Completion Systems & Mechanical Products

performance with reliability
As the originators of Dual ESP technology, RMSpumptools’ in-depth background and expertise in Dual ESPs, translates into an unparalleled range of systems that cater for the wide variety of completion needs demanded by today’s sophisticated ESP user.

**Description**

The RMSpumptools dual ESP system utilising one Y-Tool and two ESPs, to allow the operator to run two complete ESP systems in one well, to provide a downhole back-up system. Typically both units are identical, but one unit can be sized differently for anticipated later life production.

Check Valves are positioned above each ESP discharge: NRV version above the upper ESP with the Pump Chek version above the lower ESP. The Pump Chek has a pressure burst disk that can be activated before pulling the completion, to prevent the need to pull a wet string.

**Operation**

An individual cable powers each ESP and either the upper or lower ESP system can be selectively operated, without any well intervention.

When failure of the first operating ESP eventually occurs, the second ESP is then activated to provide extended operating time between workovers.

**Application**

For high workover cost environments such as offshore and remote locations and for where rig access to well for workover may not be immediate.

**Advantage**

RMSpumptools Dual ESP redundancy system will radically improve well profitability by lowering workover costs and by cutting deferment. Initial installation time is minimised.

Utilising only one Y-Tool for the upper ESP only, this simple configuration provides a dual ESP completion with the redundancy benefits of halving workover costs, requiring minimal additional downhole equipment.
Redundancy Dual Y-Tool - Dual ESP System

As the originators of dual ESP technology, RMSpumptools’ in-depth background and expertise in dual ESPs, translates into an unparalleled range of systems that cater for the wide variety of completion needs demanded by today’s sophisticated ESP user.

Description
The classic RMSpumptools dual ESP system utilising two Y-Tools and two ESP systems, to allow the operator to run two complete ESP systems in one well, to provide a downhole back-up system. Typically both units are identical, but one unit can be sized differently for anticipated later life production.

As both ESPs are offset from the concentric string by both Y-Tools, access to below the ESP for wireline, CT and logging operations is maintained.

Operation
An individual cable powers each ESP and either the upper or lower ESP system can be selectively operated, without any well intervention.

When failure of the first operating ESP eventually occurs, the ESP is then activated to provide extended operating time between workovers.

Application
High workover cost environments such as offshore and remote locations and for where rig access to well for workover may not be immediate (notably subsea locations). Also used where a tailpipe is required below the ESP to engage into a sump packer receptical (PBR).

Ideal for applications where intervention by CT or wireline below the ESP is required.

Advantage
RMSpumptools Dual ESP redundancy system will radically improve well profitability by lowering workover costs and by cutting deferment. Initial installation time is minimised.

Intervention to the reservoir for multi-lateral shut-off valves, logging etc, can easily be achieved through the bypass tubing. All systems are worldwide field-proven for ultimate reliability; eliminates the need of drilling a second well.
ESP Dual Systems - Redundancy Twin CAN

As the originators of dual ESP technology, RMSpumptools’ in-depth background and expertise in dual ESPs, translates into an unparalleled range of systems that cater for the wide variety of completion needs demanded by today’s sophisticated ESP user.

**Description**

Utilising RMSpumptools highly successful encapsulated ESP system (CAN) and by configuring one CAN above the other, two complete ESP systems can be deployed in one well to provide a downhole backup system. Typically, both ESPs are identical, but the second operating ESP can be sized differently to meet later life production expectations.

**Operation**

An individual cable powers each ESP with the cable for the lower ESP running outside of the upper CAN. Each ESP can be operated individually and flow automatically bypasses the dormant ESP by entering the ADV (Automatic Diverter Valve) which is positioned above each pump discharge. Flow is activated by tailpipe entry into a permanent sump packer.

**Application**

High workover cost environments such as offshore and subsea applications. Also providing a clear benefit in locations that experience lengthy down time between workovers and where production deferment is an issue.

**Advantage**

Provides a dual ESP redundancy system to radically improve well profitability, whilst avoiding the need for a retrievable packer. This makes for faster workovers and avoids potential difficulties in retrieving a standard pump packer. A formation shut-off valve can also be installed in the sump packer to prevent the need to kill the well at workovers.
ESP Dual Systems - Redundancy Single CAN

As the originators of dual ESP technology, RMSpumptools’ in-depth background and expertise in dual ESPs, translates into an unparalleled range of systems that cater for the wide variety of completion needs demanded by today’s sophisticated ESP user.

**Description**

A unique dual ESP system utilising one Single Continuous CAN that has all of the cables and control lines for both ESPs carried within the Continuous CAN with no lines running externally. This latest dual ESP development incorporates RMSpumptools unique Mid CAN Packer which provides the barrier between the two ESPs in the Single CAN.

**Operation**

Each ESP can be operated individually, with typically the 2nd unit being activated upon the failure of the 1st, thus providing double life to the completion. An individual power cable feeds each ESP unit and one ADV (Automatic Diverter Valve) is located above each pump discharge to allow pumped fluid to bypass the dormant pump.

**Application**

High workover cost environments and to save downtime, especially in tight clearance or deviated wells where cables on the outside of the CAN might otherwise be vulnerable to damage. The unique RMSpumptools Mid CAN Packer prevents recirculating within the CAN and makes the installation process simple.

**Advantage**

With all cables and control lines for both ESPs carried within the CAN, mechanical damage to the cables alongside the ESP is eliminated. RMSpumptools dual ESP redundancy - Continuous CAN will radically improve well profitability by lowering workover costs and by cutting deferment.
As the originators of dual ESP technology, RMSpumptools’ in-depth background and expertise in dual ESPs, translates into an unparalleled range of systems that cater for the wide variety of completion needs demanded by today’s sophisticated ESP user.

Description
A dual ESP system, using two independent ESP systems that separately and individually produces two separate production zones in the same well, without co-mingling the fluids.

Operation
The Upper Zone is produced by the Upper ESP which is configured with the RMSpumptools Dual-Flow Y-Tool. The Lower ESP, which is encapsulated in the successful RMSpumptools pressure-tight shroud (CAN) suspended off the bypass of the Upper ESP, pumps the Lower Zone. The tailpipe of the Shroud is fitted with a Seal Mandrel that engages into the PBR of a permanent packer, which separates the two production zones.

Co-mingling of fluid is prevented by use of a separate concentric tubing string (inside the main production string), creating a micro annulus. The concentric tubing is fitted with a Seal Bore in the “Dual-Flow Y-Tool”.

Application
Dual Zone ESP pumping utilising a single well bore, where anti-co-mingling is required.

Advantage
A low cost solution to dual zone pumping, requiring no down-hole “intelligent” technology. Only one well required to produce two zones. No down-hole production measurement equipment is required because accurate measurement of production of each zone can be done at surface. Producing from two zones in one wellbore eliminates the need of drilling a second well.
The RMSpumptools Y-Chek is a new addition to the RMSpumptools Bypass range. It is an automatic downhole valve located within the world renowned RMSpumptools Y-Tool and is designed to prevent recirculation of pumped fluid from an operated ESP.

The Y-Chek, which features an internal travelling ball, is automatically activated by the flow and pressure produced by the downhole pump. The ball starts off in the flow path of the pump and will lift up and move over to the sealing position on the bypass tubing side upon pump start up. The pressure generated by the pump will keep the ball sealed in the seat position while the pump is running.

When the pump is shutdown and the pressure on the ball has equalised, the ball will return to the pump leg side; thus opening passage on the bypass side to allow well intervention by wireline or coiled tubing.

The Y-Chek is ideally suited for Dual Subsea applications, as the Y-Chek is designed to automatically seal off either leg of the Y-Tool. Therefore when one ESP is operated, the other is isolated and vice versa to provide automatic switching between ESPs.

Bullheading of fluid down the bypass to below both ESPs is also possible because when both ESPs are switched off the ball automatically moves to the Pump side of the upper and lower Y-Cheks, leaving free flow path through the bypass of both ESPs.

**Key Performance Features**
- Automatic operation on ESP start-up and shut-down
- All metal sealing; i.e. no elastomers
- Simple travelling ball design allowing multiple seal faces
- Ideal for subsea applications
- Suitable for sandy well environments
- 5000psi working pressure
- Eliminates need for blanking plug
- Reduces wireline/CT trips when intervention is required
The RMSpumptools CAN Hanger provides a beneficial alternative to running retrievable packers where a second barrier for produced fluids is required. The system has a tailpipe and PBR mandrel below which stings into a sump packer to isolate the production zone. This is often run in conjunction with a formation saver device to avoid killing the well when doing a workover.

**Key Benefits**
- Avoids Casing Damage
  (Slips on ESP Packers often damage casing)
- Allows the ESP to be set at the same depth after each workover
- Avoids downtime and problems when pulling packers
- Corrosion to the casing is reduced
- Better cooling of the ESP Motor
- Quicker and simpler workovers
- Easily configured for Dual ESPs for both redundancy and booster applications

The CAN Hanger is supported by a comprehensive range of accessories to allow full pressure testing prior to installation. Used in conjunction with the industry’s only gas proof penetrator, the RMSpumptools ‘V0 tested’ CAN Penetrator, the CAN Hanger ensures complete system integrity and unrivalled performance.

**Application**
In high workover cost environments, especially in tight clearance or deviated wells where cables on the outside of the CAN might otherwise be vulnerable to damage. The unique RMSpumptools Mid CAN Packer prevents recirculating within the CAN and makes the installation process simple.

**Innovation**
RMSpumptools has developed the industry’s first V0 tested (gas proof) CAN and Penetrator System for extreme HP/HT wells. Encapsulating the ESP and eliminating the need for production packers the CAN Hanger has been V0 tested to 21,000 psi differential, 300°F.

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<table>
<thead>
<tr>
<th>Casing Run-in</th>
<th>CAN Size</th>
<th>Production Tubing</th>
<th>ESP Series</th>
<th>Penetrator Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>16” 84# or larger</td>
<td>13-3/8”</td>
<td>5-1/2”</td>
<td>600 or larger</td>
<td>Single Mandrel</td>
</tr>
<tr>
<td>11-3/4” 47# or larger</td>
<td>10-3/4”</td>
<td>5-1/2”</td>
<td>500 or larger</td>
<td>3 Leg or Single Mandrel</td>
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<tr>
<td>10-3/4” 51# or larger</td>
<td>9-5/8”</td>
<td>4-1/2”</td>
<td>500 or larger</td>
<td>3 Leg or Single Mandrel</td>
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<tr>
<td>9-5/8” 40# or larger</td>
<td>8-5/8”</td>
<td>4-1/2”</td>
<td>500</td>
<td>3 Leg or Single Mandrel</td>
</tr>
<tr>
<td>9-5/8” 53# or larger</td>
<td>7-5/8”</td>
<td>4-1/2”</td>
<td>500</td>
<td>3 Leg</td>
</tr>
<tr>
<td>9-5/8” 53# or larger</td>
<td>7-5/8”</td>
<td>3-1/2”</td>
<td>500</td>
<td>3 Leg or Single Mandrel</td>
</tr>
<tr>
<td>8-5/8” 52# or larger</td>
<td>7”</td>
<td>4-1/2”</td>
<td>500</td>
<td>3 Leg</td>
</tr>
<tr>
<td>8-5/8” 52# or larger</td>
<td>7”</td>
<td>3-1/2”</td>
<td>500</td>
<td>3 Leg or Single Mandrel</td>
</tr>
<tr>
<td>7-5/8” 29# or larger</td>
<td>6-5/8”</td>
<td>3-1/2”</td>
<td>500</td>
<td>3 Leg</td>
</tr>
<tr>
<td>7-5/8” 29# or larger</td>
<td>6-5/8”</td>
<td>2-7/8”</td>
<td>500</td>
<td>3 Leg or Single Mandrel</td>
</tr>
<tr>
<td>6-5/8” 26# or larger</td>
<td>5-1/2”</td>
<td>2-7/8”</td>
<td>400</td>
<td>3 Leg</td>
</tr>
<tr>
<td>6-5/8” 26# or larger</td>
<td>5-1/2”</td>
<td>2-3/8”</td>
<td>400</td>
<td>3 Leg or Single Mandrel</td>
</tr>
<tr>
<td>6-5/8” 32# or larger</td>
<td>5”</td>
<td>2-3/8”</td>
<td>300</td>
<td>3 Leg</td>
</tr>
</tbody>
</table>
Equalising Blanking Plug

The RMSpumptools Blanking Plug is designed to prevent pumped fluids re-circulating via the Bypass Tubing during pumping operations. The Blanking Plug is removed with wireline or coiled tubing to enable intervention below the ESP.

- Equalising Feature to allow fluid drain-off before pulling
- 2.75", 2.562", 2.312" and 1.875" bore size as RMSpumptools standard
- Options available in alternative sizes with Top or Bottom No Go variants
- Options to hold pressure from top-down only or top-down and bottom-up
- Pressure Tested to 5000 psi within Y-Tool assembly before shipment
- Positive Dog engagement to secure Blanking Plug into blanking plug seating nipple
- Run and Pulled with single wireline trip using standard wireline pulling/running tools
- Self Cleaning fishing neck
- Positioned in nipple to avoid flow erosion damage
- Vee Ring Seal Stack positioned below locking dogs to ensure protection of Nipple Seal Bore during entry/exit
Coiled Tubing Logging Plug

Coiled Tubing is often used in high angle or horizontal wells to deploy logging tools below the ESP. The coiled tubing logging plug is designed to provide a seal around the Coiled Tubing to prevent fluid recirculation during logging-while-pumping.

The RMSpumptools Coiled Tubing Logging Plug incorporates seals and locking dogs to enable its use with standard RMSpumptools Y-Tool systems and is carried to position in the bypass nipple by the coiled tubing. When the plug No-Go’s in the bypass nipple, the plug will lock into position allowing the coiled tubing to continue down-well to the desired depth.

A detachable sub at the bottom of the Coiled Tubing Logging Plug is secured to the Coiled Tubing and has strong enough latch force to ensure the Coiled Tubing Logging Plug is carried safely to, and locked in the Bypass Nipple; after which, it de-latches to accompany the logging tool downhole.

### Coiled Tubing to fit Coiled Tubing Logging Plug Sizes

<table>
<thead>
<tr>
<th>CT Logging Plug Sizes</th>
<th>1”</th>
<th>1-1/4”</th>
<th>1-1/2”</th>
<th>1-3/4”</th>
<th>2”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.875”</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.310”</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.750”</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
The RMSpumptools Wireline Logging Plug is designed to be used with the Bypass Y-Tool assembly for wireline logging operations while pumping. The Logging Plug features an internal changeable Flow Tube, toleranced to suit slick line or braided line sizes.

The Wireline Logging Plug is deployed with, and located above, the logging tool and the wireline is free to move up and down within it.

When running in hole, the logging tool passes through the Bypass Nipple allowing the Logging Plug above it to no-go and self-seat in the Bypass Nipple Sealbore. The logging tool will then continue downhole to the required depth for logging.

- The Tool Catcher version is recommended for use with electric line. The Tool Catcher allows the logging tool to latch to the Logging Plug with retrieval over-pull. This ensures that if the weak point of the e-line breaks upon plug retrieval, the logging tool is not lost downhole.

- The Wireline Logging Plug is available in any seal bore size to suit Bypass Nipple supplied.

- Incorporates Equalising Feature, to overcome any trapped hydrostatic pressure on removal.

- Optional Wireline Hammer (Grapple) can be deployed above the Logging Plug to tap logging plug into place. (For normal operations this is not required as the pumped fluid pressure from the ESP ensures firm seating in the sealbore).

- Alternatively, a weight bar may be attached to the bottom of plug to aid deployment in a high angle or deviated well.
Protect your ESP from Solids Fall-back
The RMSpumptools ADV™ is a field-proven automatic valve that controls tubing to annulus communication. Typically used for ESP completions, the ADV™ offers ESP protection from solids fall-back on pump shut-down and free flow prior to start up. The ADV™ is a revolutionary new tool already dramatically improving ESP run life in hundreds of wells worldwide.

**Applications**
Protect your pump...
from solids fall-back in sandy/solids producing wells. Solids settling on pump stages can wreck your pump. ADV™ protects against solids fall-back and avoids:
- Broken shafts / motor failure
- Damaged upper stages
- Plugged pump head
- Back spin

Free-flow well...
prior to pump start up in natural flow or dual ESP applications. Flow past the pump:
- Maximises production by avoiding pressure drop through dormant ESP
- Eliminates bearing damage
- Eliminates scale build up

Well treatment...
through the ADV™ ports allows full bore fluid communication to the annulus for:
- Chemical injection
- Maximum flow fluid re-injection

Benefit...
**Increased ESP Run Life**
**ADV™ (Automatic Diverter Valve) - Applications**

1. **Solids Fall-Back**
   - Upon ESP trip / shut down, fluid and solids in the tubing string exhaust into the annulus. Communication to the ESP is blocked preventing solids entering the ESP.
   - When the ESP is restarted the ADV™ automatically operates to close ports to annulus and normal production resumes.

2. **Free-Flow**
   - Free-flow to production tubing avoiding passage of fluid through pump section.
   - On ESP switch-on the ADV™ automatically operates to close ports to the annulus and pumped production commences to surface.
The RMSpumptools NRV is a high specification precision engineered check-valve for use above an ESP and is specified when reliable long-term sealing is critical to prevent reverse direction of fluid. The NRV can be pressured against from above to 5000psi, to allow tubing string test or packer setting.

Typically used with ESP completions above the pump discharge to prevent flow back when pump is deactivated:

Applications
- Single ESP installation to prevent fluid fall-back
- Dual ESP installations to provide intervention - free ability to operate either ESP automatically

Features
- Piston-type design for reliability
- High specification inconel metal-to-metal seal faces to maintain protection against erosion and provide long operational life
- Self-aligning seal faces
- Internal flow areas match tubing ID
- Optional pin and box connections to customer choice
- Material housing options of carbon steel or 13% chrome steel

NRV Size Options

<table>
<thead>
<tr>
<th>Sizes</th>
<th>OD</th>
<th>Length</th>
<th>Standard Connection</th>
<th>To Suit Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-7/8”</td>
<td>4.625”</td>
<td>25”</td>
<td>Vam Top</td>
<td>5.5”</td>
</tr>
<tr>
<td>3-1/2”</td>
<td>4.81”</td>
<td>25”</td>
<td>Vam Top</td>
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<tr>
<td>4-1/2”</td>
<td>6.5”</td>
<td>36”</td>
<td>Vam Top</td>
<td>7-5/8”</td>
</tr>
<tr>
<td>5-1/2”</td>
<td>7.5”</td>
<td>36”</td>
<td>Vam Top</td>
<td>8-5/8”</td>
</tr>
<tr>
<td>7”</td>
<td>8.25”</td>
<td>36”</td>
<td>Vam Top</td>
<td>9-5/8”</td>
</tr>
</tbody>
</table>
Adjustable Union

The RMSpumptools Adjustable Union is a mechanical telescoping device designed to allow fine adjustments to be made to lengths within the tubing string. It is operated simply by rotating a ‘Jacking Collar’ to move the Mandrel inwards or outwards thus changing the length of the assembly.

The Adjustable Union is constructed with an outer Housing, having a seal bore, a telescoping threaded Mandrel, Lock Collar and Jacking Collar. Two Anti-Rotation Keys set within the Housing engage the Mandrel to prevent rotation between the upper and lower assemblies.

The Housing incorporates 6 slots for the two Anti-Rotation Keys creating an orientation mechanism with 30 degree maximum misalignment.

The Adjustable Union is simply operated by rotating the Jacking Collar to move the Mandrel to the desired position then locking the Jacking Collar.

Premium thread connections are cut either end, normally box up and pin down, however the Adjustable Union can be installed either way up assuming correct mating connections.

The Adjustable Union is available for standard or sour service and various stroke length, although 24” is standard. It is also available in various tubing sizes and connections including Vam, API 8rd etc.

Adjustable Union Size Options

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Weight Range</th>
<th>Min Bore</th>
<th>Max OD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3/8”</td>
<td>4.6#</td>
<td>1.930”</td>
<td>3.250”</td>
</tr>
<tr>
<td>2-7/8”</td>
<td>6.4#</td>
<td>2.380”</td>
<td>3.975”</td>
</tr>
<tr>
<td>3-1/2”</td>
<td>9.2#</td>
<td>2.920”</td>
<td>4.975”</td>
</tr>
<tr>
<td>4-1/2”</td>
<td>12.6# - 13.5#</td>
<td>3.920”</td>
<td>6.000”</td>
</tr>
<tr>
<td>5-1/2”</td>
<td>20# - 23#</td>
<td>4.580”</td>
<td>7.500”</td>
</tr>
</tbody>
</table>

Features

- Simple jacking mechanism
- Anti-rotation keys
- +/- 30 degree orientation
- Simple construction
- Only one set seals

To Order

- Tubing size and weight
- Connections
- Metallurgy
PRL Swivel

The RMSpumptools PRL (Positive Rotational Lock) Swivel Union is an in-line tubing device designed to provide orientation between two sets of tubing assemblies. Typical uses are alignment of two downhole tubing units such as dual string packers or tubing to hanger make-up.

Once alignment is set, the swivel is locked in position by a series of teeth which provide a positive locking mechanism with high torque loading.

The PRL Swivel is operated by winding Lock Nut back by approximately 1/2” to allow disengagement of Upper Body and Collar. The Upper and Lower Bodies are then oriented to desired position and the Collar and Upper Body set together again, the Lock Nut is then made up tight and locked with screws.

The PRL Swivel is available for standard or sour service conditions and is configured with standard tubing connections such as New Vam or API 8rd threads.

It is configured with +/- 10 Deg Alignment as standard but can be supplied with +/- 3 Deg Alignment.

PRL Swivel Size Options

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Weight Range</th>
<th>Min Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-7/8”</td>
<td>6.4# - 7.7#</td>
<td>2.320”</td>
</tr>
<tr>
<td>3-1/2”</td>
<td>7.7# - 10.2</td>
<td>2.920”</td>
</tr>
<tr>
<td>4-1/2”</td>
<td>10.5# - 13.5#</td>
<td>3.920”</td>
</tr>
<tr>
<td>5-1/2”</td>
<td>15.5# - 23.0#</td>
<td>4.680”</td>
</tr>
</tbody>
</table>

Features

• High Torque capacity
• ± 10° alignment
• Simple construction
• Full Tubing Bore
• Only one set seals

To Order

• Tubing weight
• Connections
• Metallurgy

Other sizes available on request

Standard Materials L-80 Alloy Steel for standard service or 13% Chrome for sour service
The RMSpumptools BOP CAN provides a means of sealing production tubing with power cable along side when well testing using Electrical Submersible Pumps (ESPs). It creates a solid seal area onto which BOP Rams are closed.

The BOP CAN has two main bores, first the production bore and secondly a Penetrator bore which allows a sealed Penetrator unit which seals both around the power cable and into the body of the BOP CAN.

At the lower end of the BOP CAN is an eccentric Fluted Hanger and Threaded Mandrel for accurate space-out, this ensures the BOP Rams are correctly positioned to the centre of the BOP CAN.

At the top end where the power cable exits the Penetrator, the power cable will have to bend out to the maximum diameter of the Test Tree set above, it is therefore critical that the length of the top Crossover is specified and is of suitable length to accommodate a reasonable bend in the power cable. This dimension 'X' should always be specified.

Below the BOP CAN is the space-out to the Fluted Hanger, the dimension from the centre of the BOP CAN to the Hanger, 'Y' should also be specified.

The RMSpumptools BOP CAN is available for a variety of RAM and Production Tubing sizes and can accommodate a number of Control Line feedthrough ports, normally 1/4” NPT.

**Features**
- Positive seal around ESP Cable and BOP Rams
- Threaded Mandrel allows space-out of Fluted Hanger Nut
- Fully Pressure tested and certified

**To Order**
- Dimensions X and Y
- Top Thread to Tree (drawing may be required)
- Hanger details (drawing may be required)
- Production Tubing size and thread
- Cable details for supply of Penetrator
- Number of control lines
The RMSpumptools Pump Chek is a flapper style check valve that is used to isolate the ESP from fluid and solid fall-back upon ESP shut down. The metal-to-metal seal ensures a pressure seal against fluid fall-back when the ESP is deactivated. When pumping, the flapper sits out of the fluid flow path to provide full bore ID.

The Pump Chek incorporates a Drain Feature that is activated to avoid pulling a wet string. This is provided by a burst disk in the flapper which is activated by over-pressuring the tubing string. A drop-bar is not required.

In a dual ESP completion where no lower Y-Tool is used, the Pump Chek replaces the standard NRV above the lower ESP to allow tubing drain-off before pulling (when a lower Y-Tool is used, drain-off is either automatic, or can be achieved by pulling a plug).

The Pump Chek is also used to allow pressure testing of production tubing and the setting of hydraulically operated tools such as packers.

### Features
- Full flow on ESP operation
- All metal pressure sealing
- No Elastomers
- Simple 1-Piece Body Construction
- Available in Alloy Steel for standard service and 13% Chrome for sour service

### To Order
- Pressure Setting
- Thread Size
- Material Type

### Production Tubing

<table>
<thead>
<tr>
<th>Production Tubing</th>
<th>OD (Eccentric)</th>
<th>Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3/8&quot; EUE</td>
<td>3.50&quot;</td>
<td>1.87&quot;</td>
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<tr>
<td>2-7/8&quot; EUE</td>
<td>4.25&quot;</td>
<td>2.25&quot;</td>
</tr>
<tr>
<td>3-1/2&quot; EUE</td>
<td>5.00&quot;</td>
<td>2.75&quot;</td>
</tr>
<tr>
<td>4-1/2&quot; EUE</td>
<td>6.10&quot;</td>
<td>3.50&quot;</td>
</tr>
</tbody>
</table>

Burst Ratings: 1,000 - 4,000 psi
The RMSpumptools SandCat is a downhole centrifugal sand separator designed to separate out sand from the produced fluid before it enters the pump.

SandCat can radically reduce damage to expensive ESP’s in sandy wells and significantly increase pump run time resulting in improved well profitability for the operator.

Attached below the ESP Motor, the SandCat is installed with the ESP as a quick and simple addition to the completion system.

**Features**
- Separates sand particles 40 microns and above
- No well preparation required - RIH with the ESP
- No moving parts
- Simple to install
- Assists gas separation
- Low capital cost
- Sand management system provides choice of sand collection options

<table>
<thead>
<tr>
<th>Casing Size</th>
<th>SandCat OD</th>
<th>Flow Rate</th>
<th>Overall Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-1/2”</td>
<td>4”</td>
<td>200-1000 bbd</td>
<td>112.7”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400-1300 bbd</td>
<td>118.7”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000-1700 bbd</td>
<td>121.7”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200-2000 bbd</td>
<td>123.5”</td>
</tr>
<tr>
<td>7”</td>
<td>5-1/2”</td>
<td>200-1000 bbd</td>
<td>114.5”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000-2200 bbd</td>
<td>125.7”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500-2800 bbd</td>
<td>140.7”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1800-3600 bbd</td>
<td>148.7”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2500-5000 bbd</td>
<td>165.7”</td>
</tr>
</tbody>
</table>
SandCat

How it works

1. Solids laden fluid is forced into SandCat intake. Integrated flow seal acts as a barrier to prevent well fluid from bypassing SandCat.

2. The centrifugal chamber drives sand and solids to the outer part of chamber, allowing de-sanded fluid to enter the SandCat internal central fluid intake.

3. Separated sand and solids are directed to the tailpipe (or rat hole) by centrifugal velocity and carried downward by gravity.

4. De-sanded fluid exits into the upper annulus through the discharge sub above the flow seal. Once the tailpipe is filled, production of sandy fluid is resumed to ESP. No plugging will occur.

Minimum particle size separated at varying flowrates

Flowrate Q (bbl/day)

Particle size Dp (μm)
ESP Motor Shroud

The RMSpumptools ESP Shroud is a cylinder fitted around the Motor, Protector and Intake sections of an ESP. It is designed to reduce the annular area between the ESP and the casing bore, which allows the velocity of fluid by the Motor section to increase and subsequently help to cool the Motor.

The Shroud is simply constructed with a length of tube, normally between 25 to 30 feet, long enough to swallow the Motor, Protector and Intake sections, and is bolted with a split clamp unit to first ESP neck located above Intake.

Above the Shroud a RMSpumptools MLE Clamp is normally fitted to secure the MLE to the Discharge Head. At the bottom end, a Centraliser Guide is fitted to help secure the ESP section within the Shroud.

The ESP Shroud is available in Alloy Steel for standard service and 13% Chrome for sour service.

**Features**
- Simple construction
- Easy to install

**To Order**
- Casing size and weight
- ESP Schematic, including diameters and lengths
- Material type
- Neck size
- MLE size

<table>
<thead>
<tr>
<th>Casing Size</th>
<th>Shroud OD Max</th>
<th>Max OD Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7”</td>
<td>5-1/2”</td>
<td>4.56”</td>
</tr>
<tr>
<td>9-5/8”</td>
<td>7-5/8”</td>
<td>5.62”</td>
</tr>
</tbody>
</table>
The STEALTH Clamp™ has been developed to give maximum protection to control lines and power cables in a low profile, slimline design. The patented threaded clamping design prevents slippage and can withstand axial load whilst running in hole, out-performing recessed and friction type clamps which are typically used in similar applications.

### Performance Data

<table>
<thead>
<tr>
<th>Metallurgy Options</th>
<th>13% Cr (18-22 Rc)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4140 (18-22 Rc)</td>
</tr>
<tr>
<td>Max Axial Loading</td>
<td>10 Tonnes (22,000 lbs)</td>
</tr>
<tr>
<td>Working Temperature</td>
<td>68 - 250°F</td>
</tr>
<tr>
<td>Class of Service</td>
<td>Standard / H₂S</td>
</tr>
</tbody>
</table>

### Shroud Casing OD and MLE Options

<table>
<thead>
<tr>
<th>Shroud Casing OD</th>
<th>Effective Clamp OD</th>
<th>MLE Options</th>
<th>Control Lines</th>
<th>Casing Run Inside</th>
<th>Drift</th>
</tr>
</thead>
<tbody>
<tr>
<td>5”</td>
<td>5.705”</td>
<td>#6 (0.970” x 0.380”)</td>
<td>3 x 1/4” Bare Lines</td>
<td>6-5/8” 24#</td>
<td>5.796”</td>
</tr>
<tr>
<td>5-1/2”</td>
<td>6.000”</td>
<td>#6 (1.017” x 0.409”)</td>
<td>1 x 1/4” Bare Line</td>
<td>7” 29#</td>
<td>6.059”</td>
</tr>
<tr>
<td>7”</td>
<td>7.860”</td>
<td>#4 (1.656” x 0.652”)</td>
<td>2 x 11mm square</td>
<td>9-5/8” 53#</td>
<td>8.379”</td>
</tr>
<tr>
<td>7-5/8”</td>
<td>8.350”</td>
<td>#4 (1.295” x 0.501”)</td>
<td>2 x 11mm square / 1 x 13mm square</td>
<td>9-5/8” 53#</td>
<td>8.379”</td>
</tr>
<tr>
<td>8-5/8”</td>
<td>9.275”</td>
<td>#3 (1.320” x 0.520”)</td>
<td>1 x 0.535” square / 1 x 0.43” square</td>
<td>10-3/4”</td>
<td>9.500”</td>
</tr>
<tr>
<td>9-5/8”</td>
<td>10.500”</td>
<td>#3 (1.320” x 0.520”)</td>
<td>2 x 11mm square / 1 x 13mm square</td>
<td>11-3/4”</td>
<td>10.616”</td>
</tr>
<tr>
<td>10-3/4”</td>
<td>11.600”</td>
<td>#3 (1.320” x 0.520”)</td>
<td>2 x 11mm square / 1 x 13mm square</td>
<td>13-3/8”</td>
<td>11.969”</td>
</tr>
</tbody>
</table>

The Clamp can also be configured for protecting flatpack or chemical injection lines running outside the shrouded pump section.