<th>Transport of tubulars and pipe</th>
<th>Maximum hydraulic flow rate (l/min)</th>
<th>280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>2 1/8&quot; - 7&quot;</td>
<td>Maximum working pressure (bar)</td>
<td>2,500</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to +45°C</td>
<td>Sliding traveling speed (m/s)</td>
<td>0.8 to 4</td>
</tr>
<tr>
<td>EWS</td>
<td>40,000</td>
<td>Equipment displacement area (m²)</td>
<td>2,448</td>
</tr>
</tbody>
</table>

### CWS

The tubular shuttle machine is designed to transfer tubulars between the pipe barn and the drill floor. The design of the machine is basically very simple and utilizes tried and tested solutions from previous Hydraulik ASA equipment wherever possible. The design philosophy is intended to achieve minimum complexity, provide safe and reliable operation, and simplify maintenance requirements. It includes a modular design for simple installation and replacement of component parts when needed. Installation is made easier due to generous tolerances and simple interfaces between modules.

### Technical Specifications

<table>
<thead>
<tr>
<th>Service</th>
<th>Transport of tubulars and pipe</th>
<th>Maximum hydraulic flow rate (l/min)</th>
<th>280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>2 1/8&quot; - 7&quot;</td>
<td>Maximum working pressure (bar)</td>
<td>2,500</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to +45°C</td>
<td>Sliding traveling speed (m/s)</td>
<td>0.8 to 4</td>
</tr>
<tr>
<td>EWS</td>
<td>40,000</td>
<td>Equipment displacement area (m²)</td>
<td>2,448</td>
</tr>
</tbody>
</table>

### TS-P

The Tubular Shuttle Machine (TS) is designed to transfer tubulars between the pipe-deck and the drill-floor. Tubulars can be removed from or landed onto the tubular beam using the elevator in combination with the front mounted Pipe Tail-out Arm. The design of the machine is basically very simple and utilizes tried and tested solutions. The design philosophy is intended to achieve minimum complexity, provide safe and reliable operation, and simplify maintenance requirements. It includes a modular design for simple installation and replacement of component parts when needed. Installation is made easier due to generous tolerances and simple interfaces between modules.

### Technical Specifications

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe and casing single</th>
<th>Maximum hydraulic flow rate (l/min)</th>
<th>280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>2 7/8&quot; - 20&quot;</td>
<td>Maximum working pressure (bar)</td>
<td>2,100</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to +45°C</td>
<td>Sliding traveling speed (m/s)</td>
<td>5 to 8.4</td>
</tr>
<tr>
<td>EWS</td>
<td>40,000</td>
<td>Equipment displacement area (m²)</td>
<td>2,448</td>
</tr>
</tbody>
</table>

### CWM

The Catwalk Machine (CWM) is designed to improve speed when handling tubular both running in- and out of hole and to give a maximum safety to personnel. The CWM gives an almost “hands-free” operation of the tubular. The CWM is designed for rough handling, easy maintenance and a long trouble free operation time. The CWM is built as one unit to minimize installation costs on the rig.

### Technical Specifications

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe and casing single</th>
<th>Maximum hydraulic flow rate (l/min)</th>
<th>280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>2 7/8&quot; - 20&quot;</td>
<td>Maximum working pressure (bar)</td>
<td>2,100</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to +45°C</td>
<td>Sliding traveling speed (m/s)</td>
<td>5 to 8.4</td>
</tr>
<tr>
<td>EWS</td>
<td>40,000</td>
<td>Equipment displacement area (m²)</td>
<td>2,448</td>
</tr>
</tbody>
</table>
The Tubular Shuttle Machine (TS) is designed to transfer tubular between the pipe deck and the drill floor. Tubular can be removed from or landed onto the Tubular Beam in the form of the front mounted Pipe Tail-in Arm. The design of the machine is basically very simple and utilizes tried and tested solutions. The design philosophy is intended to achieve minimum complexity, provide safe and reliable operation, and simplify maintenance requirements. It includes a modular design for simple installation and replacement of component parts when needed. Installation is made easier due to generous tolerances and simple interfaces between modules.

### Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWL (kg)</td>
<td>20,500</td>
</tr>
<tr>
<td>Equipment shipment size (L x W x H)</td>
<td>32,800 x 3,760 x 2,800</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C to +45°C</td>
</tr>
<tr>
<td>Skid driving force (N)</td>
<td>70,000</td>
</tr>
<tr>
<td>Design temperature</td>
<td>-20°C to +45°C</td>
</tr>
<tr>
<td>Skid traveling speed (m/s)</td>
<td>0 - 0.5</td>
</tr>
<tr>
<td>Area classification</td>
<td>Zone 1</td>
</tr>
<tr>
<td>Weight, dry (kg)</td>
<td>33,000</td>
</tr>
<tr>
<td>Design code/standard</td>
<td>F.E.M./NS 3472</td>
</tr>
<tr>
<td>Maximum operating pressure (bar)</td>
<td>210</td>
</tr>
<tr>
<td>Tubular range</td>
<td>2 7/8'' - 20''</td>
</tr>
<tr>
<td>Minimum working pressure (bar)</td>
<td>180</td>
</tr>
</tbody>
</table>

---

The Catwalk Shuttle (CWS) is a Riser & Pipe Handling System designed for the rapid handling of tubular and rears both running in- and out of hole and to ensure maximum safety for personnel. The CWS gives an almost “hands-free” operation of the tubular. On the riser/pipe-deck, operation of the CWS is to be co-ordinated with the riser/pipe-handling crane. On the drill floor the operation is to be coordinated with the horizontal to vertical riser/pipe-handler system. The CWS is designed for operation with gripper or riser yokes. The tubulars are supported in a stable, horizontal position when transported with the shuttle. The CWS has two distinct modes of operation. (1) Tubulars less than 20” diameter utilize a “loading platform” with a loading system; this allows either automatic, semi-automatic, or manual control. (2) Tubulars and Riser 20” and greater in diameter are handled with the trolley and cradle operating under manual control, the CWS can be run between pipe deck and drill floor with semi-automatic or manual control.

### Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWL (kg)</td>
<td>40,000</td>
</tr>
<tr>
<td>Equipment shipment size (L x W x H)</td>
<td>26,000 x 3,700 x 2,130</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10°C to +45°C</td>
</tr>
<tr>
<td>Skid driving force (N)</td>
<td>75,000</td>
</tr>
<tr>
<td>Design temperature</td>
<td>-20°C to +45°C</td>
</tr>
<tr>
<td>Skid traveling speed (m/s)</td>
<td>0 - 0.33</td>
</tr>
<tr>
<td>Area classification</td>
<td>Zone 2</td>
</tr>
<tr>
<td>Weight, dry (kg)</td>
<td>27,000</td>
</tr>
<tr>
<td>Design code/standard</td>
<td>FEM/NS4372/EC3</td>
</tr>
<tr>
<td>Maximum operating pressure (bar)</td>
<td>207</td>
</tr>
<tr>
<td>Tubular range</td>
<td>2 7/8'' - 36''</td>
</tr>
<tr>
<td>Minimum working pressure (bar)</td>
<td>180</td>
</tr>
</tbody>
</table>

---

The Riser Handling System (RHS) uses a hydraulically powered trolley-on-a-skid – part of the Catwalk machine. This secures the tubular in a steady state, when transported with the CWM. All the functions are remotely controlled from a Control Stand placed close to the V-door, typically on the drill floor. In case of a remote control failure, local operation of the functions is performed directly on the control valves, located on the support structure of the CWM.

### Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riser Diameter Capacity</td>
<td>52”</td>
</tr>
<tr>
<td>Hydraulic Requirements (psi)</td>
<td>2,500</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>180,000</td>
</tr>
<tr>
<td>Fully loaded (lbs)</td>
<td>44,000</td>
</tr>
</tbody>
</table>

---

The Catwalk Shuttle Machine (CWS) is a Risers & Pipe Handling System designed for the rapid handling of tubular between the pipe deck and the drill floor. Tubular can be removed from or landed onto the Tubular Beam in the form of the front mounted Pipe Tail-in Arm. The design of the machine is basically very simple and utilizes tried and tested solutions. The design philosophy is intended to achieve minimum complexity, provide safe and reliable operation, and simplify maintenance requirements. It includes a modular design for simple installation and replacement of component parts when needed. Installation is made easier due to generous tolerances and simple interfaces between modules.

### Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWL (kg)</td>
<td>40,000</td>
</tr>
<tr>
<td>Equipment shipment size (L x W x H)</td>
<td>31,735 x 2,660 x 2,400</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C to +45°C</td>
</tr>
<tr>
<td>Skid driving force (N)</td>
<td>90,000</td>
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<tr>
<td>Design temperature</td>
<td>-20°C to +45°C</td>
</tr>
<tr>
<td>Skid traveling speed (m/s)</td>
<td>0 - 0.5</td>
</tr>
<tr>
<td>Area classification</td>
<td>Zone 1</td>
</tr>
<tr>
<td>Weight, dry (kg)</td>
<td>40,500</td>
</tr>
<tr>
<td>Design code/standard</td>
<td>“F.E.M.” Rules for the design of Hoisting Appliances “ + NS 3472”</td>
</tr>
<tr>
<td>Maximum operating pressure (bar)</td>
<td>207</td>
</tr>
<tr>
<td>Tubular range</td>
<td>3 1/2'' - 30''</td>
</tr>
<tr>
<td>Minimum working pressure (bar)</td>
<td>180</td>
</tr>
</tbody>
</table>

---

The Catwalk Machine (CWM) is a horizontal pipe and Marine riser handling system designed for rapid handling of tubulars, risers, slip-joint and miscellaneous equipment in and out of the Drill floor. On the pipe and riser deck, the operation is to be co-ordinated with a pipe and riser handling unit. On the drill floor, the operation is to be co-ordinated with a horizontal to vertical pipe and riser handling system. The tubular, typically drill-pipe, drill-collars or casing tubular is transferred in or out of the Drill floor rotosting horizontally in a skid – part of the Catwalk machine. This secures the tubular in a steady state, when transported with the CWM. All the functions are remotely controlled from a Control Stand placed close to the V-door, typically on the drill floor. In case of a remote control failure, local operation of the functions is performed directly on the control valves, located on the support structure of the CWM.

### Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Pipe and Riser Handling</td>
<td></td>
</tr>
<tr>
<td>Maximum hydraulic flow rate (l/min)</td>
<td>160</td>
</tr>
<tr>
<td>Tubular range</td>
<td></td>
</tr>
<tr>
<td>Minimum working pressure (bar)</td>
<td>180</td>
</tr>
<tr>
<td>Area classification</td>
<td></td>
</tr>
<tr>
<td>Weight, dry (kg)</td>
<td>48,000</td>
</tr>
<tr>
<td>Design code/standard</td>
<td></td>
</tr>
<tr>
<td>Maximum operating pressure (bar)</td>
<td>207</td>
</tr>
<tr>
<td>Tubular range</td>
<td></td>
</tr>
<tr>
<td>Minimum working pressure (bar)</td>
<td>180</td>
</tr>
<tr>
<td>Area classification</td>
<td></td>
</tr>
<tr>
<td>Weight, dry (kg)</td>
<td>57,000</td>
</tr>
</tbody>
</table>
Description

The Mousehole Hoist is one component of a standbuilding system and is used to hold singles, doubles, triples and fourbles of range II pipe and to raise and lower them during standbuilding operations. It can also be used with range III singles, doubles and triples. Tubulars are supported vertically by a rabbit that is raised and lowered in the mousehole tube by a hydraulic winch. Tubulars are supported laterally by a centralizer located at the top of the MHH assembly.

Benefits

- Components and materials of proven reliability are given preference. Bearings, gears, gearboxes, cylinders and other critical components are designed with operating margins providing long life.
- The design is executed so that required maintenance is minimized. The design allows for serviceable components to be accessed without disassembly or removal of adjacent components.
- The MHH is designed for transportability. The base and skid ship as an assembly. The mousehole tube splits into two sections to facilitate shipping.
- Design and function of the machine can be easily understood by operators with a minimum of training. Controls are simple and intuitive.
- The MHH is designed for serviceability in mind. To the extent possible maintenance components are located on the narrow ends of the base/skid assembly. This allows for easier access as the sides may be located in close proximity to the substructure beams.

Technical Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Capacity and Speed</td>
<td>33,000 lbs. at speeds 2 to 3 fps</td>
</tr>
<tr>
<td></td>
<td>18,000 lbs. at speeds 2 to 3 fps</td>
</tr>
<tr>
<td>IMPACT ATTENUATOR UNIT</td>
<td>Absorption Capacity: 33,000 lbs.</td>
</tr>
<tr>
<td></td>
<td>Mounting Load Reaction: 1,000,000 lbs</td>
</tr>
<tr>
<td>Power</td>
<td>100/240 V, 50/60 Hz, 10 Amps</td>
</tr>
<tr>
<td>Hydraulic</td>
<td>2500 psi, 150 Gpm</td>
</tr>
</tbody>
</table>

For reference only, please contact your local sales contact for more information.
The Pipe Handling Crane (PHC) is a combined knuckle- and telescope crane. It is designed for safe and effective handling of drill pipes, drill collars and casings from pipe deck to catwalk machine and vice versa. By use of a NOV designed gripper pole, steady lifting and handling of the equipment is ensured. A hook adapter enables handling of various equipment suitable for lifting by slings. The crane is hydraulically driven by internal HPUs and remote operated from crane cabin or by radio remote. The PHC is designed for maximum efficiency and handles free handling of pipe, collars and casings between pipedeck and catwalk area with maximum safety to personnel. The unit is designed for rough handling, easy maintenance and high reliability.

**PC 1891**

**Technical specifications**

**DESIGN DATA**

- Handling of equipment and drill pipes, drill collars and casings from pipe deck to catwalk machine and vice versa
- Area classification: IEC Zone 2 (Zone 1 for boom tip)
- Design standards: ABS “rules for building and classification of mobile drilling units”
- Design temperature: -10°C to +45°C
- Telescopic length: 2.0 m
- Weight: 25.5 t

**PERFORMANCE DATA**

- Maximum safe working load: 12 t
- Maximum radius: 25 m
- Maximum load at maximum radius: 5.5 t
- Rotation: ±90°
- Safe working load hook adapter: 10 t

---

**PC 2201KCE**

**Technical specifications**

**DESIGN DATA**

- Handling of equipment and drill pipes, drill collars and casings from pipe deck to catwalk machine and vice versa
- Area classification: IEC Zone 2 (Zone 1 for boom tip)
- Design standards: ABS “rules for building and classification of mobile drilling units”
- Design temperature: -10°C to +45°C
- Telescopic length: 2.0 m
- Weight: 33 t

**PERFORMANCE DATA**

- Maximum safe working load: 14 t
- Maximum radius: 29 m
- Maximum load at maximum radius: 6 t
- Rotation: ±180°
- Safe working load hook adapter: 12 t

---

**PC 2401K**

**Technical specifications**

**DESIGN DATA**

- Handling of equipment and drill pipes, drill collars and casings from pipe deck to catwalk machine and vice versa
- Area classification: IEC Zone 2 (Zone 1 for boom tip)
- Design standards: ABS “rules for building and classification of mobile drilling units”
- Design temperature: -10°C to +45°C
- Weight: 47 t

**PERFORMANCE DATA**

- Maximum safe working load: 12 t
- Maximum radius: 32 m
- Maximum load at maximum radius: 10 t
- Rotation: ±180°
- Safe working load hook adapter: 12 t

---

*For reference only, please contact your local sales contact for more information.*
Drawworks and Motion Compensation

- Active Heave Drilling Drawworks (AHD)
- Single Speed Gear Driven Drawworks (SSGD)
- Active Heave Dual Drilling Drawworks (AHDD)
- 1000 sT drawworks comparison
- Crown Mounted Compensation (CMC)
- Motion compensation
Active Heave Drilling Drawworks (AHD) combine the latest technology in controls and design. These drawworks eliminate the need for overhead motion compensation machinery. In addition, braking energy is regenerated and fed back into the electrical system of the drilling rig, which increases overall rig efficiency. The active heave compensation also expands the “drilling operational window” by allowing drilling programs to continue in heavier seas than conventional drawworks.

**AHD-750**

- **Design Data**
  - Max hook load (lines): 1,200 lbf (990 kN)
  - Max hook load (lines): 1,200 lbf (990 kN)
  - Fast line pull: 175 lbf (78 lbf)
  - Weight: 380,000 lbs (172,650 kg)
  - Drilling motor diameter: 2.5” (64 mm)
  - Max continuous power: 1,500 kW
  - Max continuous power: 1,500 kW
  - Max block travel (lines vs. 107 ft)
    - Area classification: 20 mm

- **Technical specifications**
  - Drop requirement: 1,900 ft
  - Fresh/lake water supply, intake/sea water feed
  - Hose/HC: 2,500 lbf (11,300 kN)

**AHD-1000**

- **Design Data**
  - Max hook load (lines): 1,800 lbf (1,600 kN)
  - Max hook load (lines): 1,800 lbf (1,600 kN)
  - Fast line pull: 190 lbf (86 lbf)
  - Weight: 515,000 lbs (233,480 kg)
  - Drilling motor diameter: 3” (76 mm)
  - Max continuous power: 1,500 kW
  - Max continuous power: 1,500 kW
  - Max block travel (lines vs. 107 ft)
    - Area classification: 20 mm

- **Technical specifications**
  - Drop requirement: 1,900 ft
  - Fresh/lake water supply, intake/sea water feed
  - Hose/HC: 2,500 lbf (11,300 kN)

**AHD-1250**

- **Design Data**
  - Max hook load (lines): 2,000 lbf (1,400 kN)
  - Max hook load (lines): 2,000 lbf (1,400 kN)
  - Fast line pull: 220 lbf (99 lbf)
  - Weight: 530,000 lbs (240,600 kg)
  - Drilling motor diameter: 3” (76 mm)
  - Max continuous power: 1,500 kW
  - Max continuous power: 1,500 kW
  - Max block travel (lines vs. 107 ft)
    - Area classification: 20 mm

- **Technical specifications**
  - Drop requirement: 1,900 ft
  - Fresh/lake water supply, intake/sea water feed
  - Hose/HC: 2,500 lbf (11,300 kN)

**AHD-1400**

- **Design Data**
  - Max hook load (lines): 2,300 lbf (1,600 kN)
  - Max hook load (lines): 2,300 lbf (1,600 kN)
  - Fast line pull: 230 lbf (104 lbf)
  - Weight: 600,000 lbs (272,150 kg)
  - Drilling motor diameter: 3” (76 mm)
  - Max continuous power: 1,500 kW
  - Max continuous power: 1,500 kW
  - Max block travel (lines vs. 107 ft)
    - Area classification: 20 mm

- **Technical specifications**
  - Drop requirement: 1,900 ft
  - Fresh/lake water supply, intake/sea water feed
  - Hose/HC: 2,500 lbf (11,300 kN)
The AC electric powered Single Speed Gear Driven (SSGD) Drawworks offers a design unique to the industry. By overpowering a drawworks with A C motors, we are able to create a single small, single speed drawworks with the hosting performance comparable to a conventional drawworks. The result is a simple design with few mechanical parts, a small footprint and light weight. These drawworks require minimal maintenance, are entirely self-contained and completely enclosed. Fail safe spring applied disc brakes are utilized for parking and emergency only.

### SSGD-750

- **Performance @ 14 lines**
- **Performance @ 16 lines**

### SSGD-1250

- **Performance @ 14 lines**
- **Performance @ 16 lines**

### SSGD-1000

- **Performance @ 14 lines**
- **Performance @ 16 lines**

### SSGD-1400

- **Performance @ 14 lines**
- **Performance @ 16 lines**

---

**SSGD-750 Technical specifications**

- **DESIGN DATA**
  - Max hook load 14 lines: 1,080 (2,389 kN)
  - Max hook load 16 lines: 1,200 (2,667 kN)
  - Fast line pull: 176,913 lbs (80,246 kg)
  - Weight: 185,000 lbs (83,940 kg)
  - Drill line diameter: 2" (50.8 mm)
  - Weight: 142,000 lbs (64,428 kg)
  - Fast line pull: 119,585 lbs (54,243 kg)
  - Max hook load 12 lines: 750 s T (680 m T)
  - Max block travel 14: 60 ft (18.3 m)
  - Max block travel 16: 70 ft 6 in (21.4 m)

**SSGD-1000 Technical specifications**

- **DESIGN DATA**
  - Max hook load 14 lines: 1,243 s T (1,128 m T)
  - Max hook load 16 lines: 1,400 s T (1,270 m T)
  - Fast line pull: 198,142 lbs (86,876 kg)
  - Weight: 256,410 lbs (116,306 kg)
  - Drill line diameter: 2" (50.8 mm)
  - Weight: 218,493 lbs (99,107 kg)
  - Fast line pull: 176,913 lbs (80,246 kg)
  - Max hook load 14 lines: 1,109 s T (1,006 m T)
  - Max block travel 14: 60 ft (18.3 m)
  - Max block travel 16: 70 ft 6 in (21.4 m)

**SSGD-1400 Technical specifications**

- **DESIGN DATA**
  - Max hook load 14 lines: 1,400 s T (1,237 m T)
  - Max hook load 16 lines: 1,568 s T (1,416 m T)
  - Fast line pull: 200,319 lbs (90,503 kg)
  - Weight: 380,000 lbs (172,415 kg)
  - Drill line diameter: 2" (50.8 mm)
  - Weight: 218,493 lbs (99,107 kg)
  - Fast line pull: 176,913 lbs (80,246 kg)
  - Max hook load 14 lines: 750 s T (680 m T)
  - Max block travel 14: 60 ft (18.3 m)
  - Max block travel 16: 70 ft 6 in (21.4 m)

---

For reference only, please contact your local sales contact for more information.
### Technical Specifications

**AHDD-1000**

- **Max Hook Load**:
  - Dual Drilling: 1,400 sT (1,270 mT)
  - Single Drilling: 1,234 sT (1,119 mT)
- **Fast Line Pull**: 192,904 lbs (87,500 kg)
- **Weight**: 300,038 lbs (136,095 kg)
- **Drill Line Diameter**: 1.875" (48 mm)
- **Max Continuous Power**: 13,800 Hp
- **Max Intermittent Power**: 16,698 Hp
- **Max Block Travel**: 16 lines (3 layers)
- **Area Classification**: Zone 2
- **Design Temperature**: -4°F to 113°F (-20°C to 45°C)
- **Brake System**: Main AC Motors, Emergency Disc Brakes
- **Brake Disc Cooling Method**: Air Cooling
- **Fresh/Sea Water Supply, Lube Oil Heat Exchanger**: 40 GPM @ 96.8°F (9.08 m³/hr @ 36°C)

**AHDD-1400**

- **Max Hook Load**:
  - Dual Drilling: 1,600 sT (1,451 mT)
  - Single Drilling: 1,442 sT (1,308 mT)
- **Fast Line Pull**: 191,376 lbs (86,807 kg)
- **Weight**: TBC
- **Drill Line Diameter**: 1.875" (48 mm)
- **Max Continuous Power**: 15,000 Hp
- **Max Intermittent Power**: 18,280 Hp
- **Max Block Travel**: 18 lines (4 layers)
- **Area Classification**: Zone 2
- **Design Temperature**: -4°F to 104°F (-20°C to 40°C)
- **Brake System**: Main AC Motors, Emergency Disc Brakes
- **Brake Disc Cooling Method**: Air Cooling
- **Fresh/Sea Water Supply, Lube Oil Heat Exchanger**: 20 GPM @ 96.8°F (4.54 m³/hr @ 36°C)

**AHDD-1600**

- **Max Hook Load**:
  - Dual Drilling: 1,000 sT (907 mT)
  - Single Drilling: 1,000 sT (907 mT)
- **Fast Line Pull**: 137,789 lbs (62,500 kg)
- **Weight**: 142,000 lbs (69,400 kg)
- **Dimensions (LxWxH)**: 28,500 x 24,000 x 29,000 mm
- **Max Continuous Power**: 9,200 Hp
- **Max Intermittent Power**: 12,880 Hp
- **Max Block Travel**: 16 lines (Dual Drilling)
- **Area Classification**: Zone 1 (Zone 2 for ATEX Certified Systems)
- **Design Temperature**: -4°F to 104°F (-20°C to 40°C)
- **Brake System**: Main AC Motors, Emergency Disc Brakes
- **Brake Disc Cooling Method**: Air Cooling
- **Fresh/Sea Water Supply, Lube Oil Heat Exchanger**: 20 GPM @ 96.8°F (4.54 m³/hr @ 36°C)

*For reference only, please contact your local sales contact for more information.*
### SSGD-1000

- Single shaft, single speed drawworks with hoisting performance comparable to conventional drawworks
- Simple design, few mechanical parts, small footprint and light weight
- Self-contained, completely enclosed and requires minimal maintenance

<table>
<thead>
<tr>
<th>Technical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESIGN DATA</strong></td>
</tr>
<tr>
<td>Max hook load 14 lines</td>
</tr>
<tr>
<td>Max hook load 12 lines</td>
</tr>
<tr>
<td>Fast line pull</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Drill line diameter</td>
</tr>
<tr>
<td>Max continuous power</td>
</tr>
<tr>
<td>Max intermittent power</td>
</tr>
<tr>
<td>Max block travel 14 lines</td>
</tr>
<tr>
<td>Max block travel 12 lines</td>
</tr>
<tr>
<td>Area classification</td>
</tr>
<tr>
<td>Design temperature</td>
</tr>
<tr>
<td>Brake system main</td>
</tr>
<tr>
<td>Brake system emergency</td>
</tr>
<tr>
<td>Brake disc cooling method</td>
</tr>
<tr>
<td>Fresh/seawater supply, lube oil heat exchanger</td>
</tr>
</tbody>
</table>

**DRILLING MOTOR**

- Type: G322A2
- Number of rotation: 1,380 rpm
- Fresh/seawater supply, main AC circuit | 208V-230V-460V, 3 ph, 60 Hz

### AHD-1000

- Eliminates the need for overhead motion compensation machinery
- Braking energy is regenerated and fed back into the electrical system of the drilling rig, which increases overall rig efficiency
- Active Heave Compensation expands the “drilling operational window” by allowing drilling programs to continue in heavier seas than conventional drawworks

<table>
<thead>
<tr>
<th>Technical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESIGN DATA</strong></td>
</tr>
<tr>
<td>Max hook load 14 lines</td>
</tr>
<tr>
<td>Max hook load 12 lines</td>
</tr>
<tr>
<td>Fast line pull</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Drill line diameter</td>
</tr>
<tr>
<td>Max continuous power</td>
</tr>
<tr>
<td>Max intermittent power</td>
</tr>
<tr>
<td>Max block travel 14 lines</td>
</tr>
<tr>
<td>Max block travel 12 lines</td>
</tr>
<tr>
<td>Area classification</td>
</tr>
<tr>
<td>Design temperature</td>
</tr>
<tr>
<td>Brake system main</td>
</tr>
<tr>
<td>Brake system emergency</td>
</tr>
<tr>
<td>Brake disc cooling method</td>
</tr>
<tr>
<td>Fresh/seawater supply, lube oil heat exchanger</td>
</tr>
</tbody>
</table>

**DRILLING MOTOR**

- Type: GEB22A
- Number of rotation: 1,380 rpm
- Power requirement: 600/690 V, 60 Hz, 3 phases
- Fresh/seawater supply, main AC circuit | 208V-230V-460V, 3 ph, 60 Hz

### AHD-1000

- Fully redundant hoisting system
- Superior hoisting speed and wire line life
- Based on the trusted and proven AHD technology

<table>
<thead>
<tr>
<th>Technical specifications*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESIGN DATA</strong></td>
</tr>
<tr>
<td>Max hook load dual drawworks 16 lines</td>
</tr>
<tr>
<td>Max hook load single drawworks 16 lines</td>
</tr>
<tr>
<td>Fast line pull</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Drill line diameter</td>
</tr>
<tr>
<td>Max continuous power</td>
</tr>
<tr>
<td>Max intermittent power</td>
</tr>
<tr>
<td>Max block travel 16 lines (Dual drawworks)</td>
</tr>
<tr>
<td>Max block travel 16 lines (Single drawworks)</td>
</tr>
<tr>
<td>Area classification</td>
</tr>
<tr>
<td>Design temperature</td>
</tr>
<tr>
<td>Brake system main</td>
</tr>
<tr>
<td>Brake system emergency</td>
</tr>
<tr>
<td>Brake disc cooling method</td>
</tr>
<tr>
<td>Fresh/seawater supply, lube oil heat exchanger</td>
</tr>
</tbody>
</table>

**DRILLING MOTOR**

- Type: GEB22A2 (AC)
- Number of rotation: 1,380 rpm
- Power requirement: 690 V, 60 Hz, 3 phases
- Fresh/seawater supply, main AC circuit | 208V-230V-460V, 3 ph, 60 Hz

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*For reference only, please contact your local sales contact for more information.

rig@nov.com

For reference only, please contact your local sales contact for more information.
Crown Mounted Compensator (CMC)
Specialized for locked bottom operations

CMC-E
The one piece solution

CMC-H/H2
Excellent performance made for SSGD rigs

Active Heave Compensator (AHC)
Designed for position control of the CMC

Standard delivery includes
- Set of two (2) compensator cylinders.
- Fluid/Gas Accumulator.
- Fluid Storage Unit with pumps for installation at deck level.
- Control cabinet for installation in safe zone at deck level.
- Single PV Ilng (Working PVs).
- Mechanically prepared for AHC.

Standard delivery includes
- One complete CMC-E including cylinder, accumulators, working gas PVs, crown block and equalizing system.
- Fluid/Gas Accumulator.
- Fluid Storage Unit with pumps for installation at deck level.
- Control cabinet for installation in safe zone at deck level.
- Single PV Ilng (Working PVs).
- Mechanically prepared for AHC.

Options
- Service handling tool (SHT)

Technical specifications
- Model: 600-25, 800-25, 1000-25
- Crown block capacity, static: 1,500 Kips, 1,500 Kips, 1,500-2,800 Kips
- Compensator capacity, dynamic: 600 Kips, 800 Kips, 1,000 Kips
- Crown block sheave configuration: 6 x 72", 6 x 72", 7 x 72" or 78" x 72"
- Weight (complete): 110 mT, 120 mT, 110-145 mT

Technical specifications
- Crown block capacity, static: 1,500 Kips, 2,000 Kips, 2,800-3,200 Kips
- Compensator capacity, dynamic: 600 Kips, 1,000 Kips, 1,500 Kips
- Crown block sheave configuration: 6 x 72", 6 x 72", 7 x 78" or 8 x 78"
- Weight (complete): 120 mT, 163 mT, 190 mT

Technical specifications
- Model: AHC/CMC-25, AHC/CMC-35
- Capacity: 25 mT, 35 mT
- Max speed: 1.22 m/s, 1.22 m/s
- Cylinder stroke: 7,800 mm, 9,070 mm
- Weight AHC complete: 4.5 mT, 4.7 mT

AHC cylinder is primarily used for the following purposes
- Optimization of the CMC performance during operations like landing of components onto seabed, like BOP or Christmas trees.
- Wire line logging inside well without the need for wire rigging against slip joint and required weak link.
- ADC (Auto Driller Controller) ready

Delivery includes
- Motion Reference Unit (MRU)
- Wireline mode, Part of control system
- AHC cylinder controls and Wire Line Mode are executed by the CMC PLC controller and integrated into the CMC control cabinet.

Optional delivery
- Standalone Hydraulic Power Unit for AHC

*For reference only, please contact your local sales contact for more information.

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Wireline Riser Tensioner (WRT)

**Description**
The wireline tensioner provides positive tension to the marine riser, and compensates for the relative motion between the riser and the drilling rig. The tensioners are installed diametrically opposite to each other. This is to avoid any lateral forces in the riser tensioner ring when reducing tension in one unit (bleeding off air for wire rope travel etc.). The tensioners maintain tension in each support wire, which is connected to the support ring on the marine riser pipe. The wires from the support ring runs over the pivot hinged idler sheaves, via the fixed lead-in sheaves and then around the two double shear assemblies on each end of the tensioner cylinders. The wires are then attached to the wire rope anchors.

- A four to one mechanical advantage is obtained, cylinder stroke of 12.5 ft. is transferred to 50 ft. of wire rope travel.
- A fluid connection block is installed between the accumulator and cylinder.
- Prevents damage on the cylinder and other equipment.
- Accumulator gas side is connected to a gas reservoir to obtain constant tension in marine riser pipe.
- Centralized control of tensioners.
- Driller’s control panel interfaces with control unit for operator to start, operate, monitor or shut down the total system.

![Wireline Riser Tensioner Diagram](image)

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N-Line Riser Tensioner (NRT)

**Description**
The wireline tensioner provides positive tension to the marine riser, and compensates for the relative motion between the riser and the drilling rig. The tensioners are installed diametrically opposite to each other. This is to avoid any lateral forces in the riser tensioner ring when reducing tension in one unit (bleeding off air for wire rope travel etc.). The tensioners maintain tension in each support wire, which is connected to the support ring on the marine riser pipe. The wires from the support ring runs over the pivot hinged idler sheaves, via the fixed lead-in sheaves and then around the two double shear assemblies on each end of the tensioner cylinders. The wires are then attached to the wire rope anchors.

- A four to one mechanical advantage is obtained, cylinder stroke of 12.5 ft. is transferred to 50 ft. of wire rope travel.
- A fluid connection block is installed between the accumulator and cylinder.
- Prevents damage on the cylinder and other equipment.
- Accumulator gas side is connected to a gas reservoir to obtain constant tension in marine riser pipe.
- Centralized control of tensioners.
- Driller’s control panel interfaces with control unit for operator to start, operate, monitor or shut down the total system.

![N-Line Riser Tensioner Diagram](image)

---

**Technical Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>WRT-120</th>
<th>WRT-200</th>
<th>WRT-225</th>
<th>WRT-250</th>
<th>WRT-280</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic capacity (at midstroke)</td>
<td>200 kips (907 kN)</td>
<td>250 kips (1,106 kN)</td>
<td>200 kips (907 kN)</td>
<td>200 kips (907 kN)</td>
<td>200 kips (907 kN)</td>
</tr>
<tr>
<td>Weight (single)</td>
<td>10 kips (44.5 kN)</td>
<td>12 kips (54.2 kN)</td>
<td>10 kips (44.5 kN)</td>
<td>12 kips (54.2 kN)</td>
<td>10 kips (44.5 kN)</td>
</tr>
<tr>
<td>Diameter (groove)</td>
<td>1.524 m (52&quot;)</td>
<td>1.524 m (52&quot;)</td>
<td>1.524 m (52&quot;)</td>
<td>1.524 m (52&quot;)</td>
<td>1.524 m (52&quot;)</td>
</tr>
<tr>
<td>Wire travel</td>
<td>15.24 m (50')</td>
<td>15.24 m (50')</td>
<td>15.24 m (50')</td>
<td>15.24 m (50')</td>
<td>15.24 m (50')</td>
</tr>
</tbody>
</table>

**System**

- Tensioners: 4 dual or single
- Control panel: Local operators’ panel
- Hydraulic fluid: Water / glycol (HFC)
- Trip saver: Possible
- Local control panel: Yes
- Trip laser: Possible

---

*For reference only, please contact your local sales contact for more information.*
Power Generation

- Compact drive systems
- Drill Force
- Power blade
Compact Drive Systems - Liquid Cooled

The Compact Drive LC (Liquid Cooled) systems share all the features with Drill Force LC systems but with a reduced height and footprint. The system still offers the best reliability and seamless integration with NOV control systems and machinery. NOV proprietary liquid cooling design provides the best cooling capacity and redundancy. High thermal dissipation guarantees the continuous drilling and breaking operations without thermal failures.

Features
- Onboard pre-charge circuitry
- 6/12/18/24 pulse configurable
- Reduced height and footprint to fit any tight space
- Reserve cooling tank
- Isolation between modules for easy diagnostics
- Induction / PM switchable firmware
- Modular design and configure flexibility
- Excellent serviceability and accessibility
- Proven interface with NOV control and machinery

Compact Drive LC Specifications

<table>
<thead>
<tr>
<th>DC Bus Rating</th>
<th>Rectifier Size</th>
<th>Output Power</th>
<th>Rated Temperature</th>
<th>Max Pressure Range</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000 / 8000 A</td>
<td>520 A</td>
<td>3648 kW</td>
<td>40 / 45°C</td>
<td>EC 61439-1</td>
<td></td>
</tr>
<tr>
<td>Peak Fault Braking</td>
<td>Charged Voltage</td>
<td>Continuous Current</td>
<td>Density</td>
<td>Max Flow Range</td>
<td>Max Flow Capacity</td>
</tr>
<tr>
<td>220/440/680/1100 V</td>
<td>0.36 S</td>
<td>980-1144 A</td>
<td>0-300 Hz</td>
<td>80-110 GPM</td>
<td>IEEE - 45</td>
</tr>
<tr>
<td>3648 kW</td>
<td>1200-2400</td>
<td>Bottom/Set</td>
<td>6-18°C</td>
<td>225 kW / 765 Btu/hr</td>
<td>DNV</td>
</tr>
</tbody>
</table>

Compact Drive Systems - Air Cooled

The Compact Drive AC (Air Cooled) Systems have reduced height and footprint to meet the most confined switchgear room design. With reduced size, the compact drives still keep the reliability and integration with NOV control systems and machinery. Dedicated VFD sections provide more configurable products and flexibility to arrange the VFD sections for different layouts.

Features
- Onboard pre-charge circuitry
- Dedicated VFD sections for each drilling equipment
- Reduced height and footprint to fit any tight space
- Induction / PM switchable firmware
- Modular design and configure flexibility
- Excellent serviceability and accessibility
- Proven interface with NOV control and machinery

Compact Drive AC Specifications

<table>
<thead>
<tr>
<th>DC Bus Rating</th>
<th>Rectifier Size</th>
<th>Output Power</th>
<th>Rated Temperature</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000 / 8000 A</td>
<td>250 A</td>
<td>3648 kW</td>
<td>40 / 45°C</td>
<td>EC 61439-1</td>
</tr>
<tr>
<td>Peak Fault Braking</td>
<td>Charged Voltage</td>
<td>Continuous Current</td>
<td>Density</td>
<td>Max Flow Range</td>
</tr>
<tr>
<td>220/440/680/1100 V</td>
<td>0.36 S</td>
<td>980-1144 A</td>
<td>0-300 Hz</td>
<td>80-110 GPM</td>
</tr>
<tr>
<td>3648 kW</td>
<td>1200-2400</td>
<td>Bottom/Set</td>
<td>6-18°C</td>
<td>225 kW / 765 Btu/hr</td>
</tr>
</tbody>
</table>
Drill Force - Liquid Cooled

The Drill Force LC (Liquid Cooled) systems share all the features with Drill Force AC systems and offer the best reliability and seamless integration with NOV control systems and machinery. NOV proprietary liquid cooling design provides the best cooling capacity and redundancy. High thermal dissipation guarantees the continuous drilling and breaking operations without thermal failures.

Features

• Onboard pre-charge circuitry
• 6/12/18/24 pulse configurable
• Built-in jacking energy dissipation
• Reserve cooling tank
• Isolation between modules for easy diagnostics
• Induction / PM switchable ramware
• Modular design and configurability
• Excellent serviceability and accessibility
• Proven interface with NOV control and machinery

Drill Force Liquid Cooled Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4000 / 8000 A</td>
<td>3200 A</td>
<td>560/1120/1600 kW</td>
<td>40 / 45 °C</td>
<td>80 / 75 °C</td>
<td>20-40 psi</td>
<td>IEC 61439-1</td>
</tr>
<tr>
<td>Peak Fault Braking</td>
<td>Chopper Voltage</td>
<td>Continuous Current</td>
<td>Output Frequency</td>
<td>Ex. Max Flow Range</td>
<td>In. Max Flow Range</td>
<td>IEC 60800-1-2-4</td>
</tr>
<tr>
<td>220 kA</td>
<td>900/1000/1100 V adjustable</td>
<td>0.38/0.75/1.14 A</td>
<td>30-114 GPM</td>
<td>200-346 GPM</td>
<td>EEC - IE</td>
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</tr>
<tr>
<td>System IP Rating</td>
<td>Chopper Continuous Power</td>
<td>Overload Current</td>
<td>Cable Entry Options</td>
<td>Ex. Cooling Water Temp</td>
<td>Measured/Thermal Dissipation</td>
<td>ABS MDDX 2012</td>
</tr>
<tr>
<td>NEMA B-38</td>
<td>120/208/240 kW/480 V</td>
<td>Bottom/Top</td>
<td>5 °F</td>
<td>200-690 / 740 °F</td>
<td>EN</td>
<td></td>
</tr>
</tbody>
</table>
NOV/PowerBlade is an innovative technology suitable for drilling and hoisting systems. It preserves energy to reduce fuel costs and lower emissions while increasing operational safety and reliability.

During operation, the PowerBlade system captures regenerated electrical energy when the drawworks, crane or winch slows and stops the load on the hook. Previously, this energy was dissipated as heat using braking resistors.

The PowerBlade stores this as kinetic energy using a flywheel that accelerates and gathers speed, capturing energy from vessel rising and block lowering during active heave compensation. This energy is then recycled and utilized to put power back onto the power grid when needed.

Main Components
- Asynchronous motors
- Flywheel
- Controls cabinet (not pictured)
- Drives cabinet (not pictured)

Features
- PowerBlade is easily integrated into the power grid and recaptured energy can be distributed as both DC and AC power.
- Modular design allows flexibility to adapt to varying rig equipment capacities and vessel configurations.
- Seamless interface with rig generator control, power management system, equipment controls and the driller operation system.

Benefits
- Preserve energy to reduce operating costs by lowering peak power demand and leveling load.
- Reduce generator/engine maintenance cost as a result of less consumption demand.
- Provide full power supply if one main generator fails and a full power backup in case of ship black out.
- Recover up to 65%-70% system energy from vessel rising and block lowering in active heave compensation.

Testing
- Three-step testing process: computer simulation, lab environment setup testing and full scale prototype testing.
- Computer simulation and testing of power scenarios including: active heave compensation mode, constant tension mode, power boost at tripping, and operation in the case of ship black out.
- Full scale testing employs (2) 50-ton multilayer winches, flywheel modules, drives and control & measurement equipment (refer to the above curve for results).

Performance Estimates*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flywheel discharge voltage</td>
<td>1500 V</td>
</tr>
<tr>
<td>DC bus current, continuous</td>
<td>150 A</td>
</tr>
<tr>
<td>DC bus connection voltage range</td>
<td>675 V – 1080 V</td>
</tr>
<tr>
<td>Internal DC bus capacities per bus</td>
<td>20 kVA</td>
</tr>
<tr>
<td>Continuous power handling, per bus</td>
<td>1000 kW</td>
</tr>
<tr>
<td>Peak power consumption reduction with winch, crane, or drawworks application</td>
<td>65%</td>
</tr>
<tr>
<td>Average power consumption reduction with winch, crane, or drawworks application</td>
<td>60%</td>
</tr>
</tbody>
</table>

Cooling Data Total
- Cooling of VFD cabinets: 
  - Minimum flow rate: 30 L/min per VFD
- Cooling of Flywheel motors: 
  - Minimum flow rate: 70 L/min per motor

Design Data
- Design Standards: DNV OS-E101 Drilling Plant 2009
- Design Temperature (ambient): -20 to +45 Celsius
- Design Weather Temperature and Flywheel Power and Control System: 0°C to +52°C
- Dimensions and Weight Estimates (excluding service area)*
  - Size (L x W x H): 5500 mm x 1750 mm x 1600 mm
  - Weight: 17500 kg

*For reference only, please contact your local sales contact for more information.
Drilling Controls and Instrumentation

- Cyberbase™
- Amphion™
### CYB-43

**Features:**
- Adjustable height (relative to floor)
- Default rotation sector of 136 degrees with adjustable end stops in 36-degree steps

**Comfortable Recaro seat with:**
- Durable leather
- Side support
- With adjustable:
  - Height (relative to control panels)
  - Position (fore and aft)
  - Seat cushion length and rake of front part
  - Lumbar support
  - Neck rest
  - Seat back angle

**Control panels:**
- Ergonomic component layout
- Angled control joystick
- Track ball
- Mode switch
- Emergency switch
- Numeric and functional keypads
- Pan holder
- Cup holder
- Attachment for note pad holder

**Control panel:**
- Each high quality 19” TFT LCD
- Extractable sunscreen
- Step-less adjusting of angle
- Foot support

**Foundation:**
- Access hatch to main connection box
- Shock and vibration dampers
- Recessed mounting

**Service access:**
- Monitor house: Hinges and internal gas spring
- Upper chair box: Seat mounted to a hinged hatch, flip backward to open
- Main connection box: Open floor hatch to access main connection box.

---

### CYB-63

**Features:**
- Adjustable height (relative to floor)
- Default rotation sector of 136 degrees with adjustable end stops in 36-degree steps

**Comfortable Recaro seat with:**
- Durable leather
- Side support
- With adjustable:
  - Height (relative to control panels)
  - Position (fore and aft)
  - Seat cushion length and rake of front part
  - Lumbar support
  - Neck rest
  - Seat back angle

**Control panels:**
- Ergonomic component layout
- Angled control joystick
- Track ball
- Mode switch
- Emergency switch
- Numeric and functional keypads
- Pan holder
- Cup holder
- Attachment for note pad holder

**Control panel:**
- Each high quality 19” TFT LCD
- Extractable sunscreen
- Step-less adjusting of angle
- Foot support

**Foundation:**
- Access hatch to main connection box
- Shock and vibration dampers
- Recessed mounting

**Service access:**
- Monitor house: Hinges and internal gas spring
- Upper chair box: Seat mounted to a hinged hatch, flip backward to open
- Main connection box: Open floor hatch to access main connection box.

---

### CYB-7

**Features:**
- Adjustable height (relative to floor)
- Default rotation sector of 30 degrees

**Monitor House:**
- 2 each high quality 19” TFT LCD
- Laminated anti-reflex glass
- Sunscreen
- Stepless adjusting of angle

**Control Panels:**
- Angled control joystick
- Track ball
- Mode switch
- Emergency switch
- Numeric and functional keypads
- Pan holder
- Cup holder
- Attachment for note pad holder
AMPHION™ is National Oilwell Varco’s modular, fully integrated, networked, and field-proven drilling control solution delivered in a compact, comfortable, and cost-effective package. AMPHION™ manages, controls, and monitors rig floor equipment to ensure safe, efficient, and seamless operations. Configurable, expandable and with a future-looking platform, the AMPHION™ control system adds value to your operations.

**Amphion-FE**

- **General Features:**
  - Integrated Talkback system
  - Integrated CCTV system
  - Optional cabin control integration (HVAC, wipers, lighting, etc.)
  - Integrated drilling instrumentation through RigSense/MSI
  - Up to four touchscreens for monitoring and control
  - Adjustable touchscreen position

- **Chair Features:**
  - Durable leather material
  - Removable seat cover
  - Adjustable pedestal support
  - 7 position electric adjustments including height, rotation, setback angle and lumbar support

- **Control Features:**
  - Ergonomic joystick control
  - Integrated control buttons and knobs
  - Optional trackball for remote HMI control
  - Emergency stop button(s)
  - Multiple levels of redundancy
  - Intuitive and user-friendly graphic interface
  - Touchscreens with fast response time
  - User selectable information displays
  - Multiple language options
  - Selectable units of measure
  - Alarms and diagnostic screens

**Amphion-WAW**

- **General Features:**
  - Integrated CCTV system
  - Electric weight indicator
  - Optional cabin control integration (HVAC, wipers, lighting, etc.)
  - Integrated drilling instrumentation through RigSense/MSI
  - Up to four touchscreens for monitoring and control
  - Adjustable touchscreen position

- **Chair Features:**
  - Durable leather material
  - Removable seat cover
  - Pedestal support
  - Swing chair for sit/stand operation
  - 7 position adjustments including height, rotation, setback angle and lumbar support

- **Control Features:**
  - Emergency stop button(s)
  - Ergonomic joystick control
  - Integrated control buttons and knobs
  - Multiple levels of redundancy
  - Intuitive and user-friendly graphic interface
  - Touchscreens with fast response time
  - User selectable information displays
  - Multiple language options
  - Selectable units of measure
  - Alarms and diagnostic screens

**Amphion-SUW**

- **General Features:**
  - Stand up workstation for pipe handling operations
  - Provides driller’s workstation redundancy
  - Integrated Talkback system
  - Integrated CCTV system
  - Touchscreen for monitoring and control
  - Adjustable height
  - Adjustable touchscreen viewing angle

- **Control Features:**
  - Ergonomic joystick control
  - Integrated control buttons and knobs
  - Emergency stop button
  - Intuitive and user-friendly graphic interface
  - Touchscreen with fast response time
  - User selectable information displays
  - Multiple language options
  - Selectable units of measure
  - Alarms and diagnostic screens
Pressure Control Equipment

- NXT BOP
- NXT-M BOP
- Corrosion Resistant Enhancement Package - sheet 1 & 2
- Low Force Shear Rams - LFS-5
- RCX multiplex pod
- RCX low shock valves - sheet 1 & 2
- EHBS Adjustable Timing Circuit Actuator
- RCX emergency hydraulic backup system acoustic pod
- Depth compensated bottles - sheet 1 & 2
- Hands free gooseneck
- Riser
- Wellhead connectors - sheet 1 & 2
- CMX 1527 LMRP wellhead connector
- Shuttle stack tool
18-15m NXT BOP Assembly

**Hydraulic System**

Hydraulic power to operate a Modular NXT ram BOP can be furnished by any standard oil field accumulator system. Hydraulic passages drilled through the body eliminate the need for external manifold pipes between the hinges. Each pair of rams requires only one opening and one closing line. There are two opening and two closing hydraulic ports, clearly marked, on the back side of the BOP. The extra hydraulic ports facilitate connecting the control system to the preventor. A standard hydraulic accumulator unit will close any Modular NXT ram with rated working pressure in the well bore.

**Ultra-Temp™**

The conservative Shaffer™ testing procedures call for maintaining pressure and temperature for the duration of the test. Even with these stringent demands, the Ultra-Temp ram holds in witnessed testing. Shaffer™Ultra-Temp ram assemblies are designed to safely withstand wellbore pressures up to 15,000 psi and some temperatures up to 250°F (121°C) for prolonged periods. This translates into rigsite capability to safely evacuate personnel and equipment in the event of a major high temperature, high pressure kick.

**Low Force Blind Shear (LFS) Rams**

The force required to shear casing is reduced by at least 50%. The LFS Ram uses 14", 113/4", Q-125 casing at 2700 psi with a 22" operator. Multiple shear and seal sequences can be performed with the same assembly, including conditions where the drill pipe is hanging-off below the shear ram cavity, enhancing reliability and extending the life of the BOP stack deployment.

- Less pressure required to shear
- Capable of centering pipe before shearing
- Shearing range
- Wireline to 14"
- Temperature Range: 30°F to 170°F (-3°C to 77°C)

**Wellbore Cavities**

The introduction of no weld cavities in previous Shaffer™ BOP designs is carried on in the NXT models. This feature introduces replaceable parts to the cavity to eliminate extensive in-shop repairs and post weld heat treatments. The seal seat, skid plate and side pads can be replaced using the BOP cavity tolerances to as new condition.

---

18-15m NXT BOP Assembly Features

- **Supported Inner Diameter Range:**
  - 3 1/2" - 5 7/8"
  - 4 1/2" - 6 5/8" HT
  - 5" - 7 5/8"

---

**Shaffer™ NXT BOP Systems** are unique in providing a means of significantly improving safety and efficiency in the critical path of activity. With the replacement of the door roots in all BOP's, National Oilwell Varco has eliminated the time consuming manual practice of using brute force to torque up numerous large door bolts. A number of benefits have been realized with this development:

- Reduced Weight (lightest BOP systems in the industry)
- Reduced Height (smallest BOP systems in the industry)
- Elimination of Manual Labor Under Time Pressure

**Multi-Rams**

Shaffer™ addresses the need for changing out rams on a tapered drilling by offering Multi-Ram assemblies to cover a range of varying ODs of drill pipe.
Hydraulic ports facilitate connecting the control system to the preventer. As a standard, Oilwell Varco has eliminated the time-consuming manual practice of using brute force to torque up numerous large door bolts. A number of benefits have been realized with this development:

- Reduced Weight (lightest BOP systems in the industry)
- Reduced Height (smallest BOP systems in the industry)
- Elimination of Manual Labor Under Time Pressure

## Upper Multi-Rams
- Supported Inner Diameter Range:
  - 3 1/2" - 5 7/8"
  - 3 1/2" - 6 5/8"
  - 4 1/2" - 6 6/8" HT
  - 5" - 7 5/8"

## Ultra-Lock II (B) Door
- Hydraulic System
  - Hydraulically powered to operate a Model NXT-M ram BOP can be furnished by any standard oil field accumulator system. Hydraulic passages drilled through the body eliminate the need for external manifold pipes between the hinges. Each set of rams requires only one opening and one closing line. There are two opening and two closing hydraulic ports, clearly marked, on the back side of the BOP. The extra hydraulic ports facilitate connecting the control system to the preventer. A standard hydraulic accumulator unit will close any Model NXT-M ram with rated working pressure in the well bore.

**Ultra-Temp™**

The conservative Shaffer™ testing procedures call for maintaining pressure and temperature for the duration of the test. Even with these stringent demands, the Ultralamp rams hold in witnessed testing. Shaffer™ Ultra-temp ram assemblies are designed to safely withstand wellbore pressures up to 15,000 psig and extremes of temperature up to 392°F (200°C) for prolonged periods. This translates into rig capability to safely evacuate personnel and equipment in the event of a major high temperature, high pressure kick.

## Low Force Blind Shear (LFS) Rams
- The force required to shear casing is reduced by at least 50%. The LFS Rams save 14", 113psf, Q-125 casing at 2700 psi with a 22" operator. Multiple shear and seal sequences can be performed with the same assembly, including conditions where the drill pipe is hung, off the shear ram cavity, enhancing reliability and extending the length of the BOP stack deployment.

### Multi-Rams
- Supported Inner Diameter Range:
  - 3 1/2" - 5 7/8"
  - 3 1/2" - 6 5/8"
  - 4 1/2" - 6 6/8" HT
  - 5" - 7 5/8"

## Weldless Cavity
- The introduction of weld cavities in previous Shaffer™ BOP designs is carried on in the NXT-M models. This feature intends replaceable parts to the cavity to eliminate extensive in-shop repairs and post weld heat treatments. The seal, skid plate and side pads can be replaced upgrading the BOP cavity to new condition.

### CREP - Corrosion Resistance Enhancement Package
- BOP Body - CREP Overview

## 14” Ultra Lock II (B) Door
- Hydraulically powered to operate a Model NXT-M ram BOP can be furnished by any standard oil field accumulator system. Hydraulic passages drilled through the body eliminate the need for external manifold pipes between the hinges. Each set of rams requires only one opening and one closing line. There are two opening and two closing hydraulic ports, clearly marked, on the back side of the BOP. The extra hydraulic ports facilitate connecting the control system to the preventer. A standard hydraulic accumulator unit will close any Model NXT-M ram with rated working pressure in the well bore.

**Ultra-Temp™**

The conservative Shaffer™ testing procedures call for maintaining pressure and temperature for the duration of the test. Even with these stringent demands, the Ultralamp rams hold in witnessed testing. Shaffer™ Ultra-temp ram assemblies are designed to safely withstand wellbore pressures up to 15,000 psig and extremes of temperature up to 392°F (200°C) for prolonged periods. This translates into rig capability to safely evacuate personnel and equipment in the event of a major high temperature, high pressure kick.

## Low Force Blind Shear (LFS) Rams
- The force required to shear casing is reduced by at least 50%. The LFS Rams save 14", 113psf, Q-125 casing at 2700 psi with a 22" operator. Multiple shear and seal sequences can be performed with the same assembly, including conditions where the drill pipe is hung, off the shear ram cavity, enhancing reliability and extending the length of the BOP stack deployment.

### Multi-Rams
- Supported Inner Diameter Range:
  - 3 1/2" - 5 7/8"
  - 3 1/2" - 6 5/8"
  - 4 1/2" - 6 6/8" HT
  - 5" - 7 5/8"
Corrosion Resistant Enhancement Package (CREP) - Sheet 1 of 2

CREP Purpose and Definition

In an effort to reduce corrosion in the critical sealing areas of the BOP’s, NOV provides a Corrosion Resistant Enhancement Package (CREP) on all of the 18-3/4” NXT and SLX BOPs. This CREP package is designed to reduce down time and extend the useful life of the BOP assembly prior to the need for field machining on the BOPs. On the BOP bodies, NOV only provides the maximum level of protection. Customers can choose the level of protection they desire for the BOP doors. This sheet describes the different CREP options available. Coating and inlay locations are indicated by the shaded areas on the included graphics. Incrol is inlaid, while chrome, ever-silk®, and phosphate are applied as coatings. The information provided is derived from NOV Engineering Specification AX0710224.

NXT Body View

<table>
<thead>
<tr>
<th>AREA</th>
<th>CREP LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Incrol</td>
</tr>
<tr>
<td>Top Seat</td>
<td>Incrol</td>
</tr>
<tr>
<td>Bottom Seat</td>
<td>Incrol</td>
</tr>
<tr>
<td>Hydraulic Ports</td>
<td>Incrol</td>
</tr>
<tr>
<td>Ring Grooves</td>
<td>Incrol</td>
</tr>
</tbody>
</table>
### Corrosion Resistant Enhancement Package (CREP) - Sheet 2 of 2

#### 22” PosLock Door
- Cylinder Head Cylinder Seal
- Manifold Ports
- Cylinder Bore
- Packing Ports
- Door Seal Race Track
- Tail Shaft Bore

#### 14” PosLock Booster Door
- Cylinder Head Cylinder Seal
- Manifold Ports
- Cylinder Bore
- Door Seal Race Track
- Lock Bar Grooves (Top and Bottom)
- Hinge Pin Holes
- Manifold Ports
- Door Cylinder Seal

#### 14” UltraLock II(B) Door
- Cylinder Head Cylinder Seal
- Manifold Ports
- Cylinder Bore
- Door Seal Race Track
- Hydraulic Port

#### NX Door CREP Levels - 22” PosLock Door

<table>
<thead>
<tr>
<th>Door Area</th>
<th>CREP Level H</th>
<th>CREP Level J</th>
<th>CREP Level K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder Head Cylinder Seal</td>
<td>Cyl-60®</td>
<td>Cyl-60®</td>
<td>Cyl-60®</td>
</tr>
<tr>
<td>Manifold Ports</td>
<td>Ever-slik®</td>
<td>Ever-slik®</td>
<td>Incanal</td>
</tr>
<tr>
<td>Cylinder Bore</td>
<td>Phosphate</td>
<td>Chrome</td>
<td>Chrome</td>
</tr>
<tr>
<td>Packing Bore</td>
<td>Incanal</td>
<td>Incanal</td>
<td>Incanal</td>
</tr>
<tr>
<td>Lock Bar Grooves</td>
<td>Phosphate</td>
<td>Phosphate</td>
<td>Phosphate</td>
</tr>
<tr>
<td>Hinge Pin Holes</td>
<td>Phosphate</td>
<td>Incanal</td>
<td>Incanal</td>
</tr>
<tr>
<td>Door Cylinder Seal</td>
<td>Ever-slik®</td>
<td>Ever-slik®</td>
<td>Incanal</td>
</tr>
<tr>
<td>Tail Shaft Bore</td>
<td>Phosphate</td>
<td>Phosphate</td>
<td>Incanal</td>
</tr>
</tbody>
</table>

#### NX Door CREP Levels - 14” PosLock Booster Door

<table>
<thead>
<tr>
<th>Door Area</th>
<th>CREP Level H</th>
<th>CREP Level J</th>
<th>CREP Level K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder Head Cylinder Seal</td>
<td>Phosphate</td>
<td>Phosphate</td>
<td>Incanal</td>
</tr>
<tr>
<td>Booster Cylinder Bore</td>
<td>Chrome</td>
<td>Chrome</td>
<td>Chrome</td>
</tr>
<tr>
<td>Middle Head Cylinder Seal</td>
<td>Phosphate</td>
<td>Phosphate</td>
<td>Incanal</td>
</tr>
<tr>
<td>Middle Head Manifold Ports</td>
<td>Phosphate</td>
<td>Phosphate</td>
<td>Incanal</td>
</tr>
<tr>
<td>Packing Ports</td>
<td>Incanal</td>
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<td>Incanal</td>
</tr>
<tr>
<td>Door Cylinder Seal</td>
<td>Ever-slik®</td>
<td>Ever-slik®</td>
<td>Incanal</td>
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<tr>
<td>Tail Shaft Bore</td>
<td>Phosphate</td>
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<td>Incanal</td>
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</table>

#### NX Door CREP Levels - 14” UltraLock II(B) Door

<table>
<thead>
<tr>
<th>Door Area</th>
<th>CREP Level H</th>
<th>CREP Level J</th>
<th>CREP Level K</th>
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<tr>
<td>Cylinder Head Cylinder Seal</td>
<td>Phosphate</td>
<td>Phosphate</td>
<td>Incanal</td>
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<tr>
<td>Door Cylinder Seal</td>
<td>Phosphate</td>
<td>Chrome</td>
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<tr>
<td>Cylinder Bore</td>
<td>Phosphate</td>
<td>Incanal</td>
<td>Incanal</td>
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<tr>
<td>Packing Bore</td>
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<td>Hydraulic Ports</td>
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<td>Door Seal Race Track</td>
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<td>Incanal</td>
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</tbody>
</table>

**For reference only, please contact your local sales contact for more information.**

*rig@nov.com*
LFS-5 is the latest application of the NOV Low Force Shear technology, now with enhanced shearing performance on high-strength, heavy-weight drill pipe and landing string. Through creative engineering, the centering assembly has been eliminated while maintaining pipe centering geometry across the entire width of the wellbore. Only NOV can shear and seal today’s stronger drill pipe and landing strings.

**Features**
- Shear efficiencies improved by up to 40%
- Automatically centers pipe by sweeping the entire throughbore to accommodate off-center wire line
- Centers pipe with 10,000 lbs side pull
- Designed to shear and seal landing string and work string consecutively
- Passed API16A qualification testing
- Rated ED (90° to 210°)
- Will retrofit to current LFS capable doors
- Improved seal design with increased cycle life

**Ram Geometry**

**Proven Performance Results**

**LFS-5 Shear Performance**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PIPE OD</th>
<th>LB/FT</th>
<th>GRØDE</th>
<th>OPMD/HDR</th>
<th>LFS-5 ACTUAL SHEAR PRESSURE</th>
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<tr>
<td>Drill Pipe</td>
<td>5.875</td>
<td>27</td>
<td>S-135</td>
<td>22°</td>
<td>11180</td>
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<tr>
<td>Total</td>
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<td>0.45</td>
<td>S-135</td>
<td>22°</td>
<td>1069</td>
</tr>
<tr>
<td>Total</td>
<td>0.24</td>
<td>0.45</td>
<td>S-135</td>
<td>22°</td>
<td>1069</td>
</tr>
<tr>
<td>Landing String</td>
<td>0.625</td>
<td>0.04</td>
<td>V-150</td>
<td>22°</td>
<td>4036</td>
</tr>
<tr>
<td>Landing String</td>
<td>0.625</td>
<td>0.04</td>
<td>V-150</td>
<td>22°</td>
<td>4036</td>
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<tr>
<td>Casing</td>
<td>10.75</td>
<td>0.06</td>
<td>Q-125</td>
<td>22°</td>
<td>2040</td>
</tr>
<tr>
<td>Casing</td>
<td>10.75</td>
<td>0.06</td>
<td>Q-125</td>
<td>22°</td>
<td>2040</td>
</tr>
</tbody>
</table>

**Successful Shear and Seal**
- 6 7/8", 50ppf, S-135 followed by 5 7/8", 27ppf, S-135
- 6 7/8", 57ppf, UD-165 followed by 5 7/8", 27ppf, S-135
- 6 7/8", 64ppf, V-150 followed by 5 7/8", 27ppf, S-135
- 7 7/8", 5 1/2", VT, CR-115 followed by 5 7/8", 27ppf, S-135
- THR-A followed by 5 7/8", 27ppf, S-135
- 7 7/8", 54ppf, V-150 followed by 6 7/8", 27ppf, S-135
- 10 5/8", 104ppf, P-110 followed by 10 5/8", 104ppf, P-110
- 14", 115ppf, Q-125 followed by 14", 115ppf, Q-125

“All of the above shear and seal tests (and more) were performed using the same set of shear rams.”

**Shear and Seal Wireline**
- Schlumberger 7-48A SUS
- Rochester 7-H-490K
- Rochester 1-H-334K

“All with no tension on wireline.”

*For reference only, please contact your local sales contact for more information.*
The RCX Multiplex (MUX) Pod is NOV’s next generation control system. Components from Sub-pla to Mounted Valves (SPM) to the full electronics package were targeted to improve quality. Combining high reliability achieved through meticulous component redesign with retrievability, the RCX system was built to keep you drilling.

The pod takes in hydraulic supply, electrical power, and control data from the rig and distributes pressure via a network of valves to individual stack-mounted functions. Each valve is controlled by a pilot valve which is solenoid operated and controlled by the Subsea Electronics Assembly (SEA).

Features
- Retrievable
- RCX Low Shock SPM Valves
- Dual pod design with independent retrieval for both BOP and LMRP sections
- Improved packer seal design
- Pod-mounted manifold for directing fluid from either conduit to either pod
- Manifold-to-manifold connections use dual seal, seal subs
- Streamlined footprint
- Ergonomically designed user interface & HMI
- Unique pod ID - function counting capability even on test stand

Technical Specifications

- Operating pressure: 5000 psi
- Combined weight: 40,000 lbs
- Operating Fluid: Water / Glycol / Soluble oil mix
- Max Allowable Working Depth: 12,000 ft
- Functions: 140
- Voltage Rating: 480 V AC
- Temperature Rating: -20°C to 50°C

Other Specifications

- Piping of 1/2” and larger functions use schedule pipe with socket welded connections, terminating in SAE Code 62, dual seal connections
- Pilot lines are 1/4” tubing using Swagelok connectors and SAE O-ring boss connections
- Compensated Chamber Solenoid Valves (CCSVs)
- Pressure balanced 12-strand (BOP) Cables
- Machined Stainless Steel Frame - no welding

Description

The RCX Multiplex (MUX) Pod is NOV’s next generation control system. Components from Sub-plate Mounted Valves (SPM) to the full electronics package were targeted to improve quality. Combining high reliability achieved through meticulous component redesign with retrievability, the RCX system was built to keep you drilling.

The pod takes in hydraulic supply, electrical power, and control data from the rig and distributes pressure via a network of valves to individual stack-mounted functions. Each valve is controlled by a pilot valve which is solenoid operated and controlled by the Subsea Electronics Assembly (SEA).
RCX Low-Shock SPM Valves

Sub Plate Mounted (SPM) valves are 3-way, 2-position fluid control valves. SPM valves are used throughout National Oilwell Varco (NOV) control systems to direct hydraulic fluid within hydraulic circuits.

• Created to address industry requests for a more robust and reliable valve.
• Direct circuit replacements with matched flow rates. Closing times are not affected.
• Utilize improved materials and are designed to reduce hydraulic shock (water hammer). Test data provided on sheet 2.
• Must be used with RCX Low-Shock SPM valve blocks. RCX Low-Shock SPM valve blocks may be re-machined to NOV specifications. Non-RCX Low-Shock blocks cannot be re-machined.

**RCX Low-Shock SPM Valve Components**

- SPM valve engraved with identification
- SPM valve block stamped with identification
- SPM valve block re-machinable
- Assembly tag stamped with SPM + valve block assembly ID
- Spring chamber filled with control fluid to prevent corrosion
- Cap threads made from high-strength copper alloy for anti-galling properties
- Seawater chamber drains through milled slot
- Keyhole assembly of actuator rod and spool eliminates retainer nut (see Detail View - B)
- Spool support improved by moving wear bands further apart (see Detail View - A)
- Spool clearances and line-on-line spool timing (opening/closing) of vent and supply port used to minimize interflow
- Cage flow areas designs to gradually open and close the supply and vent chambers as the spool shifts
- Improved cage seals (Hy-gap) designed to accommodate cavity rework and larger extrusion gaps
- Improved cage designed to prevent “crushing”
### Pod Select Legend
- Supply Port - Standard SPM - Yellow pod
- Work Port - Standard SPM - Blue pod
- Supply Port - Low-Shock SPM - Blue pod
- Work Port - Low-Shock SPM - Blue pod

### High Pressure Shear Accumulator Legend
- Pod Manifold Supply
- HP Upper Shear Close @ SPM Work Port
- HP Upper Shear Close @ Accumulator

### High Pressure Upper Shear Legend
- Pod Manifold Supply
- HP Upper Shear Close @ SPM Work Port
- HP Upper Shear Close @ Operator Door
- LMRP Accumulator Supply @ Accumulator

### Standard RCX Low-Shock

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<thead>
<tr>
<th>Value Size</th>
<th>Value Configuration</th>
<th>Value &amp; Block Assembly P/N</th>
<th>Value Application</th>
<th>Value Only P/N</th>
<th>Spare Kit P/N</th>
<th>Repair Kit P/N</th>
<th><strong>Block Only P/N</strong></th>
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<td>FRS</td>
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<td>11449364-001</td>
<td>11449364-001</td>
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<tr>
<td>1 1/4”</td>
<td>MC (Normally Closed)</td>
<td>11449364-001</td>
<td>None</td>
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</table>

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For reference only, please contact your local sales contact for more information.

rig@nov.com
The National Oilwell Varco (NOV) Koomey® Emergency Hydraulic Back-up System (EHBS) is an independent hydraulic control pod mounted on the lower BOP stack. When armed, the EHBS pod performs automatically in the event main conduit hydraulic pressure and electric power to the BOP control system 112-line MU Pod are disconnected or lost. The EHBS is a reliable safety system that activates customer-specified functions in the event of power failure, riser string disconnect or Lower Marine Riser Package disconnect.

**Adjustable Timing Circuit Actuator**

The Adjustable Timing Circuit Actuator provides a mechanical method for providing a time delay between two hydraulic functions on an (EHBS). The Adjustable Timing Circuit Actuator is easily adjusted to provide a time delay range of 18 to 52 seconds (when supplied with 5,000 psi [345 bar]).

**Operating Principles:**

- No pre-charging for time delay.
- No temperature or depth variables or pre-charge calculations.
- Rugged and reliable.
- Easily adjustable.
- Corrosion resistant.
- Existing timing circuits are easily upgraded.

The system can be deployed as tested.

**Key Benefits:**

- No nitrogen pre-charging for time delay.
- No temperature or depth variables or pre-charge calculations.
- Rugged and reliable.
- Easily adjustable.
- Corrosion resistant.
- Existing timing circuits are easily upgraded.

**Adjustable Actuator**

**Adjustable Actuator Properties**

- **Height:** 50.2” (127.51 cm)
- **Width:** 9.9” (25.15 cm)
- **Depth:** 9.9” (25.15 cm)
- **Weight:** 410 lb (185.0 kg)

**Stack Mounted Timing Circuit Properties**

- **Height:** 50.64” (128.63 cm)
- **Width:** 20.8” (52.83 cm)
- **Depth:** 10.96” (27.84 cm)
- **Weight:** 1,720 lb (780.2 kg)

**Adjustable Actuator—Cross Section**

**Adjustment Range**

- Min: 18-22 Seconds
- Max: 48-52 Seconds

**Adjustment Procedure**

1. Remove the timing adjustment thread cover.
2. Using a socket wrench, thread the adjustment screw inward (shorter delay) or outward (longer delay).
3. Replace the timing adjustment thread cover.

*For reference only, please contact your local sales contact for more information.*
RCX A-HB Pod

The RCX A-HB Pod combines both acoustic and EHBS functionality. Those two circuits are completely isolated hydraulically, however, they share a structural package. Acoustic emergency backup control system provides remote closure of certain BOP stack functions.

• Acoustic emergency back-up consists of two (2) sections of control, acoustic and electrohydraulic
• System is sized for 12,000 feet water depth
• Acoustic Functions will be as listed in later in this document
• System will include HIPAP
• Cables for the connectors to have test ports

Acoustic Electronic Section

• Portable Surface Acoustic Command and Control Unit for two way communication and operation of the control system. Splash proof design, with easy operation from buttons and a small LCD display. Two hands operation of critical BOP functions. Connector for interface to transducer. Internal rechargeable battery for several days’ normal operation. Charges from 100 – 220V AC.
• Dunking Transceiver, with 70M cable
• Acoustic Control Subsea Unit. Fully redundant subsea container, with built in dual lithium, two year operating, batteries and electronics. Each electronic section has interface to dedicated transducer connectors (one for each). The electronics/ transducers communicate with the surface system with individual acoustic addresses. Connector and interface cable to 10 solenoid drivers and read backs are standard. Additional 6 optional drivers with read backs are available. GISMA connectors are delivered as standard.
• 2 Subsea Transceivers. Inclusive of 15 meter cable with GISMA connector
• Simulator for testing of ACS Tool for on-deck-trimming of the ACS before the BOP enters the sea. Connector and interface cable simulating solenoid drivers and read backs are standard. The connector mates directly into the ACS interface cable (solenoid end).

EHBS

Emergency Hydraulic Backup System (EHBS) (also referred to as Auto Shear Circuit), commonly called a “Deadman System” is an independent hydraulic control pod circuit mounted on the BOP stack which performs the following stack functions automatically if main conduit and electrical power to the BOP control system are disconnected or otherwise lost.

The EHBS is hydraulically powered from the stack-mounted Shear Accumulator Bank. The EHBS system consists of the following major components:

• EHBS Assembly, housed in a steel frame attached to the BOP stack. All inputs, outputs and manual valves are labeled. All manifold valve functions are stamped on the manifold.
• On screen activation for simulation of the Deadman Circuits; “Normal Operation / Test” function for simulation of Loss of Electric and Loss of Hydraulic before stack deployment.
• Two (2) Functions: Close Casing Shear and after 20 second, close the upper blind shear rams.
• Will include one additional valve, 3 valves total.
• Timing Circuit included will be mechanical. No pre-charged bottle.

Electrohydraulic Control Section

Electro-hydraulic mini pod to interface between acoustic system and desired functions. The modularly constructed pod will consist of the following:

• One (1) Stainless steel pressure compensated chamber. The chamber is filled with dielectric insulating fluid and compensated by a pressure compensator complete with a relief valve. The chamber is to contain CCSV environmentally protected solenoid actuators.
• One (1) 3m absolute filtration assembly
• One (1) piston type accumulator for supply pressure storage to the CCSV valves.

*For reference only, please contact your local sales contact for more information.
Today’s designed operating environment for stack mounted accumulators is challenging. Design criteria include 12,000 ft water depths, temperatures as low as 12°F with surface temperatures of 110°F, rapid discharge (adiabatic), as well as higher minimum system pressures. All of these things add up to a large number of bottles on a lower BOP stack. It is not uncommon to see as many as 126 accumulator bottles on a lower BOP stack, 98 of which are dedicated to the shear system alone. This adds weight to the overall assembly, increases maintenance requirements, and decreases stack equipment access. By using the water column pressure and mechanically boosting the hydraulic pressure, a Depth Compensated Accumulator has reduced the total number of stack mounted shear circuit bottles dramatically.

Functionality
This system is comprised of a double-piston accumulator. The two pistons are connected by a piston rod. This creates five separate chambers within the DCB, plus the transfer barrier:

- The first two chambers (V1 and V2) contain a Nitrogen pre-charge acting against one piston.
- The third chamber (V3) is a vacuum that acts against the other piston.
- The fourth chamber (V4) is filled with BOP fluid from the transfer barrier. The transfer barrier is open to ambient seawater pressure on one end and forces more fluid into V4 as depth increases.
- The fifth chamber (V5) contains the hydraulic fluid.
- The result is 100% usable hydraulic fluid while subsea.

Estimating the number of bottles required:
1. On the vertical axis, find the required Shear Pressure (including the effects of Mud Weight and Water Depth) and intersect with the curve for DCB bottle type. (Example: 3900 psi, 7.9 Gal DCB)
2. Draw a line down from the point of intersection to the horizontal axis of the chart and read usable volume for one bottle. (Example: 3.6 gal)
3. Multiply the required operator volume by 1.1 (API 16D Volume Design factor) to obtain the total required volume. (Example: 18’-15M NXT 22” Operator, closing volume = 37.3 gal, required volume = 37.3 x 1.1 = 41.03 gal)
4. Divide the required volume by the usable volume for one bottle to obtain the required number of bottles. (Round up to the next whole number.) (Example: 41.03/3.6 = 11.4, round up to 12 bottles)

Equation
Required Operational Volume X 1.1
Volume Used Per Bottle
Number of Bottles Required
(Round Up)

Note: This is only an estimate. Contact NOV Pressure Control Engineering for certified calculations.

For reference only, please contact your local sales contact for more information.

rig@nov.com  nov.com
P/N 20090035 configuration

Nitrogen Pressure Chamber - V2

Nitrogen Pressure Chamber - V2

Connectors

Anti-extrusion Rod

Shell

Hydraulic Pressure Chamber - V5

Hydraulic Connection

Bladder

Seawater Chamber - V4

Note: Seawater Chamber is filled with BOP fluid from transfer barrier

Poppet Valve

Seawater Port

Vacuum Chamber - V3

Vacuum Chamber Gas Valve - V3

Specifications

<table>
<thead>
<tr>
<th>P/N</th>
<th>V1 VOLUME (GAL)</th>
<th>V2 VOLUME (GAL)</th>
<th>HEIGHT (IN)</th>
<th>WIDTH (IN)</th>
<th>DEPTH (IN)</th>
<th>WEIGHT (LB)</th>
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<tbody>
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</table>

*Transfer barrier can be mounted separately if desired*

P/N 10641709-003 configuration

Nitrogen Pressure Chamber - V2

Nitrogen Pressure Chamber - V2

Bladder

Shells

Seawater Chamber - V4

Note: Seawater Chamber is filled with BOP fluid from transfer barrier

Hydraulic Pressure Chamber - V5

Hydraulic Connection

Test Port

Seawater Port

Vacuum Chamber - V3

Vacuum Chamber Gas Valve - V3

Specifications

<table>
<thead>
<tr>
<th>P/N</th>
<th>V1 VOLUME (GAL)</th>
<th>V2 VOLUME (GAL)</th>
<th>V3 VOLUME (GAL)</th>
<th>HEIGHT (IN)</th>
<th>WIDTH (IN)</th>
<th>DEPTH (IN)</th>
<th>WEIGHT (LB)</th>
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</table>

10641709-002

10641709-004

10641709-005

For reference only, please contact your local sales contact for more information.

rig@nov.com
Hands Free Gooseneck Overview

NOV understands the oil and gas industry, and with it, the inherent dangers of rig personnel working inside the moon pool area. Manual goosenecks have a tendency to have long connection times and are difficult to manage, leaving an opportunity for both equipment damage as well as exposing rig personnel to potentially harmful situations.

With an eye ever towards the needs of our customer, NOV is proud to introduce the Hands Free Gooseneck System (HF GS). NOV’s HF GS eliminates the need to have rig personnel in potentially hazardous environments and with the addition of rotating stabs, the BOP stack has easy access beneath the drill floor.

Manual Swivel Gooseneck

The hands free gooseneck stabs are designed such that they may swing in the clockwise and counterclockwise directions by manually pulling the hose in the desired plane of rotation, making way for any equipment which must find its way to well center. The unit is available in 75 1/2” and 60 1/2” diverter sizes.

1. Visual Position Rod to verify successful stab with the telescopic joint
2. Secondary locking to prevent unintentional un-stabbing of the gooseneck with the telescopic joint
3. Emergency packing element to temporarily seal potential leaks
4. API Flange or Hub moon pool hose connections, customizable to customer preference.

Features

• Simple connection process
• Improved Safety
• No manual intervention required
• Rotating cartridge assemblies
• Modular Components
• Quick disconnects to facilitate connection of control hoses
• Emergency packing element in each cartridge
• Safety interlocks to prevent unintended operation of HF GS functions

Benefits

• Removes personnel from working over water in a riding belt
• Connection process is reduced from hours to minutes
• Can be retrofitted to existing NOV riser systems with minimal modifications
• Eliminates damage from manually stabbing individual goosenecks using snatch blocks and tuggers
• Modular configuration provides for common spare parts

Testing

• Designed and tested to API 16F Specifications
• Each Hands Free Gooseneck is stab tested with a Telescoping Joint prior to shipment

Top View

Front View

Perspective View

*For reference only, please contact your local sales contact for more information.

rig@nov.com  nov.com
Dog Type 2™ Flange Type-E™ Flange Type-H™ Flange Type-H DG™

## Specifications

### Flange Type-E™

- **Service Load**: 2,000,000 lb.
- **OD Pipe**: 21" (Duplex SS)
- **Unique Configurations**: 5 Line (Choke, Kill, Mud Return, Seawater, 2x Hydraulic)
- **Foot Lengths**: 5, 10, 20, 25, 40, 90
- **Wall Thickness**: 7/8" and 15/16"
- **Line Configurations**: 2 Line (Choke, Kill, Booster, in Hydraulic)
- **Flange Configurations**: 7/8" and 15/16" with split hydraulic lines.
- **Glycol Pocket**: Between Hyds
- **Line Pressures and Sizes**: 15K / 6.5"x4.5" and 10K / 5"x4"
- **Other**: All flanges are 90 degrees apart with split hydraulic lines.

### Flange Type-H™

- **Service Load**: 3,000,000 lb.
- **OD Pipe**: 21" (Duplex SS)
- **Unique Configurations**: 5 Line (Choke, Kill, Mud Return, Seawater, 2x Hydraulic)
- **Foot Lengths**: 5, 10, 20, 25, 40, 90
- **Wall Thickness**: 7/8" and 15/16"
- **Line Configurations**: 2 Line (Choke, Kill, Booster, in Hydraulic)
- **Flange Configurations**: 7/8" and 15/16" with split hydraulic lines.
- **Glycol Pocket**: Between Hyds
- **Line Pressures and Sizes**: 15K / 6.5"x4.5" and 10K / 5"x4"
- **Other**: All flanges are 90 degrees apart with split hydraulic lines.

### Flange Type-H DG™

- **Service Load**: 4,000,000 lb.
- **OD Pipe**: 21" (Duplex SS)
- **Unique Configurations**: 5 Line (Choke, Kill, Mud Return, Seawater, 2x Hydraulic)
- **Foot Lengths**: 5, 10, 20, 25, 40, 90
- **Wall Thickness**: 7/8" and 15/16"
- **Line Configurations**: 2 Line (Choke, Kill, Booster, in Hydraulic)
- **Flange Configurations**: 7/8" and 15/16" with split hydraulic lines.
- **Glycol Pocket**: Between Hyds
- **Line Pressures and Sizes**: 15K / 6.5"x4.5" and 10K / 5"x4"
- **Other**: All flanges are 90 degrees apart with split hydraulic lines.

### Notes

- For reference only, please contact your local sales contact for more information.
- *rig@novo.com*

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NVO Technologies
The CHX model connector is an industry leader in bending load capacity. Mechanical engagement of the unlocking piston to the finger segments, a 27% higher unlocking force to locking force, and a secondary unlocking piston ensures full release of the connector segments from the wellhead.

A wide variety of option features including top connection, gasket control features, porting types, and corrosion prevention measures, provide flexibility to meet customer satisfaction.

Standard Features
- Industry leading bending and tension capacity
- Unlock force 27% greater than locking force
- Load path directly through self-locking segments
- Secondary unlocking piston for increased detachment reliability
- Two visual piston position indicator rods that engage with the annular piston to ensure an accurate reading. Both with life cycle grooves for easy connector life wear inspections
- Hydraulic and spring operated gasket retention pins
- Hydraulic gasket nudge pins
- Inconel inlay on all sealing surfaces
- Weep hole porting for quick testing validation
- ID running tool alignment slot
- Molded, bi-directional T seals with dual polyurethane back up extrusion protection
- Wear band protection against piston cylinder galling

Available Options
- CREP level packages
- Detachable WLHD funnel down assembly
- Various API top flange connections
- Multiple gasket control feature configurations
- Various hydraulic porting connection types
- Adapter kit which allows for a 27” H4 locking profile

Other Benefits
- 92% Surface coverage on locking profile allows for higher pre-load without damaging wellhead / mandrel
- Lead in alignment that eliminates potential gasket contact when landing on the wellhead
- Design flexibility with integrated stack controls

Design Validation Testing
- Sealing Mechanism (Wellbore Shell)
- Tension / Bending Capacity
- Seal Life Cycle Fatigue
- Piston Displacement
- Hub Separation
- Stack Pull (Gimbal) Simulation
- Vibration Simulation
- Locking Relationship Validation
- High & Low Temperature Testing
- Function Life Cycle Fatigue
- Friction Validation

All values are preliminary and are subject to change. Full capacity values are based on FEA and will be confirmed with testing.
The CMX-1527 connector includes a patent pending floating hydrate seal that allows for extreme angle release, while maintaining hydrate prevention during operation.

Mechanical engagement of the unlocking piston to the finger segments, a 43% higher unlocking force to locking force, and a secondary unlocking piston ensures full release of the connector segments from the mandrel or wellhead.

A wide variety of option features including top connection, gasket control features, porting types, and corrosion prevention measures provide flexibility to meet customer satisfaction.

**Standard Features:**
- High angle release capability
  - Stationary upper support (patent pending)
- Floating hydrate seal (patent pending)
- Competitive bending and tension capacity
- Unlock force 43% greater than locking force
- Load path directly through sel locking segments
- Two visual piston position indicator rods that engage with the annular piston to ensure an accurate reading. Both with life cycle grooves for easy connector life wear inspections.
- Hydraulic and spring operated gasket retention pins
- Weep hole porting for quick testing validation
- ID running tool alignment slot

**Available Options:**
- CREP level packages
- Detachable LMRP alignment / WLHD funnel down assembly
- Various API top flange connections
- Multiple gasket control feature configurations
- Various hydraulic porting connection types

**Benefits:**
- Added HAR capability with floating hydrate seal design
- 92% Surface coverage on locking profile allows for higher pre-load without damaging wellhead/mandrel
- Lead in alignment that eliminates potential gasket contact when landing
- Design flexibility with integrated stack controls
- Improved delivery times

---

**Technical Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Bending Load Capacity</td>
<td>75 mm H2O</td>
</tr>
<tr>
<td>Pure Tension Load Capacity</td>
<td>6.75 mm H2O</td>
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<tr>
<td>Preload</td>
<td>4.9 mm H2O</td>
</tr>
<tr>
<td>Locking Volume</td>
<td>10.6 Gal</td>
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<tr>
<td>Unlocking Volume</td>
<td>15.4 Gal</td>
</tr>
<tr>
<td>Max Internal Pressure</td>
<td>15,000 psi</td>
</tr>
<tr>
<td>Max Hydraulic Operating Pressure</td>
<td>15,800 psi</td>
</tr>
<tr>
<td>Stack Up Height</td>
<td>10.3 in.</td>
</tr>
<tr>
<td>Stack Down Height</td>
<td>20.3 in.</td>
</tr>
</tbody>
</table>

---

**Technical Marketing Sheet**

CMX-1527 LMRP/WLHD Connector

---

**Design Validation Testing:**
- Sealing Mechanism (Wellbore Shell)
- Tension/Bending Capacity
- Seal Life Cycle Fatigue
- Piston Displacement
- Hub Separation
- Stack Pull (Gimbal) Simulation
- Vibration Simulation
- Locking Relationship Validation
- High & Low Temperature Testing
- Function Life Cycle Fatigue
- High Angle Release

---

*For reference only, please contact your local sales contact for more information.*
Type FT-H/FT-HB

The shuttle stack tool is used as a lifting tool for the riser string and BOP stack when the vessel needs to move a short distance. The shuttle stack tool is comprised of two main parts, the riser shuttle joint and the shuttle tool assembly. The riser shuttle joint is installed beneath the telescopic joint and functions as another joint of riser during normal operations. However, the riser shuttle joint has a large locking area in which the shuttle tool assembly’s six lock dogs can engage.

Hydraulic Locking System

The Shuttle Tool hydraulic circuit is equipped with a pilot operated check valve. This allows the operator to first activate the pilot operated check valve before functioning the tool to the unlock position. This procedure prevents the Shuttle Tool from being inadvertently unlocked:

- Stab the shuttle tool pin into the riser shuttle joint box connection
- Apply 1500 psi hydraulic pressure to the shuttle tool’s lock side hydraulic circuit

Shuttle Tool Uses

The Shuttle Tool does not carry over 500T.

- Re-landing the LMRP/BOP
- Move or reorient the BOP Stack
- Location Hopping for Short Distances
- Perhaps fully utilizing the Dual Activity Rigs

Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe Working Load</td>
<td>500 Tons (454 Tonnes)</td>
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<tr>
<td>Estimated Weight</td>
<td>16,904 lb. (7,670 kg.)</td>
</tr>
<tr>
<td>Weight: Riser Shuttle Joint Only</td>
<td>9,118 lb. (4,136 kg.)</td>
</tr>
<tr>
<td>Weight: Shuttle Tool Only</td>
<td>5,916 lb. (2,683 kg.)</td>
</tr>
<tr>
<td>Length: (whole Assembly)</td>
<td>105' (32.0 m)</td>
</tr>
<tr>
<td>Length: Riser Shuttle Joint Only</td>
<td>105' (32.0 m)</td>
</tr>
<tr>
<td>Length: Shuttle Tool Only</td>
<td>5' (1.5 m)</td>
</tr>
<tr>
<td>Hydraulic Fluid</td>
<td>Type FT-H / FT-HB</td>
</tr>
<tr>
<td>Operating Fluid</td>
<td>BOP Fluid or Hydraulic Oil</td>
</tr>
</tbody>
</table>

*For reference only, please contact your local sales contact for more information.
Pumping and Circulation Equipment

- 14-P-220 Triplex mud pump
- Choke and kill manifold
- Brandt centrifuge
- Brandt agitators
- Brandt shakers
- Brandt shaker screens
National Oilwell Varco provides smooth Triplex performance and high efficiency from the 14-P-220 Mud Pump. Its compact engineering provides higher efficiency in less space. The pump’s light weight and flexible design make it easily adaptable to a variety of rig configurations. This provides flexibility as drilling requirements and conditions change.

Key Features:
- Adaptability to a variety of drive arrangements on either sides or on both sides
- Belt Drive
- Premium module has a four-year, 100% warranty against cracking
- Crankshaft carries a seven-year limited warranty

Belt Drive
- Belt life in excess of
- Fabricated steel frame construction
- No welding

Fluid End Modules
- Standard module carries a three-year, 100% warranty against cracking
- Premium module has a four-year, 100% warranty against cracking
- Crankshaft carries a seven-year limited warranty

Technical Specifications
- Power End
  - Fabricated steel frame construction
  - One-piece forged steel construction crankshaft, connecting rod and green shaft
  - Adaptable to a variety of drive arrangements on either sides or on both sides
  - Premium roller bearings to enhance smooth performance and efficiency
- Belt Drive
  - Belt life in excess of 10 years delivers an effective drive solution with the lowest cost of ownership in the industry
  - No requirement for lube oil filter, cable, cable trays, MCC cubicles, starters
- Forged steel crankshaft
  - One-piece forged steel crankshaft with pressed fit bearing journals
  - Naturally balanced for smooth running
  - No casting
  - No welding

Optional Accessories
- Hydrolign™ piston rod
- Blak-JAK™ liner retention system
- Blak-JAK™ Torque master quick change valve cover retention system
- Pneumatic pump rotation tool

Warranties
- The standard module carries a three-year, 100% warranty against cracking
- The premium module has a four-year, 100% warranty against cracking
- Crankshaft carries a seven-year limited warranty

Performance 14-P-220
- Max. discharge pressure, psi of 14-P-220 with 2795 psi high pressure flush end
- Discharge pressure, psi
- Stroke, inches (mm)
- Max. fluid cylinder liner bored, inches (mm)
- Rated pump speed, spm
- Maximum input horsepower (kW)
- Height, floor to top of gear case, inches (mm)
- Weight - complete, less sheave, lbs. (kg)
- Fluid End Modules
- NOV offers a choice of fluid end modules and valve covers for every P-Series pump model to select the fluid end module that exactly matches the drilling requirements. All pump models can be equipped with either the standard or premium forged two-piece interchangeable fluid modules.

Fluid End key features
- Two-piece modular cylinder design is completely interchangeable between modules
- Fast Change™ screw type valve covers, which facilitate quick removal and installation are currently standardized
- Suction manifold can be equipped with front or side inlet connections
- Discharge piping connects from either side
- Piston and liner chambers are easily accessible and fully open
- Two-piece piston rod construction allows removal of piston without disturbing liner
- Easy-to-operate clamps give positive locking for liners and piston rod assemblies
- Spray system cools and lubricates piston and liner surfaces

Technical Marketing Sheet
14-P-220 Triplex Mud Pump

*For reference only, please contact your local sales contact for more information.
### Local Control Panel
- Dedicated HPU
- Choke position
- Choke speed control
- Pump stroke counter
- Standpipe pressure

### Choke Control Panel
- Data logging
- Choke/Valve control
- Auto line-up functionality
- Auto pressure test available

### Glycol Injection Unit
- Data logging
- Manual and automatic version
- Automatic glycol injection available

### General Specification

<table>
<thead>
<tr>
<th>Design Code</th>
<th>API-6A, API-53, and API-54.6</th>
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</thead>
<tbody>
<tr>
<td>Drive</td>
<td>230V - 60Hz 3-ph</td>
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<tr>
<td>Blowout</td>
<td>4,000 psi (upstream) / 6,000 psi downstream</td>
</tr>
<tr>
<td>Working Pressure</td>
<td>18000 psi (upstream) / 6000 psi downstream</td>
</tr>
<tr>
<td>Temperature Class</td>
<td>P 60°C °C, to 377°C °C</td>
</tr>
<tr>
<td>Material Class</td>
<td>SS 316L, SS 316L</td>
</tr>
<tr>
<td>Plug Size</td>
<td>4-1/2” °C, 6”</td>
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<tr>
<td>Ring Gasket Material</td>
<td>Inconel 625</td>
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<tr>
<td>Top Cover Colour</td>
<td>RAL 9002</td>
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<tr>
<td>API Standard</td>
<td>API-6A with monogram available</td>
</tr>
</tbody>
</table>

### HP Choke & Kill Manifolds
- Choke Control Panel
  - Logging and line-up functionality
  - Pipe stress calculations
- Local Control Panel
  - Automatic glycol injection available
- Glycol Injection Unit
  - Custom design available

### Model Dimensions & Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>CKM-1000 series</th>
<th>CKM-2000 series</th>
<th>CKM-3000 series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>6200 x 3200 x 3000</td>
<td>6200 x 3200 x 3000</td>
<td>7600 x 4600 x 4500</td>
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<td>Weight (kg)</td>
<td>Approx. 25000</td>
<td>Approx. 26000</td>
<td>Approx. 29000</td>
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<tr>
<td>API Standard</td>
<td>Included as Standard **</td>
<td>Included as Standard **</td>
<td>Included as Standard **</td>
</tr>
<tr>
<td>Double Isolation Valve Before The Chokes</td>
<td>N/A</td>
<td>N/A</td>
<td>Included as Standard **</td>
</tr>
<tr>
<td>Double Isolation Valves on Downstream Outlet</td>
<td>N/A</td>
<td>N/A</td>
<td>Optional</td>
</tr>
<tr>
<td>Inlay in Gate Valve Seat Pockets</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Inlay in Gate Valve Bonnet Seat Pockets</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Choke Type</td>
<td>Mission MP X 40d</td>
<td>Mission MP X 40d</td>
<td>Mission MP X 40d</td>
</tr>
<tr>
<td>Manual Override on the Chokes</td>
<td>N/A</td>
<td>N/A</td>
<td>Optional</td>
</tr>
<tr>
<td>Electric Pressure Transmitter Upstream</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Bypass Choke Kill Line</td>
<td>Included as Standard</td>
<td>Included as Standard</td>
<td>Included as Standard</td>
</tr>
<tr>
<td>Interface for Primary And Secondary Kill/Choke Line</td>
<td>N/A</td>
<td>N/A</td>
<td>Included as Standard</td>
</tr>
<tr>
<td>Local Pressure Gauge Upstream</td>
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<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Local Pressure Gauge Downstream</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

*For reference only, please contact your local sales contact for more information.
HS-2172

Description
The HS-2172 series centrifuge uses high G-forces to separate fine solids from liquid. The HS-2172 centrifuge is able to exert up to 2,684 G's on the drilling fluid. It is equipped with a variable frequency drive (VFD) control which provides a controlled application of motor drive power to the centrifuge components. With a process capacity up to 550 gpm (2082 lpm), the HS-2172 centrifuge is able to quickly process high volumes of mud while allowing prescribed mud weights and separation efficiencies to be maintained. This enables the HS-2172 centrifuge to produce fine cut points at higher flow rates, making it ideal for high-flow applications and critical conditions solids control.

Technical Specifications
- Water capacity: 350 gpm (1345 lpm)
- Weight: 8800 lbs (3991 kg)
- Bowl diameter: 18 in (457 mm)
- Bowl length: 60 in (1524 mm)
- Bowl speed: 3200 max; 2600 typical
- Drive: VFD
- Beach angle: 10°
- Bowl diameter (cone): 14 in (356 mm)
- Back drive (cone): 40 hp
- Back angle: 6

**VFD Control Cabinet**

---

HS-1960

Description
The HS-1960 series centrifuge uses high G-forces to separate fine solids from liquid. The HS-1960 centrifuge is able to exert up to 2,480 G's on the drilling fluid. It is equipped with a variable frequency drive (VFD) control which provides a controlled application of motor drive power to the centrifuge components. With a process capacity up to 350 gpm (1325 lpm), the HS-1960 centrifuge is able to quickly process high volumes of mud while allowing prescribed mud weights and separation efficiencies to be maintained. This enables the HS-1960 centrifuge to produce fine cut points at higher flow rates, making it ideal for high-flow applications.

Technical Specifications
- Water capacity: 350 gpm (1345 lpm)
- Weight: 11600 lbs (5262 kg)
- Bowl diameter: 19.4 in (493 mm)
- Bowl length: 60 in (1524 mm)
- Bowl speed: 3200 max; 2400 typical
- Drive: VFD
- Beach angle: 5°
- Bowl diameter (cone): 16.4 in (417 mm)
- Back drive (cone): 40 hp
- Back angle: 6

---

HS-2000

Description
The HS-2000 series centrifuge uses high G-forces to separate fine solids from liquid. The HS-2000 centrifuge is able to exert up to 2,617 G's on the drilling fluid. The HS-2000M is equipped with a variable frequency drive (VFD) control which provides a controlled application of motor drive power to the centrifuge components. With a process capacity up to 250 gpm (946 lpm), the HS-2000M series centrifuge offers outstanding performance over a wide range of drilling applications and conditions.

Technical Specifications
- Water capacity: 250 gpm (946 lpm)
- Weight: 8800 lbs (2177 kg)
- Bowl diameter: 18 in (457 mm)
- Bowl length: 49.5 in (1257 mm)
- Bowl speed: 3200 max; 2200 typical
- Drive: VFD
- Beach angle: 10°
- Bowl diameter (cone): 11 in (279 mm)
- Back drive (cone): 30 hp
- Back angle: 6

---

HS-3400

Description
The HS-3400 series centrifuge uses high G-forces to separate fine solids from liquid. Three models are available: HS-3400F, HS-3400VS and HS-3400FS. The HS-3400VS is able to exert up to 3,180 G's on the drilling fluid. With a process capacity up to 200 gpm (757 lpm), the HS-3400 series centrifuge offers outstanding performance over a wide range of drilling applications.

Technical Specifications
- Water capacity: 200 gpm (757 lpm)
- Weight: 4800 lbs (2177 kg)
- Bowl diameter: 14 in (2177 mm)
- Bowl length: 49.5 in (1257 mm)
- Bowl speed: 3200 max; 2200 typical
- Drive: Fixed
- Beach angle: 10°
- Bowl diameter (cone): 9 in (229 mm)
- Back drive (cone): 30 hp
- Back angle: 6

---

VFD Control Cabinet

All variable frequency drive (VFD) enclosures are designed the same for all centrifuges. VFD’s are rated to match motor and load requirements and are recognized by the American Bureau of Shipping & DNV for hazardous area use. Designed for desert, arctic and hazardous area service, where power disconnect is required for hazardous area duty.

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*For reference only, please contact your local sales contact for more information.*
BRANDT™ Agitators

VMAI-10

Description

The VMAI series mud agitators are vertically mounted with a helical inline gearbox. They are heavy duty mechanical mixers used for viscous fluids such as drilling fluids. The gearbox utilizes a helical bevel gear drive system that reduces the rotational speed of the motor to drive the impeller(s). The impeller shaft is suspended from and attached to the output shaft of the gearbox with a coupling. Each VMAI agitator uses a shaft mounted impeller to maintain a homogenous mixture of liquids and solids within a tank. Impellers are available with flat blades (radial flow), contour blades (axial flow), and canted blades (radial/axial flow). Blades may be installed in single or multiple configurations to provide desired results. Multiple sizes and locations of impeller configurations are available. These agitators are sized to meet all drilling rig needs and have a large and successful install base worldwide.

Technical Specifications

| Dimensions (Least, largest) | 22 in x 22 in x 33 in (559 mm x 559 mm x 890 mm) |
| Weight | Gearbox Helicoidal-Bevel |
| Vacuum Test Pressure | 8 in (203.2 mm) |
| Maximum Torque | 17,912 in-lb (2023.78 Nm) |
| Impeller Shaft Diameter | Various |
| Impeller Shaft Length | 24 in (60.96 cm)|

MA-25RG

Description

The MA-RG series mud agitators are horizontally mounted with a helical bevel gearbox. They are heavy duty mechanical mixers used for viscous fluids such as drilling fluids. The gearbox utilizes a helical bevel gear drive system that reduces the rotational speed of the motor to drive the impeller(s). MA-RG series agitators are very compact. Their low profile reduces headroom requirements and provides more layout space on top of the tanks. They also utilize the same impellers as the VMAI agitators, the main difference being the size and mounting configuration. Multiple sizes and locations of impeller configurations are available. MA-RG agitators are sized to meet all drilling rig needs and have a large and successful install base worldwide.

Technical Specifications

| Dimensions (Least, largest) | 22 in x 22 in x 39 in (559 mm x 559 mm x 991 mm) |
| Weight | Gearbox Helicoidal |
| Vacuum Test Pressure | 8 in (203.2 mm) |
| Maximum Torque | 31,200 in-lb |
| Impeller Shaft Diameter | Various |
| Impeller Shaft Length | 3-4.5 in (76-114 mm) |

23BRGTD-20

Description

The 23BRGTD-20 series agitators are offset parallel vertically c-face mounted motor with a helical bevel gearbox. These agitators are considered high efficiency models because they are a drive designed specifically for mixing and utilize an oversized output shaft and bearings for a robust fit for purpose design for trouble free mixing. The 23BRGTD-20 Series are backed by mixing expertise and state of the art design software that sizes the mixers to allow for optimal mixing with lower HP requirements. These agitators also utilize very high efficiency impellers that have been developed through design and testing at our mixer facility to allow NOV to create more mixing without consuming a lot of power due to low shear and velocities. These are the latest premium models being sold along with BRANDT™ solids control equipment.

Technical Specifications

| Dimensions (Least, largest) | 30 in x 22 in x 44 in (788 mm x 559 mm x 1118 mm) |
| Weight | Gearbox Helicoidal-Bevel |
| Vacuum Test Pressure | 8 in (203.2 mm) |
| Maximum Torque | 31,200 in-lb |
| Impeller Shaft Diameter | Various |
| Impeller Shaft Length | 3-4.5 in (76-114 mm) |

XE-3 High Efficiency Impeller

Description

The XE-3 impeller is designed to provide high flow and low shear with an optimized shape to maximize mechanical strength. Designed using high tech Laser Doppler Anemometry, Digital Particle Image Velocimetry, and Computational Fluid Mixing, the XE-3 impeller is always the right choice for flow controlled processes.

Product Efficiency

- High flow for improved blending and solids suspension applications
- Possible reduction in the horsepower and size of the gear drive required to achieve the desired mixing result

Mechanical Design

- Decreases impeller weight by nearly 40% over other high efficiency impellers
- Longer in-tank shafts can be used without the need for steady bearings

Upgrade Opportunity

- The impeller weight is similar to or less than older, less efficient impeller designs
- The superior performance of the XE-3 High Efficiency Impeller can almost double a canted impeller pumping rate at an equivalent torque level
**VSM™ Multi-Sizer**

The VSM Multi-Sizer is a balanced elliptical motion, fine screen shaker which utilizes three screen decks, an integrated scalping deck and two primary fine screen decks. The three deck design enables two modes of operation; series for recovery of well bore strengthening materials and parallel flow for increased flow capacity. This unit is ideal for offshore clay/gumbo formations, it is an extremely simple machine to operate requiring little maintenance. The screen decks employ a PNEUMOSEAL™ bladder system for securing the screens. The screen changes can be carried out in 2-3 minutes by one operator. This unit has a fixed deck angle of 2° in the feed zone and 7° on the incline screen ramp. No adjustments are required.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Screen and Deck Type</th>
<th>Balancing Rotor</th>
<th>G-Force</th>
<th>Scr teen Type</th>
<th>Special Features</th>
<th>Basket Angle</th>
<th>Bask t A ng le</th>
<th>Deck Area</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Screens (5”, 5”, 5”)</td>
<td>Balanced Rotor</td>
<td>5.3 G’ s</td>
<td>Automatic Pre-tensioned</td>
<td>Pneumatic Screen Clamping</td>
<td>-2° to +2°</td>
<td>-2° to +2°</td>
<td>2 (2.4 m²)</td>
<td>4943 lbs (2247 kg)</td>
</tr>
</tbody>
</table>

**VSM 300™**

The VSM 300 is a balanced elliptical motion, fine screen shaker which utilizes three screen decks, an integrated scalping deck, a primary fine screen deck and a drying deck. This unit is ideal for offshore and clay/gumbo formations, it is an extremely simple machine to operate requiring little maintenance. The primary screen deck employs a PNEUMOSEAL™ bladder system for securing the screens. The screen changes can be carried out in 2-3 minutes by one operator. This unit has a fixed deck angle of 0° in the feed zone and 7° on the incline screen ramp. No adjustments are required.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Screen and Deck Type</th>
<th>Balancing Rotor</th>
<th>G-Force</th>
<th>Scr teen Type</th>
<th>Special Features</th>
<th>Basket Angle</th>
<th>Bask t A ng le</th>
<th>Deck Area</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Screens (5”, 5”, 5”, 5”)</td>
<td>Balanced Rotor</td>
<td>5.3 G’ s</td>
<td>Automatic Pre-tensioned</td>
<td>Pneumatic Screen Clamping</td>
<td>-2° to +2°</td>
<td>-2° to +2°</td>
<td>2 (2.4 m²)</td>
<td>5370 lbs (2436 kg)</td>
</tr>
</tbody>
</table>

**KING COBRA™ VENOM™**

The KING COBRA VENOM shaker is a fine screen shaker with several motor/starter options producing linear or tuned elliptical motion. The KING COBRA VENOM is provides a lower profile than the KC Hybrid shaker. The VENOM utilizes CONSTANT-G-CONTROL technology which increases the shakers G-F orce during drilling operations to optimize capacity and finer screening. The shaker is almost always located at the flow line unless it is preceded by a “sc alping” or gumbo shaker. The KING COBRA VENOM shaker removes a large percentage of drilling cuttings from the mud before the mud is circulated through the surface mud system leading to improved performance of downstream solids control equipment.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Vibration</th>
<th>Balanced Rotor</th>
<th>G-Force</th>
<th>Scr teen Type</th>
<th>Special Features</th>
<th>Basket Angle</th>
<th>Bask t A ng le</th>
<th>Deck Area</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear and tuned elliptical</td>
<td>Balanced Rotor</td>
<td>7.3-8.3 G’ s</td>
<td>Automatic Pre-tensioned</td>
<td>N/A</td>
<td>Adjustable (+5°)</td>
<td>Adjustable (+5°)</td>
<td>2 (2.4 m²)</td>
<td>4500 lbs (2043 kg)</td>
</tr>
</tbody>
</table>

**MINI COBRA™ 3-Panel**

The Mini COBRA 3-Panel Shaker is a fine screen shaker with several motor/starter options producing linear motion. The Mini COBRA 3-Panel shaker is a smaller footprint and weight design shaker for smaller land and workover rigs. The shaker is almost always located at the flow line unless it is preceded by a “sc alping” or gumbo separator. The shaker removes a large percentage of drill cuttings before the mud is circulated through the surface mud system, leading to improved performance of downstream solids control equipment.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Vibration</th>
<th>Linear</th>
<th>G-Force</th>
<th>Scr teen Type</th>
<th>Special Features</th>
<th>Basket Angle</th>
<th>Bask t A ng le</th>
<th>Deck Area</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>Linear</td>
<td>6.6 Nominal G’ s</td>
<td>Automatic Pre-tensioned</td>
<td>N/A</td>
<td>Adjustable (+5°)</td>
<td>Adjustable (+5°)</td>
<td>2 (1.9 m²)</td>
<td>3800 lbs (1724 kg)</td>
</tr>
</tbody>
</table>
VENOM™ Screens

**Description**
The VENOM series shale shaker screens utilize an advanced frame design and unique mesh combinations to effectively and efficiently separate detrimental solids from drilling fluid. VENOM series screens are designed to fit all COBRA™, KINGS COBRA™, and LCM-3D series shale shakers. All VENOM Series Screens are API RP 13C Compliant.

**Technical Specifications**

**VENOM SCREENS**

<table>
<thead>
<tr>
<th>Available Mesh</th>
<th>Available API Availability</th>
<th>Cut Point Range (depending on API Size selected)</th>
<th>NBOA</th>
<th>Dimensions (LxWxH)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG API 10</td>
<td>20, 30, 40, 50</td>
<td>900/μm – 426/μm</td>
<td></td>
<td>8.5 in x 27 in x 1 in</td>
<td>22 lbs (10 kg)</td>
</tr>
<tr>
<td>MG API 20</td>
<td>45, 60, 80, 100, 120, 140, 170, 200, 240, 270, 400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VSM-300™ Screens

**Description**
The VSM 300 series shale shaker screens utilize an advanced frame design and unique mesh combinations to effectively and efficiently separate detrimental solids from drilling fluid. All VSM 300 Series Screens are API RP 13C Compliant.

**Technical Specifications**

**VENOM 300 PRIMARY SCREENS**

<table>
<thead>
<tr>
<th>Available Mesh</th>
<th>Available API Availability</th>
<th>Cut Point Range (depending on API Size selected)</th>
<th>NBOA</th>
<th>Dimensions (LxWxH)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>XF API</td>
<td>60, 70, 100, 120, 140, 170, 200, 240, 270, 400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RHD API</td>
<td>45, 60, 80, 100, 120, 140, 170, 200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VSM™ Multi-Sizer Screens

**Description**
The VSM Multi-Sizer series shale shaker screens utilize an advanced frame design and unique mesh combinations to effectively and efficiently separate detrimental solids from drilling fluid. All VSM Multi-Sizer Series Screens are API RP 13C Compliant.

**Technical Specifications**

**VSM MULTI-SIZER PRIMARY SCREENS**

<table>
<thead>
<tr>
<th>Available Mesh</th>
<th>Available API Availability</th>
<th>Cut Point Range (depending on API Size selected)</th>
<th>NBOA</th>
<th>Dimensions (LxWxH)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG API</td>
<td>10, 12, 14, 18, 25, 30, 40</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**VSM MULTI-SIZER SCALPING SCREENS**

<table>
<thead>
<tr>
<th>Available Mesh</th>
<th>Available API Availability</th>
<th>Cut Point Range (depending on API Size selected)</th>
<th>NBOA</th>
<th>Dimensions (LxWxH)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG API</td>
<td>10, 12, 14, 18, 25, 30, 40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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