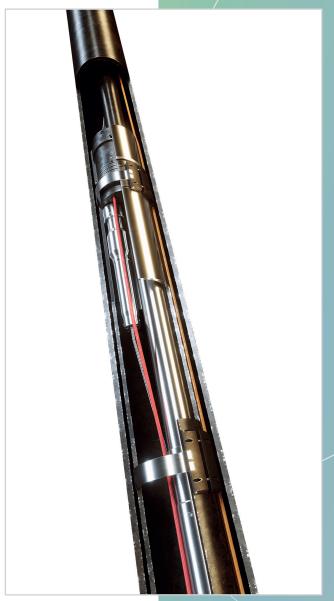


# Completion Systems & Intervention Tools







## **Bypass** Series Y-Chek® - Automatic Y-Tool

With many units successfully installed and operational around the globe, the RMSpumptools Y-Chek® has taken ESP Bypass technology to the next level. This patented Automatic Y-Tool features infinite Sealing Point Technology, substantially increasing sealing integrity and providing an extremely robust and reliable product.

### The Benefits

The Y-Chek® eliminates the requirement for a blanking plug, avoiding a needless intervention run and thereby reducing risk, time and cost. The Y-Chek® also replaces the need for check valves in Dual ESP Completions, avoiding further unnecessary cost.

### Proven Technology

The Y-Chek® is factory pressure tested to 7,500psi as standard. Its one-piece solid body construction eliminates external leak paths and facilitates higher pressure ratings. Fully versatile, the Y-Chek® is suitable for all Y-Tool applications - Single or Dual ESP completions in any deviation.

## The New Standard in ESP Bypass Technology

Unique, Patented Technology Patents: EP2088279B1 & US8104540

Metal to Metal Sealing

Infinite Sealing Point Technology

Automatic Operation

Avoid Needless Intervention Runs

Field Proven in Harsh Environments

Pressure Tested to 7,500psi

Suitable for all Y-Tool Applications

## Y-Chek® Size Options

| Specifications    | 7"         | 9-5/8"     | 10-3/4"    | 13-3/8"    |
|-------------------|------------|------------|------------|------------|
| OD                | 6.00"      | 8.25"      | 9.25"      | 11.75"     |
| Min Flow Rate     | 300 bpd    | 500 bpd    | 1,500 bpd  | 2,000 bpd  |
| Max Flow Rate     | 15,000 bpd | 23,000 bpd | 25,000 bpd | 30,000 bpd |
| Max Flow Pressure | 5,000 psi  | 5,000 psi  | 5,000 psi  | 5,000 psi  |
| Temperature       | 150°C      | 150°C      | 150°C      | 150°C      |
| Metalurgy         | 13 Chrome  | 13 Chrome  | 13 Chrome  | 13 Chrome  |





## **Bypass** Series

## Y-Chek® - Automatic Y-Tool

The Y-Chek® is perfectly suited for Dual ESP Subsea applications as it 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

Size Range: 7", 9-5/8", 10-3/4" and 13-3/8"

Can operate at Extremely Low Flow Rates (from 300 bpd)

Tested to over 25,000bpd

(above the Capacity of a 562 Series Pump)

Fully Functional in all Deviations with Pump Leg either Up or Down

Operates with Existing Range of Logging Plugs

Simple Solid Body Construction eliminates Leak Path risk

Conventional access for Bypass/Intervention Tools

Automatic Operation on ESP Start-up and Shut-down

All Metal Sealing - No Elastomers

Ball/Seat Sealing Mechanism offers Infinite Seal Faces

Ideal for Subsea Applications

Suitable for Sandy Well Environments

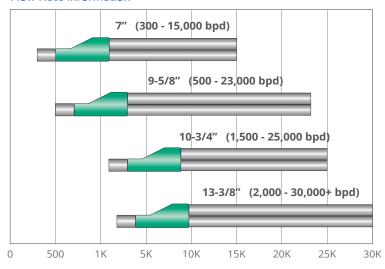
7,500psi Working Pressure

Eliminates a Blanking Plug

Saves Rig Time and Lost Production Time

Saves Wireline/Coiled Tubing Time

#### Flow Rate Information







## **Encapsulation Series**Redundancy Twin CAN/POD - Dual ESP System

The RMSpumptools Redundancy Twin CAN (POD) is a universally field-proven product and contains two separate CAN systems with flow from the lower CAN passing through the upper CAN. Typically, both ESPs are identical, but the second operating ESP can be sized differently to meet later life production expectations.

ADVs (Automatic Diverter Valve) above each ESP ensures fluid flow bypasses the dormant pump. This configuration can also be used as a booster system.

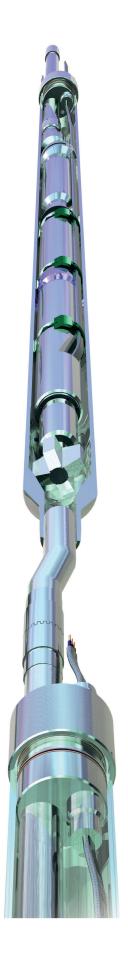
An individual cable powers each ESP with the cable for the lower ESP running outside of the upper CAN. Each ESP can be operated individually and flow automatically bypasses the dormant ESP by entering the ADV (Automatic Diverter Valve) which is positioned above each pump discharge. Flow is activated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





## **Encapsulation Series**Redundancy Single CAN/POD - Dual ESP System

The RMSpumptools Redundancy Single CAN is 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.

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

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.





## Encapsulation Series CAN/POD Hanger

The RMSpumptools CAN/POD 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. The CAN/POD 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/POD Penetrator, the Hanger ensures complete system integrity.

In high workover cost environments, especially in tight clearance or deviated wells where cables on the outside of the CAN/POD might otherwise be vulnerable to damage. The unique RMSpumptools Mid CAN/POD Packer prevents recirculating within the CAN/POD and makes the installation process simple. RMSpumptools has developed the industry's first V0 tested (gas proof) CAN/POD and Penetrator System for extreme HP/HT wells. Encapsulating the ESP and eliminating the need for production packers the CAN/POD Hanger has been V0 tested to 21,000 psi differential at 300°F.

## Key Performance Features

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

| Casing Run-in         | CAN Size | Production Tubing | ESP Series    | Penetrator Type         |
|-----------------------|----------|-------------------|---------------|-------------------------|
| 16" 84# or larger     | 13-3/8"  | 5-1/2"            | 600 or larger | Single Mandrel          |
| 11-3/4" 47# or larger | 10-3/4"  | 5-1/2"            | 500 or larger | 3 Leg or Single Mandrel |
| 10-3/4" 51# or larger | 9-5/8"   | 4-1/2"            | 500 or larger | 3 Leg or Single Mandrel |
| 9-5/8" 40# or larger  | 8-5/8"   | 4-1/2"            | 500           | 3 Leg or Single Mandrel |
| 9-5/8" 53# or larger  | 7-5/8"   | 4-1/2"            | 500           | 3 Leg                   |
| 9-5/8" 53# or larger  | 7-5/8"   | 3-1/2"            | 500           | 3 Leg or Single Mandrel |
| 8-5/8" 52# or larger  | 7"       | 4-1/2"            | 500           | 3 Leg                   |
| 8-5/8" 52# or larger  | 7"       | 3-1/2"            | 500           | 3 Leg or Single Mandrel |
| 7-5/8" 29# or larger  | 6-5/8"   | 3-1/2"            | 500           | 3 Leg                   |
| 7-5/8" 29# or larger  | 6-5/8"   | 2-7/8"            | 500           | 3 Leg or Single Mandrel |
| 6-5/8" 32# or larger  | 5-1/2"   | 2-7/8"            | 400           | 3 Leg                   |
| 6-5/8" 32# or larger  | 5-1/2"   | 2-3/8"            | 400           | 3 Leg or Single Mandrel |
| 6-5/8" 32# or larger  | 5"       | 2-3/8"            | 300           | 3 Leg                   |





## **Encapsulation** Series

## **Motor Shroud**

The RMSpumptools Motor 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 house the Motor, Protector and Intake sections. It is bolted with a split clamp unit to the first ESP neck located above the Intake.

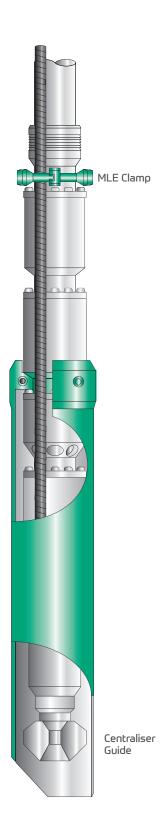
Above the Shroud a RMSpumptools MLE Clamp is normally fitted to secure the MLE to the Discharge Head. At the bottom end, a Centraliser Guide is fitted to help secure the ESP section within the Shroud. The ESP Shroud is available in Alloy Steel for standard service and 13% Chrome for sour service.

## Key Performance Features

Simple Construction

Easy to Install

| Tubing Size | Weight Range | Min Bore |
|-------------|--------------|----------|
| 7"          | 5-1/2"       | 4.56"    |
| 9-5/8"      | 7-5/8"       | 5.62"    |





## **Completion Series**Redundancy Dual Y-Tool - Dual ESP System

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.

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.





## **Bypass Series**Redundancy ESP Bypass System System

The RMSpumptools Bypass system is designed to provide access below an Electrical Submersible Pump allowing well intervention without the need to pull the completion. The System is most commonly used for Logging-whilst-Pumping operations but has a wide range of alternative usages.

Production Logging
Through Tubing Perforation
Coiled Tubing Operations
Operation of Flow Valves
Fluid Injection
Free-flowing, bypassing the ESP during ESP downtime
Configuring for Dual (Tandem) ESP Systems

Supported by a comprehensive accessory product range and service back up, the RMSpumptools Bypass System ensures ease, efficiency and simplicity of all operations.

With the largest installed base worldwide and years of field experience having been incorporated into the design, the RMSpumptools Bypass System is established as the tool of choice of ESP companies and end users.

## Speed of Installations

Acknowledged to be the fastest to install Bypass system available on the market today; the time saved to install a standard RMSpumptools Bypass System over an ESP installation without a Bypass, is timed and verified as 1hour 20 minutes.

| Casing Size/Weight   | Maximum Bypass Tubing Sizes |        |        |        |        |  |
|----------------------|-----------------------------|--------|--------|--------|--------|--|
| 13-3/8" 72lb/ft      | -                           | -      | 5-1/2" | 5-1/2" | 4-1/2" |  |
| 10-3/4" 65lb/ft      | -                           | =      | 4"     | 3-1/2" | 2-1/8" |  |
| 9-5/8" up to 47lb/ft | 2-7/8"                      | 2-7/8" | 2-7/8" | 2-7/8" | -      |  |
| 9-5/8" 53lb/ft       | 2-7/8"                      | 2-7/8" | 2-7/8" | 2-3/8" | -      |  |
| 7" up to 26lb/ft     | 2-3/8"                      | =      | -      | =      | -      |  |
| 7" 29lb/ft           | 2-1/8"                      | -      | -      | -      | -      |  |
| ESP Motor Diameter   | 3.75"                       | 4.50"  | 5.40"  | 5.62"  | 7.25"  |  |





## **Completion Series**Redundancy Single Y-Tool - Dual ESP System

The RMSpumptools Y-Tool is a simple extension of our field-proven standard Y-Tool ESP completion which allows the operator to run two complete ESP systems in one well, to provide a down-hole back up system. Typically both ESP systems are identical.

An individual cable powers each ESP and either the upper or lower ESP system can be selectively operated without any well intervention required. When failure of the first operating ESP eventually occurs, the other ESP is then activated to provide extended operating time between workovers.

This system is best applied in high workover cost environments such as offshore and remote locations where rig access to well for workover may not be immediate (notably subsea applications).

The dual ESP redundancy system radically improves well profitability by lowering workover costs and by cutting deferment. Initial installation time is minimised and all systems are worldwide field-proven for ultimate reliability.

## 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.





## **ALTERN8**ESP Deployment System

RMSpumptools ALTERN8 is an industry first, cable deployed ESP Wellhead Electro-Mechanical Termination System. It allows ESP deployment through production tubing into a live well using existing wellhead infrastructure to minimise lost production until a workover can be completed.

#### System Benefits

Seamless Fit - fully integrated Wellhead Interface designed and manufactured by RMSpumptools

No Rig requirement - minimal infrastructure is required to deploy a system and all tree functionality remains in place

Reduced installation time - faster deployment compared to conventional tubular completions

Live well deployment through existing tree (allows full use of tree valves)

Maintains master valve functionality

Manage/maintain flow line height

Accommodates existing penetrator stack up

Minimal assembly of parts

#### System Components

Wellhead Spool

Hanger String

(Hanger & Lock Mandrel, Adjustable Union, Grapple, Seal Sub)

Electrical Connectors

### **Key Performance Features**

Dual Bulkheads

Testable Well Barriers

Hanger Landing Confirmation

Flushing Capability

Flexible, Low Profile Connectors

ALTERN8 provides the interface to produce or de-water wells using alternatively deployed ESP's without pulling the existing completion or making facilities modifications - saving significant cost

Keep your Well Producing with a Thru-Tubing Cable Deployed ESP System





## **ALTERN8**ESP Deployment System





Keep your Well Producing with a Thru-Tubing Cable Deployed ESP System



## **Completion Series**Double Horsepower - Series & Parallel

RMSpumptools Double Horsepower is a dual ESP system that enables maximum production in high volume/high PI wells by providing high downhole horsepower shared between two standard-range ESPs.

An individual cable powers each ESP - both ESPs are operated simultaneously to share the pumping requirements, either by doubling the production rate or doubling the head (pressure output).

This system is best applied when the full production potential of a well is otherwise restricted because the well has very high productivity index (PI) and the high horsepower required to maximise production is beyond the range of available ESP motors or voltage supply.

### Features & Benefits

Although ESP technology has improved dramatically over recent years and high horsepower ESP motors are available, limitations to using high horsepower single ESPs include:

Shaft Torque
Voltage and Power availability limitations
Downhole Power concerns
Well Bore Restrictions
Equipment availability

By using standard medium horsepower ESPs in either parallel (dual Y-Tools) or series (dual can system), the operator can utilise standard off-the-shelf ESPs without upsizing topside switchboards, drives and transformers.





## **Completion** Series Dual Concentric / Multiple Zone

The RMSpumptools Dual Concentric/Multiple Zone is a dual ESP system using two independent ESP systems that separately and individually produce two production zones in the same well without mingling the fluids.

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 pressure-tight shroud (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, separating the two production zones.

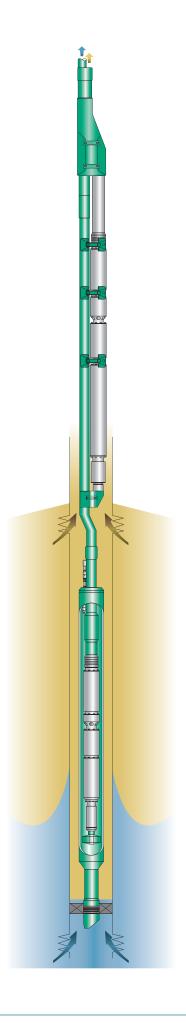
Co-mingling of fluid is prevented by the use of a separate concentric tubing string (inside the main production string), creating a micro annulus. The concentric tubing is fitted with a Seal Mandrel that locates in the Seal Bore in the Dual Flow Y-Tool.

### 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.





## **TS** Series 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.

It 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.

It 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 amongst others.

### Adjustable Union Size Options

| Tubing Size | Weight Range  | Min Bore | Max OD |
|-------------|---------------|----------|--------|
| 2-3/8"      | 4.6#          | 1.930"   | 3.250" |
| 2-7/8"      | 6.4#          | 2.380"   | 3.975" |
| 3-1/2"      | 9.2#          | 2.920"   | 4.975" |
| 4-1/2"      | 12.6# - 13.5# | 3.920"   | 6.000" |
| 5-1/2"      | 20# - 23#     | 4.680"   | 7.500" |

### **Key Performance Features**

Simple Jacking Mechanism
Anti-rotation Keys
+/- 30 degree Orientation
Simple Construction
Only One Set of Seals





## **TS** Series

## ADV® - Automatic Diverter Valve

The RMSpumptools ADV® is the Industry's Best Performing ESP Diverter Valve that enables tubing to annulus communication. Typically used for ESP completions, the ADV® combines ESP protection from solids fall-back on pump shut-down and free flow either from natural flow or from a lower ESP (dual completion). The ADV® dramatically improves ESP run life and has saved significant costs for Operators.

The ADV® has been independently customer tested against all competitor variants and approved as the only diverter valve that can operate under high flow and high pressure ESP applications, especially Dual POD applications.

## The ADV™ versus Similar Competitor Tools

| ESP Flow Valve                    | DFV | PAR | AFV | AFS | TDV | ADV® |
|-----------------------------------|-----|-----|-----|-----|-----|------|
| Patented Design                   |     |     |     |     |     | •    |
| Metal to Metal Sealing            |     |     |     |     |     | •    |
| No Valve Chatter                  | •   | •   |     |     |     | •    |
| Instant & Precise Open/Close      |     |     |     |     |     | •    |
| No Recirculation                  |     |     |     |     | •   | •    |
| High Pressure Equalisation*       |     |     |     |     |     | •    |
| Maximises Free Flow               |     |     |     |     |     | •    |
| Non-Reactive to Flow Variations   |     | •   |     | •   |     | •    |
| Extensive Flow Ranges             |     |     |     |     | •   | •    |
| Lowest Pressure Drop Design       |     |     |     |     |     | •    |
| Wireline Retrievable Option       |     | •   | •   |     | •   | •    |
| ESPCP & RDPCP Options             |     |     |     |     |     | •    |
| 2-3/8, 2-7/8, 3-1/2, 4-1/2, 5-1/2 |     |     |     |     |     | •    |

<sup>\*</sup>Metal to Metal sealing enables high pressure unloading on ESP shut-off and combats the high risk of elastomeric seal failures.

### Maximising Flow

The annular port area of the ADV® is greater than the Tubing Area, maximising flow through the tool. All flow areas inside the tool are optimised with paths designed to minimise pressure drop and lessen the effects of erosion.

### Why the ADV® is Unique

The ADV® uses pressure differential, not flow, to function unlike elastomeric competitor tools. As long as the minimum pressure differential is maintained, the well flow rate can fluctuate without disturbing the function of the tool. The benefit is that the ADV® does not prematurely wear from "chattering" as competitor tools are known to do.

## Key Performance Features

Patented Technology

Metal to Metal Primary Sealing

Field Proven in Harsh Environments

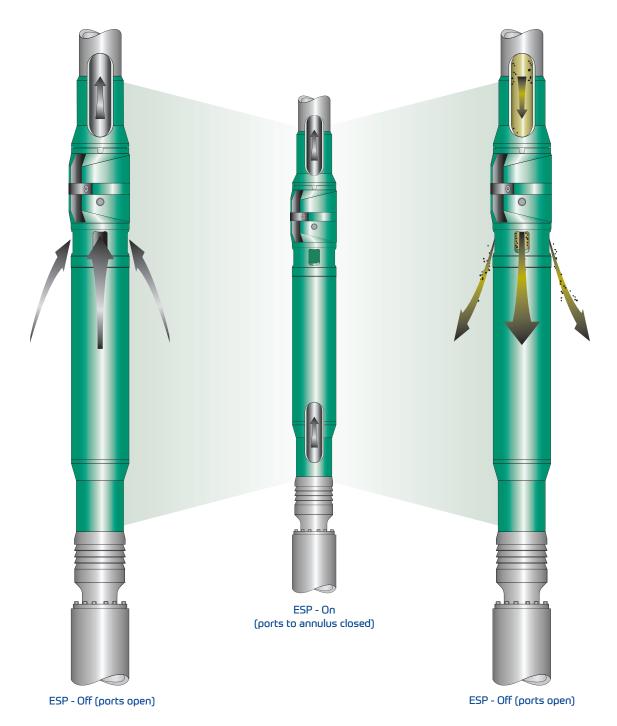
Widest Range of Sizes and Flow Rate Operation





## TS Series ADV® - Automatic Diverter Valve

- " The Automatic Diverter Valve Saved North Slope Operator \$4.9M over Three Years." BH, Alaska
- " Run times of ESPs fitted with the ADV in Occidental's fields have increased by 450% as a direct result of the use of the ADV." OXY, Colombia
- "The ADV saved 12 hours rig time by removing the need to run a dedicated injection string." BH, UK



#### Free-Flov

Free-flow to production tubing avoiding passage of fluid through pump section, eliminating bearing damage and scale build up. On ESP switch-on the ADV® automatically operates to close ports to the annulus and pumped production commences to surface.

### Tubing Drain / Solids Fall-Back to Annulus

Upon ESP trip / shut down, fluid and solids in the tubing string instantly exhaust into the annulus. Communication to the ESP is blocked preventing solids entering the ESP and eliminating ESP backpin. When the ESP is restarted the ADV® automatically operates to close ports to annulus and normal production resumes.



## TS Series BOP CAN/POD

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.

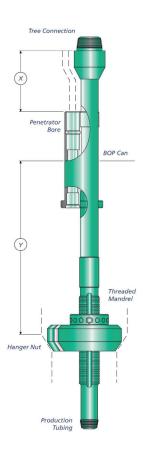
Below the BOP CAN is the space-out to the Fluted Hanger, the dimension from the centre of the BOP CAN to the Hanger, 'Y' should also be specified. The RMSpumptools BOP CAN is available for a variety of RAM and Production Tubing sizes and can accommodate a number of Control Line feedthrough ports, normally 1/4" NPT.

### **Key Performance Features**

Positive seal around ESP Cable and BOP Rams

Threaded Mandrel allows space-out of Fluted Hanger Nut

Fully Pressure tested and certified







## **TS** Series

## NRV - Non Return Valve

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 a tubing string test or packer setting.

It is typically used with ESP completions above the pump discharge to prevent flow back when the pump is deactivated - applications include:

Single ESP installation to prevent fluid fall-back.

Dual ESP installations to provide intervention - free ability to operate either ESP automatically.

## **NRV Size Options**

| Sizes  | OD     | Length | Connection | Casing |
|--------|--------|--------|------------|--------|
| 2-7/8" | 4.625" | 25"    | Vam Top    | 5.5"   |
| 3-1/2" | 4.810" | 25"    | Vam Top    | 7"     |
| 4-1/2" | 6.500" | 36"    | Vam Top    | 7-5/8" |
| 5-1/2" | 7.500" | 36"    | Vam Top    | 8-5/8" |
| 7"     | 8.250" | 36"    | Vam Top    | 9-5/8" |

## **Key Performance 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





## **TS** Series

## PRL (Positive Rotational Lock) Swivel Union

The RMSpumptools PRL Swivel 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.

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

The PRL Swivel is configured with +/- 10 Deg Alignment as standard but can be supplied with +/- 3 Deg Alignment. Standard Materials are L-80 Alloy Steel for standard service or 13% Chrome for sour service.

### PRL Swivel Size Options

| Tubing Size | Weight Range  | Min Bore |
|-------------|---------------|----------|
| 2-7/8"      | 6.4# - 7.7#   | 2.320"   |
| 3-1/2"      | 7.7# - 10.2   | 2.920"   |
| 4-1/2"      | 10.5# - 13.5# | 3.920"   |
| 5-1/2"      | 15.5# - 23.0# | 4.680"   |

## **Key Performance Features**

High Torque Capacity ± 10° Alignment Simple Construction Full Tubing Bore Only One Set of Seals





## **TS** Series Pump Chek

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.

| Production Tubing | OD (Eccentric) | Bore  |
|-------------------|----------------|-------|
| 2-3/8" EUE        | 3.50"          | 1.87" |
| 2-7/8" EUE        | 4.25"          | 2.25" |
| 3-1/2" EUE        | 5.00"          | 2.75" |
| 4-1/2" EUE        | 6.10"          | 3.50" |

Burst Ratings: 1,000 - 4,000 psi

### **Key Performance Features**

Full Flow on ESP Operation

All Metal Pressure Sealing

No Elastormers

Simple 1-Piece Body Construction

Available in Alloy Steel for Standard Service and 13% Chrome for Sour Service





## TS Series SandCat - ESP Desander

The RMSpumptools SandCat is a down-hole centrifugal sand separator designed to separate out sand from the produced fluid before it enters the pump. Attached below the ESP motor, the SandCat is installed with the ESP as a quick and simple addition to the completion system.

Solids laden fluid is forced into the SandCat intake. An integrated flow seal acts as a barrier to prevent well fluid from bypassing the SandCat. A centrifugal chamber drives sand and solids to the outer part of the chamber allowing de-sanded fluid to enter the SandCat internal central fluid intake.

Separated sand and solids are directed to the tailpipe by centrifugal velocity and carried downward by gravity. De-sanded fluid exits into the upper annulus through the discharge sub above the flow seal. It can radically reduce damage to expensive ESPs in sandy wells and significantly increase pump run time resulting in improved well profitability for the operator.

| Casing Size | SandCat OD | Flow Rate     | Overall Length |
|-------------|------------|---------------|----------------|
| 5-1/2"      | 4"         | 200-1000 bbd  | 112.7"         |
|             |            | 400-1300 bbd  | 118.7"         |
|             |            | 1000-1700 bbd | 121.7"         |
|             |            | 1200-2000 bbd | 123.5"         |
| 7"          | 5-1/2"     | 200-1000 bbd  | 114.5"         |
|             |            | 1000-2200 bbd | 125.7"         |
|             |            | 1500-2800 bbd | 140.7"         |
|             |            | 1800-3600 bbd | 148.7"         |
|             |            | 2500-5000 bbd | 165.7"         |

### **Key Performance 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

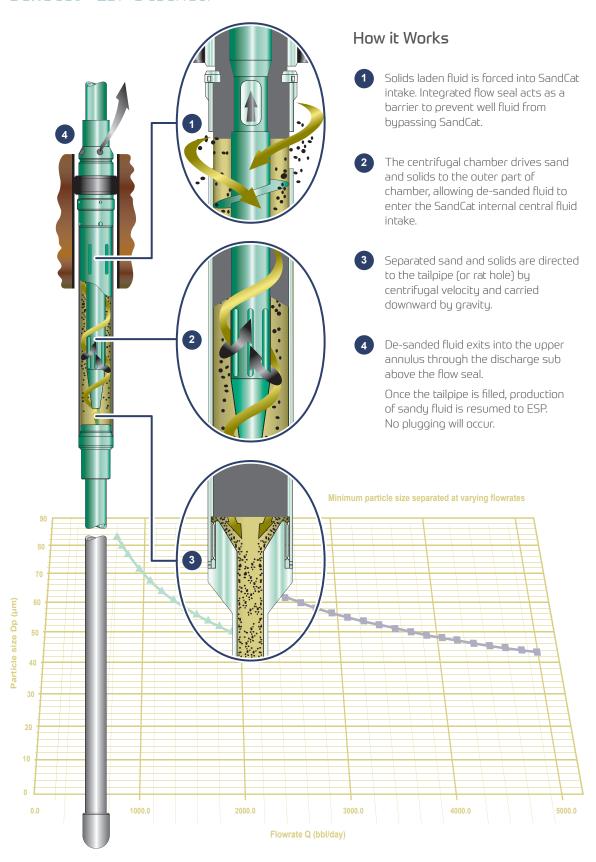
Sand Management System provides choice of sand collection options





## **TS** Series

## SandCat - ESP Desander





## **TS** Series

## Ultra Low Profile **Stealth Clamp™**

The uniqueness of the patented Stealth Clamp<sup>TM</sup> lies in its Helix profile design which substantially increases surface area contact and load strength. The StealthClamp<sup>TM</sup> fully protects and secures all cables and control lines during installation and in operation, whilst providing total rotational lock protection.

The minimal possible running OD allows for extremely tight clearances or heavy wall casing and the StealthClamp $^{\text{TM}}$  can withstand an axial load of 10 Tonnes (22,000lbs) whilst running in hole, without compromising casing integrity.

### Performance Data

Metallurgy Options: 13% Cr (18-22 Rc)

4140 (18-22 Rc)

Maximum Axial Loading: 10 Tonnes (22,000 lbs)

Working Temperature: 68°F - 250°F Class of Service: Standard / H<sub>2</sub>S

#### Key Performance Features

Premium Quality Patented Design

Maximum Slippage Protection

Zero Risk of Hang-up

Lightweight for Ease of Handling

Flexible and strong (tested load rating - 10 Tonnes)

Optimum Protection of Cables and Lines

No Loose Parts - all Captive Machined Components

Chemical Injection Applications

Smart Well Applications

Split body with Helix internal profile machined from a single billet of material

High tensile steel bolts offer speed during assembly and maximum

clamping strength

Helix profile matched to the Casing

Anti-rotation with infinite adjustment

Ultimate strength Steel Strap machined from a solid billet of material, secured and protected inside the recessed OD of the Casing

Axial load is supported by the Helix profile and not the fasteners

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









## **Bypass** Series 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.

## **Key Performance Features**

Equalising Feature to allow fluid drain-off before pulling

2.75", 2.625", 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

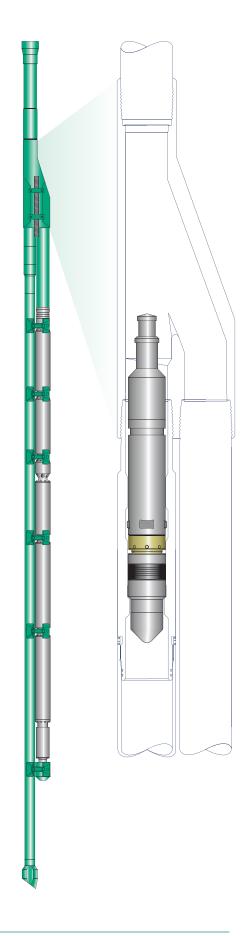
Run and Pulled with single wireline trip using standard wireline pulling/running tools

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







## **Bypass Series**Universal & Bypass Neck Clamps

The RMSpumptools Universal Bypass Neck Clamps transfer load from the ESP to the bypass tubing and are adjustable to fit any neck size of any brand of ESP and either 2-3/8" or 2-7/8" bypass tubing. Investment cast, single assembly with all captive parts so nothing can fall downhole, the Clamps also have slots to retain MLE's and control lines without stressing the cables.

Adjustable Inserts within the neck clamp are adjusted into position prior to locating on the ESP neck to fit any ESP neck size. An Allen Key is used to adjust the cable clip, neck size adjustment and to secure the clamp into position. All clamps can be tailored specifically to customer requirements according to Tubing size, MLE size, Control Lines and ESP size.



Premium Quality Patented Designs
Maximum Slippage Protection
Zero Risk of Hang-up
Ultimate Strength
Lightweight for Ease of Handling
Precision Machined Components
Optimum Protection of Cables and Lines
No Loose Parts - all Captive Components
Adjustable Neck Sizes and Inserts
Rotational Lock Protection

| Universal Neck Clamps | 7"               | 9-5/8"           |
|-----------------------|------------------|------------------|
| Tubing Size           | 2-1/8" & 2-3/8"  | 2-3/8" to 2-7/8" |
| ESP Size              | Up to 400 Series | Up to 500 Series |
| Metallurgy            | 13 Chrome        | 13 Chrome        |
| Max OD                | 5.93"            | 8.22"            |
| MLE Size              | No.4 - No.6      | No.4 - No.6      |
| Control Line Size     | 1/8" - 3/4"      | 1/8" - 3/4"      |

| Bypass Neck Clamps | 10-3/4"                 | 13-3/8"           |  |
|--------------------|-------------------------|-------------------|--|
| Tubing Size        | 2-7/8" to 4-1/2"        | 2-7/8" to 4-1/2"  |  |
| ESP Size           | Up to 800 Series        | Up to 1000 Series |  |
| Metallurgy         | 13 Chrome               | 13 Chrome         |  |
| Max OD             | 9.25"                   | 12.00"            |  |
| MLE Size           | No.2 - No.4 No.2 - No.4 |                   |  |
| Control Line Size  | 1/8" - 3/4" 1/8" - 3/4" |                   |  |











## **Bypass** Series Coiled Tubing Logging Plug

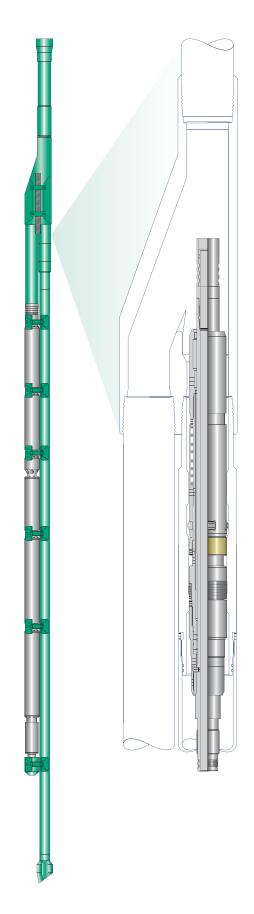
Coiled Tubing is often used in high angle or horizontal wells to deploy logging tools below the ESP. The coiled tubing logging plug is designed to provide a seal around the Coiled Tubing to prevent fluid recirculation during logging-while-pumping. The RMSpumptools Coiled Tubing Logging Plug incorporates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

| CT Logging<br>Plug Sizes | 1" | 1-1/4"   | oiled Tubing Size<br>1-1/2" | es<br>1-3/4" | 2" |
|--------------------------|----|----------|-----------------------------|--------------|----|
| 1.875"                   | ✓  | ×        | ×                           | ×            | ×  |
| 2.310"                   | ✓  | ✓        | ✓                           | ×            | ×  |
| 2.750"                   | ✓  | <b>√</b> | ✓                           | ✓            | ✓  |







## **Bypass** Series Wireline Logging Plug

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.

Aternatively, a weight bar may be attached to the bottom of plug to aid deployment in a high angle or deviated well.

