

Archer Oiltools

PRODUCT CATALOGUE



archerwell.com

Archer is a global oil services company with a heritage that stretches back over 40 years. With a strong focus on safety and delivering the highest quality products and services, Archer operates in 43 locations over 17 countries providing drilling services, well integrity & intervention, plug & abandonment and decommissioning to its upstream oil and gas clients.

Oiltools Introduction

Archer Oiltools is recognized as an industry leader for its smart and robust solutions for markets where well integrity, reliability and time saving are of utmost importance. In line with our mandate to deliver better wells, we have assembled a range of technologies designed to combat this serious challenge, to extend well life, maximize well performance, and minimize environmental impact. Our well integrity portfolio addresses three key challenges: annulus integrity, well suspension and integrity diagnostics.

Portfolio

The Archer Oiltools portfolio specializes in the design, manufacturing, operation and installation of high-end tools and services, unique within well barrier and well integrity remit. To ensure all of our oil tools products and services meet or exceed client expectations, Archer's engineering department develops and regularly tests tools to ISO 14310 and now recently also the 14998 VO standard. Our specialized products can be tailored to clients' internal and/or external needs, specifications and regulations.

Our premium product portfolio consists of:

- Plugs and plug Solutions
- Slot Recovery and P&A Solutions
- Cementing Solutions
- Well Cleaning Solutions

Value

Delivering value driven excellence to our clients operations is what we do. Our well barrier equipment is certified to the highest international standards and is consistently being applied by the in most challenging environments around the world.

People

Archer's Oiltools personnel are recognized for their experience, expertise and the personal pride and care they take in performing their work safely and efficiently. We are constantly in search of new ways to deliver outstanding performance, which starts with selecting the right tools to solve customer challenges.

Performance

Our pursuit is to perform to the highest standards in safety, conduct, operations, engineering and service. The desire to succeed, the reliability to deliver on what we promise, and the discipline to be consistent in doing so safely, defines Archer's performance.

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**Plugs & Plug
Solutions**

SPARTAN®

Everyday solution for short or medium term well suspension

The SPARTAN® is designed for well suspension periods of days to months, ensuring easy deployment, a secure seal and safe removal on task completion.



Benefits

- Absolute protection
- Confidence in retrieval
- Easy and rapid deployment
- Reduces operational time
- Safer and lower cost operations
- Flexible set depths and angles

Features

- ISO 14310 V3 to V6 certified seal
- 100% retrieval record; millable
- No set weight needed below
- High differential pressure elements up to 12,500 psi and 95°C
- Seal testable from above and below
- Sizes 9 5/8" – 14"

Specifications

Sizes, inches	9 5/8" – 14"
Pressure rating, psi [bar]	3,000 – 12,500 [207 – 862]
Temperature rating, °F [°C]	35 – 203 [2 – 95]
ISO 14310 qualified	Yes
Max hang-off weight, klbs [tons]	250 [113]
Through-bore diameter, inches	1.96 – 3
Typical suspension period	Days to Months
Drillpipe Connections	NC50 – 6 f/8 FH
Elastomer	HNBR – FKM
Ball valve ISO 28781 qualified	Yes

Specifications may be subject to change.



Archer

LEAKFINDER

Leak detection plug

LEAKFINDER is a leak detection plug that builds on the exacting standards set by SPARTAN® and LOCK® plugs. It is a simple and cost effective plug for various types of testing and leak detection.

Benefits

- Reliable packer, with similar mechanisms as SPARTAN® & LOCK®
- Multiple set
- Can be run with cleanout tools as an integrated part of the assy

Typical Applications

- Leak testing
- Pressure testing
- Setting tie-back anchor against plug
- Inflow testing
- Annulus testing
- Formation testing

Features

- Easy to set/release. Same setting/releasing mechanism as LOCK® plugs that are used for our customers
- High pressure ratings up to 12500 psi (862 bar)
- High pumping capacity due to large 3" ID through plug when set.
- Easy to monitor leakage when testing against elements from above, leakage past plug can be monitored up DP



Archer

C-SPARTAN™

Everyday solution for permanent suspensions

The C-SPARTAN™ is designed for permanent well suspensions and as a fundament for cement. The C-SPARTAN™ is designed based on the pioneering LOCK® and SPARTAN® technology and provides the customer with a reliable solution for safe and lower cost operations.



Benefits

- Easy and rapid deployment and installation
- Safer and lower cost operations
- Reduces operational time
- Flexible set depths and deviations
- Easy adaption to suit combined operations

Features

- ISO 14310 V6 rated
- No set weight needed below, limited weight needed above
- Resettable if required

Specifications

Sizes, inches	9 5/8 - 10 3/4
Pressure rating, psi [bar]	3133 - 4000 [216 - 276]
Temperature rating, °F [°C]	39 - 203 [4 - 95]
ISO 14310 qualification	V6
Typical application	Permanent barrier or fundament
Drillpipe Connections	NC50 Box
Elastomer	NBR - HNBR
Service provided	Standard

Specifications may be subject to change.



Archer

TIMELOCK®

Long term suspension
and harsh conditions

Archer's TIMELOCK® plug is designed for longer-term suspension periods and harsh well conditions. TIMELOCK® is part of the LOCK® plug series that brings absolute protection, efficiency and flexibility to deliver time and cost savings.



Benefits

- VO protection for extended periods or harsh well conditions
- Confidence in retrieval
- Easy and rapid deployment
- Safer and lower cost operations
- Flexible set depths and angles

Features

- ISO 14310 VO certified gas-tight seal with enhanced seal technology
- High performance elastomer (NORSOK M-710 approved)
- 100% retrieval record; millable
- No set weight needed below
- High differential pressure elements
- Seal testable from above and below
- Multiple sets without tripping

Specifications

Sizes, inches	7 – 14
Pressure rating, psi [bar]	5,000 – 8,850 [345 – 610]
Temperature rating, °F [°C]	39 – 311 [4 – 155]
ISO 14310 VO qualified	Yes
Max hangoff klbs [tons]	300 [136]
Through-bore diameter, inches	11 – 3
Typical suspension period	Days to Years
Drillpipe connections	Pin NC38 – NC50
Elastomer	HNBR
Ball valve ISO 28781 qualified	Yes

Specifications may be subject to change.



Archer

STORMLOCK®

Storms, long term suspension or harsh conditions

Engineered to support up to 300 tons of pipe and with enhanced seal technology, STORMLOCK® takes suspension plug performance to its highest peak. Rapidly deployable, reliable and absolutely secure once set, STORMLOCK® delivers VO protection for short or long suspension periods, harsh well conditions—and storms.



Benefits

- VO protection for storms, extended periods or harsh well conditions
- Confidence in retrieval
- Easy and rapid deployment
- Safer and lower cost operations
- Flexible set depths and angles
- Reduces rig time

Features

- ISO 14310 VO certified gas-tight seal
- Up to 300 tons hanging capacity
- 100% retrieval record; millable
- No set weight needed below
- High differential pressure elements up to 10,000 psi and 150°C
- Seal testable from above and below
- Multiple sets without tripping
- Unrestricted 2" straight-through bore

Specifications

Sizes, inches	9 5/8 – 16
Pressure rating, psi [bar]	8,000 – 10,000 [551 – 689]
Temperature rating, °F [°C]	39 – 302 [4 – 150]
ISO 14310 VO qualified	Yes
Max hang-off weight, klbs [tons]	551 – 660 [250 – 300]
Through-bore diameter, inches	2
Typical suspension period	Days to Years
Drillpipe Connections	6 5/8 in FH
Elastomer	HNBR
Ball valve ISO 28781 qualified	Yes

Specifications may be subject to change.



Archer

LASTLOCK®

Total security in permanent well abandonment

As part of the LOCK® series to provide gas-tight barriers for wells, LASTLOCK® brings total security and maximum protection for permanent plug and abandonment (P&A).



Benefits

- Permanent barrier (VO protection)
- Easy and rapid deployment
- Safer and lower cost operations
- Flexible set depths and angles

Features

- ISO 14310 VO certified gas-tight seal with enhanced seal technology
- High-performance elastomer (NORSOK M-710 approved)
- No set weight needed below
- High differential pressure elements
- Multiple sets without tripping
- Sizes 7”–14”

Specifications

Sizes, inches	7 – 14
Pressure rating, psi [bar]	5,000 – 8,850 [345 – 610]
Temperature rating, °F [°C]	39 – 311 [4 – 155]
ISO 14310 VO qualified	Yes
Max hang-off weight, klbs [tons]	300 [154]
Through-bore diameter, inches	N/A
Typical suspension period	Permanent
Drillpipe Connections	NC38 – NC50
Elastomer	HNBR

Specifications may be subject to change.



Archer

VAULT®

Dual Plug System

The VAULT® dual plug system enables two Archer barrier plugs to be installed in one run. VAULT® streamlines plug operations with the ultimate goal of reducing operational (rig) time.



Benefits

- Saves operational time
- Saves operational costs
- Reduced rigsite handling, improving safety standards

Features

- Dual plug system
- ISO 14310 certified, available as a VO rating
- No set weight needed below
- High differential pressure elements

Specifications

Sizes, inches	9 5/8 – 14
Pressure rating, psi [bar]	6,090 – 7,500 [420 – 517]
Temperature rating, °F [°C]	39 – 311 [4 – 155]
ISO 14310 qualification	VO – V6
Max hang-off weight, k lbs [tons]	300 [154]

Specifications may be subject to change.



Archer

SPEARHEAD®

Strong, extensive hangoff and pull capability

The SPEARHEAD® system is designed to withstand increased hang off loads, or pull forces, whilst qualifying as a barrier plug. This system allows customers to combine two or more operations, using the SPEARHEAD® as an anchor before or after it has been set as a barrier.



Benefits

- Saves operational time
- Saves operational costs
- Reduced rigsite handling, improving safety standards
- Reduced rigsite handling

Features

- Extensive hangoff capability
- ISO 14310 certified
- Ability to pressure test above and below the plug

Specifications

Sizes, inches	9 5/8 – 14
Pressure rating, psi [bar]	5,000 – 7,500 [345 – 517]
Temperature rating, °F [°C]	39 – 302 [4 – 150]
ISO 14310 qualification	V0 – V6
Max pull, k lbs [tons]	661 [300]

Specifications may be subject to change.



Archer

MARS

Permanent Bridge Plug

The MARS Permanent Bridge Plug is an ISO14310 VO qualified drill pipe or wireline set plug, capable of sealing up to 15,000 psi. The MARS plug can be run on a flow activated drill pipe deployed Running Tool or set up with an adapter kit to suit standard hydraulic wireline setting tool. The MARS plug is developed for permanent applications, but millable if required. 2 plugs can be milled in the same run if needed.

Benefits

- Flow activated (DP deployed)
- Hydraulic set
- Drill pipe and wireline deployed
- Millable (2 plugs in same run)

Features

- ISO14310 VO qualified
- 15,000 psi pressure rating
- Sour Service qualified

Specifications	6375 MARS	8375 MARS
Typical casing size	7 3/4" 46,1#	9 7/8" 62,8# / 10 1/8" 75,9#
Pressure rating, psi [bar]	15,000 (1034)	15,000 (1034)
Temperature rating, °F [°C]	40 – 250 (4 – 121)	40 – 250 (4 – 121)
ISO 14310 qualified	Yes	Yes
Setting range, in (mm)	6,5-6,696 (165,1-170,08)	8,5-8,785 (215,9-223,14)
Typical application	Permanent plug	Permanent plug
Type of service	Sour Service	Sour Service
Drillpipe connection DP deployed	NC38 Box	NC50 Box
Elastomer	FKM	FKM
Conveyance methods	Drill pipe and wireline	Drill pipe and wireline

Specifications may be subject to change.



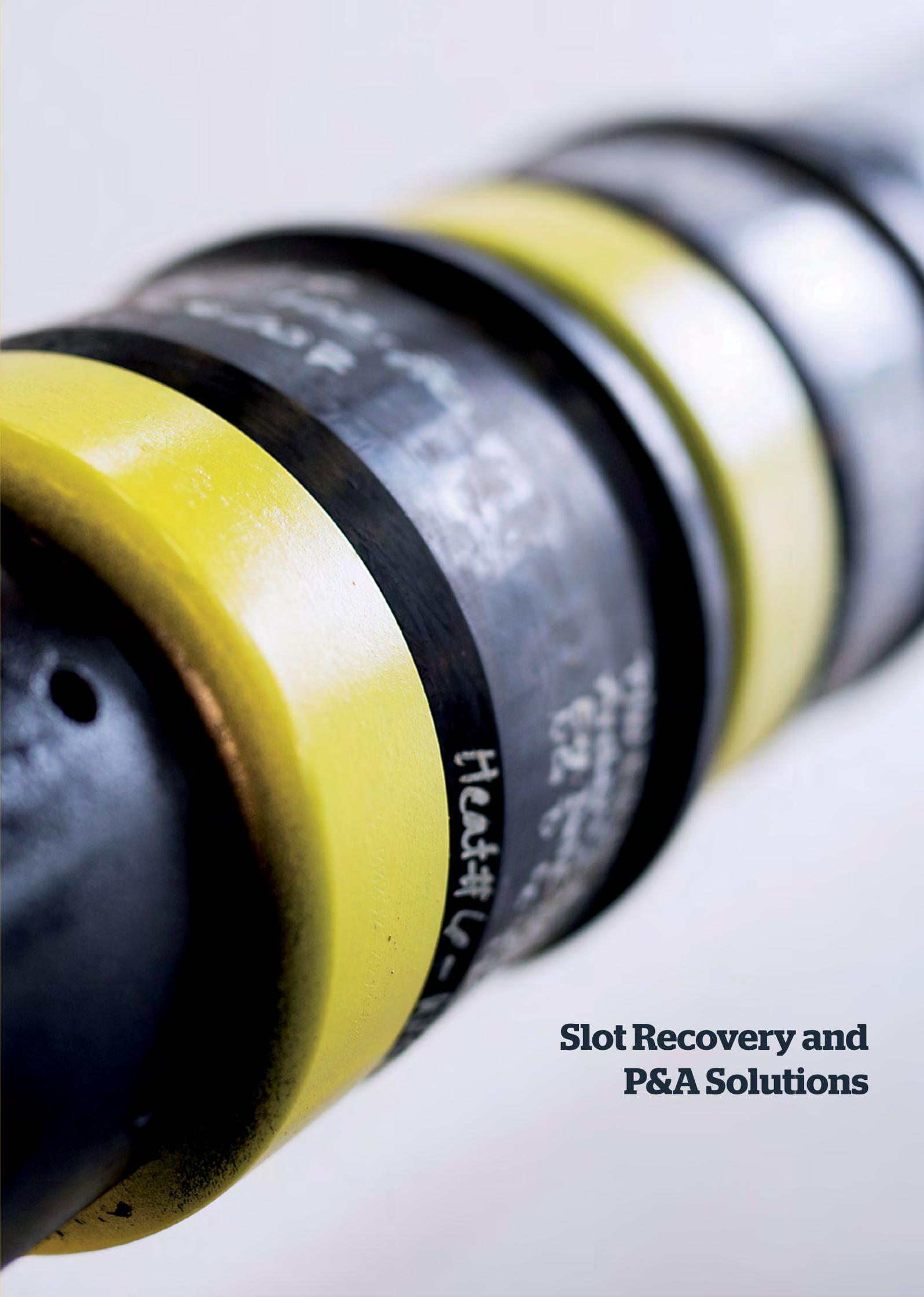
Archer

Plugs & Plug Solutions Case Studies

Our case studies are listed under each product on our website

Please visit our website for more information
archerwell.com

Archer > Products & Services > Oiltools > **Plugs and Plug Solutions**



**Slot Recovery and
P&A Solutions**

Stronghold® Barricade® System

Permanent Caprock Integrity

Archer's **Stronghold® Barricade®** is a perforate, wash and cement placement system that reduces plug and abandonment (P&A) costs by creating a rock-to-rock barrier in one trip.



STRONGHOLD®
Permanent Caprock Integrity

Benefits

- Field proven
- Significant time and cost savings
- Effective rock-to-rock sealing barrier
- No section milling and swarf handling
- No underreaming
- Efficient one-trip system with TCP
- No surge or swab effect
- Performs the fastest perforate, wash, and cement operations in the market

Applications

- Well abandonment
- Isolating Sustained Casing Pressure (SCP)
- Screen washing
- Slot recovery

Features

- High circulation rates
- Dual swab cup either side of washing ports
- Adjustable distance between swab cups
- Flow by-pass system
- Disconnect system available
- Ball or dart drop available

With the addition of the one-trip TCP (Tubing Conveyed Perforation) module, the Barricade® is designed to wash and clean the annulus of a perforated casing or liner in a selected formation zone or between casings, then accurately place a permanent barrier.

A one-trip operation with the Barricade® consists of:

- Perforating the section - at which point the guns drop automatically,
- Thoroughly washing the perforated annular section,
- Placing spacer fluid in the annulus using our calculated "Pump and Pull" method,
- Placing the barrier material using the same technique.

After the annular cleaning phase, high-circulation rates and pipe rotation enhance debris removal from the washed annulus and out of the well.

Specifications

Casing Size, in	6 5/8 - 7 5/8	9 5/8 - 16
Min ID, in	2.2	2.3
Circulation rate, lpm [bbl/m]	1,600 [10]	2,200 [14]
Pressure rating, psi [bar]	5,000 [344]	5,000 [344]

Adjustable distance between swab cups from 1 - 3 ft.



Archer

Stronghold® Defender® System

Permanent Caprock Integrity

Archer's field proven Defender barrier test system enables operators to perforate and test an annular barrier. The Defender® is part of a series of Stronghold® perforating, washing, cleaning and cementing systems to deliver faster, safer and more economical solutions for operators worldwide.



STRONGHOLD®
Permanent Caprock Integrity

Benefits

- Field proven
- Significant time and cost savings
- Efficient one-trip system with TCP
- No section milling and swarf handling
- Qualification of an effective barrier
- No surge or swab effect

Applications

- Well abandonment
- Formation integrity testing
- Annular solids integrity testing
- Circulation out of old, environmentally unfriendly, annular fluids

Features

- Primary and back-up swab cup design
- Adjustable distance between swab cups
- Flow by-pass system
- Disconnect system
- Ball or dart drop

The Defender® system provides a safe, quick, economical and effective alternative to traditional plug and abandonment (P&A) techniques of casing recovery, milling and perforate, wash and cement.

Traditionally, several runs were required to test the annulus. Setting two plugs and perforating usually took up to 3 runs.

Archer's Defender® system achieves this in just 1 trip by:

- Perforating the casing or liner.
- Verifying the integrity of the annulus.
- Placing barrier material in the casing and annulus.

The **result** is a permanent verified barrier that is achieved in a single trip – a simple, cost effective solution for annular remediation, bringing absolute protection and safety.

Together with Tubing Conveyed Perforating (TCP) products and new charge development, Archer's Stronghold® systems support the safe and efficient execution of operations.

In designing the Stronghold® Defender® system, our engineers focused on 3 key areas – **Efficiency, Flexibility** and **Reliability** to produce a service that is economical, efficient and effective.

Specifications

Casing Size, in	6 5/8 - 8 5/8	9 5/8 - 16
Min ID, in	2.2	2.3
Pressure rating, psi [bar]	5,000 [344]	5,000 [344]



Archer

Stronghold® Fortify® System

Permanent Caprock Integrity

The **Stronghold® Fortify® system** is the next generation barrier verification system used in plug and abandonment (P&A) and slot recovery. It is a superior system used to verify the integrity of existing annular barriers such as creeping formation and cement, ensuring **Permanent Caprock Integrity**.



STRONGHOLD®
Permanent Caprock Integrity

Benefits

- One-trip system
- Integrated pressure verification system with primary and back-up temperature and pressure gauge to confirm annular integrity.
- Small test volume for accurate integrity testing
- Solid ballseat system eliminating the need to drop balls or darts from surface

Applications

- Permanent Plug & Abandonment
- Slot recovery
- Workover operations
- New drills

Features

- VO rated ball valve system

Archer's Stronghold® Fortify® system provides a reliable verification of annular integrity, and is an effective alternative to traditional integrity testing.

Archer's Fortify® system achieves this in just 1 trip by:

- Perforate the casing
- Test the integrity of the annulus
- Verify annulus integrity utilizing a unique pressure verification system
- Cement across the perforated area

The significant improvement from the standard integrity tests systems in the market is the two independent pressure and temperature sensors integrated in the Fortify® system. The sensors deliver two independent verifications in addition to traditional volume verification. Fortify® is the next generation barrier verification system.

Specifications

Casing Size, in	6 5/8 - 7 5/8	9 5/8 - 16
Min ID, in	2.2	2.3
Circulation rate, lpm [bbl/m]	1,600 [10]	2,200 [14]
Pressure rating, psi [bar]	5,000 [344]	5,000 [344]



Archer

SAMURAI™

Multi- function Cutter

The Samurai™ Multi-Function Cutter is a hydraulic pressure operated mechanical tool for cutting different size pipes from 9 5/8" and up. The Samurai™ big bore multi-function pipe cutter has a ball-activation system that allows for both pumping through and pressuring up string without knives extending.

Featuring the 2 1/4" big bore and flow path design, cementing and other operations can be performed with the Samurai™ cutter in the string. In particular, the Samurai™ cutter can favourably be run together with a mechanical plug and anchor to establish permanent cement barrier, make multiple cuts and retrieve casing in same operation.

Benefits

- Ball activation
- Big Bore
- Simple to run
- Multiple cuts possible
- Large bypass areas
- Cost saving
- Time saving

Features

- Sizes 9 5/8" and up
- Cementing abilities
- Hydraulic pressure
- RIH knife Lock
- Stabilizing cutting

Typical applications

- Slot Recovery
- P&A Solutions
- Cementing Solutions
- Cutting



X-it®

Reliable sidetracks; first time

Hydraulic & mechanical set single-trip casing exit system

Proven in over 300 successful operations, X-it's unique multiramp whipstock geometry and fourth generation mill provide a step change in sidetrack drilling performance. With X-it technology, sidetracks are delivered efficiently, reliably and with far greater accuracy.



The X-it® system is the result of decades of hard-won experience in deploying and delivering sidetrack technology. In refining X-it®, our specialists have maintained a clear focus on efficiency, reliability, and accuracy as fundamental requirements of our sidetrack solutions. The X-it® system consists of two main components, each with its own combination of unique features and benefits; each working in harmony with the other.

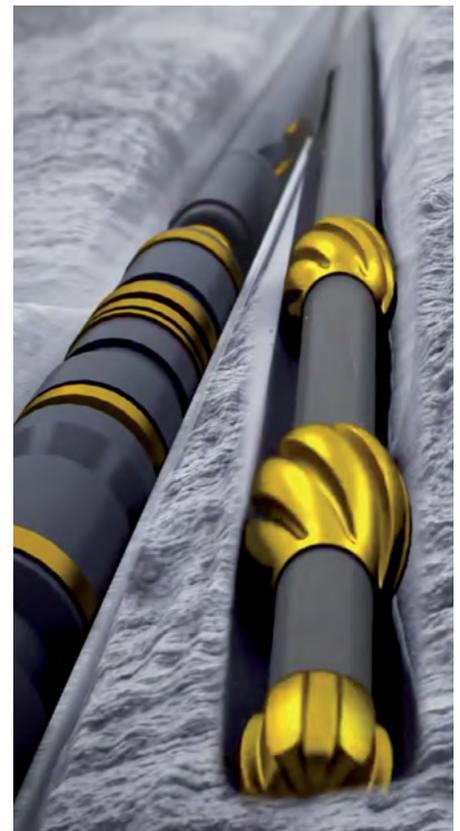
Deployment and anchoring

Once oriented using MWD or Gyro, the X-it® whipstock is firmly anchored in place using tri-directional slips, eliminating the risk of rotation and improving exit accuracy. Critically, the fulcrum lug anchor ensures that the top of the whipstock is always held firmly against the casing wall, regardless of orientation or deviation. This improves efficiency because the mill-string will not hang up at the whipstock. And it means that X-it® provides full 360 degree exit capability, making it the perfect choice for multilateral drilling and low side exits.

Milling and exiting

The X-it® whipstock features a unique 3-step ramp profile leading to the whipstock face. The precision geometry of the carbide coated ramps and the X-it® mill work together to maintain a progressive cutting force against the casing wall. This consistently improves mill efficiency; delivers a clean exit window; and ensures low dog-leg severity through the exit.

The fourth generation mill combines high-performance geometry and cutting technology to complement the whipstock design. Custom-blended Predator and Sharktooth inserts are Quicktip welded to spiral cutting blades, maximising strength and penetration rates. The integral pilot bit adds cutting force during casing exit but its main advantage is drilling formation. The pilot bit ensures a straight and true course off the whipstock face, eliminating the need for directional compensation and reducing dog-leg severity at a critical point in the new well. Overall, X-it® delivers a smooth transition through and beyond the exit point to help streamline completion of the new wellbore.





Unique Multiramp Whipstock; carbide coated ramps



The X-it® Single Trip Mill design includes a Pilot mill, Follow mill and a Dress Mill. All three mills providing advanced window milling capabilities.

The X-it® Retrievable Anchor

is a mechanical weight set slip anchor design for full contact with tri-directional wickers. Anti-rotation and high axial load slip-design. Fulcrum Lug allows for low side exits.

The X-it® Hydraulic Anchor is a hydraulic set (Mechanical with hydraulic actuation cylinder) Slip anchor design for full contact with tri-directional wickers. Anit-rotation and high axial load slip-design. Fully retrievable.

The Retrievable Packer Anchor. Pressure containment to 7500 psi. Fully retrievable with adjustable shear values.



Benefits

- Single-trip reliable, effective and efficient sidetracks
- Pilot bit precision delivers accurate, straight sidetrack with reduced dog-leg and tortuosity
- 360 degree and low side exits improve target accuracy and reduce drilling time
- Positive anchoring in high deviation eliminates hang-up risk on whipstock
- Confidence in system due to 300+ wells track record

Features

- Fully retrievable; single-trip system
- Unique multiramp whipstock; carbide coated ramps
- Unique geometry combination mill; integrated pilot mill
- Quicktip applied Predator and Sharkstooth inserts improve strength and penetration
- Tri-directional anchor slips provide positive anchoring
- Fulcrum lug anchor forces whipstock against casing in all deviations
- 360 degree exit including low side
- Dual string and horizontal well exit capability
- Two-piece whipstock
- Multiple anchor mechanisms

Applications

- Sidetracks
- Multilaterals
- Controlled casing exit

Hydraulic set options

- Hydraulic set retrievable anchor
- Low side exit capabilities
- Hydraulic set retrievable packers
- Hydraulic set permanent packers
- SSV valve for MWD orientation
- Fluid reservoir

The X-it® Whistock incorporates two field proven methods for retrieval - the X-it® retrieval die collar and retrieval hook.

Tubing Conveyed Perforating (TCP)

Perforating for better wells

Archer's Tubing Conveyed Perforating (TCP) equipment delivers high performance charges for demanding perforating operations in plug and abandonment (P&A) and completions.

Benefits

- Deeper and cleaner perforation tunnels for increased well productivity
- Excellent track record
- High performance punchers and squeeze gun systems for controlled penetration length and casing hole size

Applications

- Plug & Abandonment (P&A)
- Well completions
- Formation testing
- Remedial work

Features

- Can deliver from 0 to 360 degree phasing
- Produce optimal casing entrance hole diameter
- Controlled perforation of single or multiple casings
- Can perforate between casings to remove sustained pressures
- Gun outer diameter (OD) range from 2" to 7", and shot density of 1 shot per foot (spf) to 36 spf

Perforating is essential in delivering wells, improving well performance, Plug and Abandonment (P&A), and remedial work during the lifetime of a well.

Archer provides various shaped charges including patented liner material technology, which ensures cleaner perforation tunnels for increased well productivity. Archer's extensive P&A experience, combined with our tailor-made perforating systems, ensures time efficient and optimized P&A operations.

Associated TCP Services

In addition to standard and specialized Tubing Conveyed Perforating (TCP) services, we offer associated services, including:

- Punching
- Explosive and electro-mechanical pipe-cutting
- Pyrotechnic and plug setting horizontal pump-down "plug and shoot"
- Coil tubing perforating
- Wireline perforating
- Casing patch

Aligned with the Stronghold perforate wash cement systems, Archer's TCP services ensure an efficient and safe execution of operations, bringing time and cost savings to our customers.

TCP is part of our portfolio of Oiltools products and services. Find your local contact at: <http://archerwell.com/product-service/oiltools/>



Archer

KellyLock

Automatic Drill-Pipe Shut-off

The Archer KellyLock is a Kelly Valve that provides a quick automatic shutoff in the drill string. The KellyLock has a unique engineered design to automatically shutoff pressure and flow utilizing drill pipe rotation.

The KellyLock is especially designed to avoid mud-spill on drill floor when drilling with a drilling pup on a MODU. Valuable rig time can be saved by avoiding draining the drilling pup on each drilling connection.

Benefits

- Eliminates mud spilling
- Saved Rig time
- Easy installation and use
- 345 bar pressure rating
- No additional installation

Features

- Quick automatic shut-off
- Unique ball valve design
- Low friction shut-off
- Drill-pipe connection
- Exceeds Drill-Pipe connection

Typical applications

- Drilling Operations

Safer and cleaner drilling environment

The KellyLock is installed as the bottom part of the Top Drive drilling pup joint

1. The KellyLock stays in open position while drilling
2. When left-hand rotation is introduced, e.g. to break connection, the KellyLock automatically closes to avoid spill
3. As right-hand rotation is applied, e.g. to make-up connection, the KellyLock automatically opens again.

The Archer KellyLock provides safer and cleaner drilling environment.

Specifications

Size	Description	Pressure rating	Connection
9.45"	KellyLock Ball Valve	345 bar	5 1/2" VAM CDS

Specifications may be subject to change. Other connections available upon request.



Archer AutoFill

Efficient Back-Fill and Well control

The Archer AutoFill tool is a mechanical tool designed to automatically back-fill the drill-string.

The AutoFill tool can be integrated in any RIH operation as a part of the drill-string. The automatic drill-string back-fill will save valuable rig time use filling the drill-string on surface. It can be rotated and reciprocated without damaging the casing or tool. This is due to its rugged design and the fact that it does not contain external bolts that could become loose under extreme conditions.

Benefits

- Maintain wellbore integrity
- Saved rig time
- Controlled back-fill
- No RIH restrictions
- Simple to run
- Multiple run possible

Features

- Automatic equalizing valve
- Minimum ΔP to open/close
- Drill-pipe connection
- One piece mandrels
- Large ID

Typical applications

- Drilling Operations
- Liner running

Efficient Back-Fill

Annulus pressure acting on a Pressure valve inside the AutoFill, will automatically back-fill the drill-string from annulus. The Pressure equalizing valve automatically closes communication to annulus when the drill-string is pressurized. This allows drill-string filling without compromising drill-string integrity.

The AutoFill tool can be integrated in BOP testing with loss to formation minimizing the risk of unbalanced wellbore. Another application could be running completions saving valuable rig time filling pipe.



Specifications

Size	Description	Connection
10"	10" AutoFill Tool, with automatic back-fill valve (Plunger type)	5 1/2" FH
10"	10" AutoFill Tool, with automatic back-fill valve (Plunger type)	DPN-MT57

Specifications may be subject to change.

Archer Wear Bushing (AWB)

Reduces Rig Time

The Archer Wear Bushing (AWB) is designed to allow installation and retrieval of the wear bushing combined with other operations. This saves the operator dedicated wear bushing installation and retrieving trips. The AWB and its running tool are designed to continue run in hole once the wear bushing is installed. Retrieval of the wear bushing is done as the BHA is pulled out of hole.

Benefits

- Eliminates dedicated run
- Saves Rig time
- Applicable for most operations
- Simple to run
- Possibility for multiple runs
- Withstand drilling and milling operations

Features

- Run thru profile
- Latch in dogs
- One piece mandrel
- Large bypass areas for eliminating flow restrictions
- High strength materials

Typical applications

- Drilling
- Temporary suspension and P&A
- Cementing operations
- Casing cutting operations



The AWB runs as an integrated part of a drill string BHA. This could typically be cleaning tools, bridge plugs, cementing tools, casing cutting tools or a combination of these.

The AWB has a sturdy design, a feature that allows the drill string to be rotated and reciprocated thru the AWB without fear of damaging the internal surfaces of the wellhead equipment and top of the last casing. Sufficient flow bypass in running tool eliminates flow restriction during drill string operations.

The AWB consists of a wear bushing and a one-piece body running tool with latch dogs to install and

retrieve the AWB. Once the AWB is installed, RIH can continue by unlatching from the AWB. The running and retrieving tools are designed to avoid wear and tear or damage to the riser and casing during the drill string operation. Once the drill string operations are completed the AWB is retrieved coming out of hole, this can be combined with retrieving the seal assembly in one run.

The AWB can be designed to replace the most common wear bushing designs.

Specifications

Casing Size	Description	Running & Retrieval
13 3/8"	13 3/8" The Archer Wear Bushing for 13 3/8" 68 - 72# casing	7 1/4" Running Tool

Specifications may be subject to change.

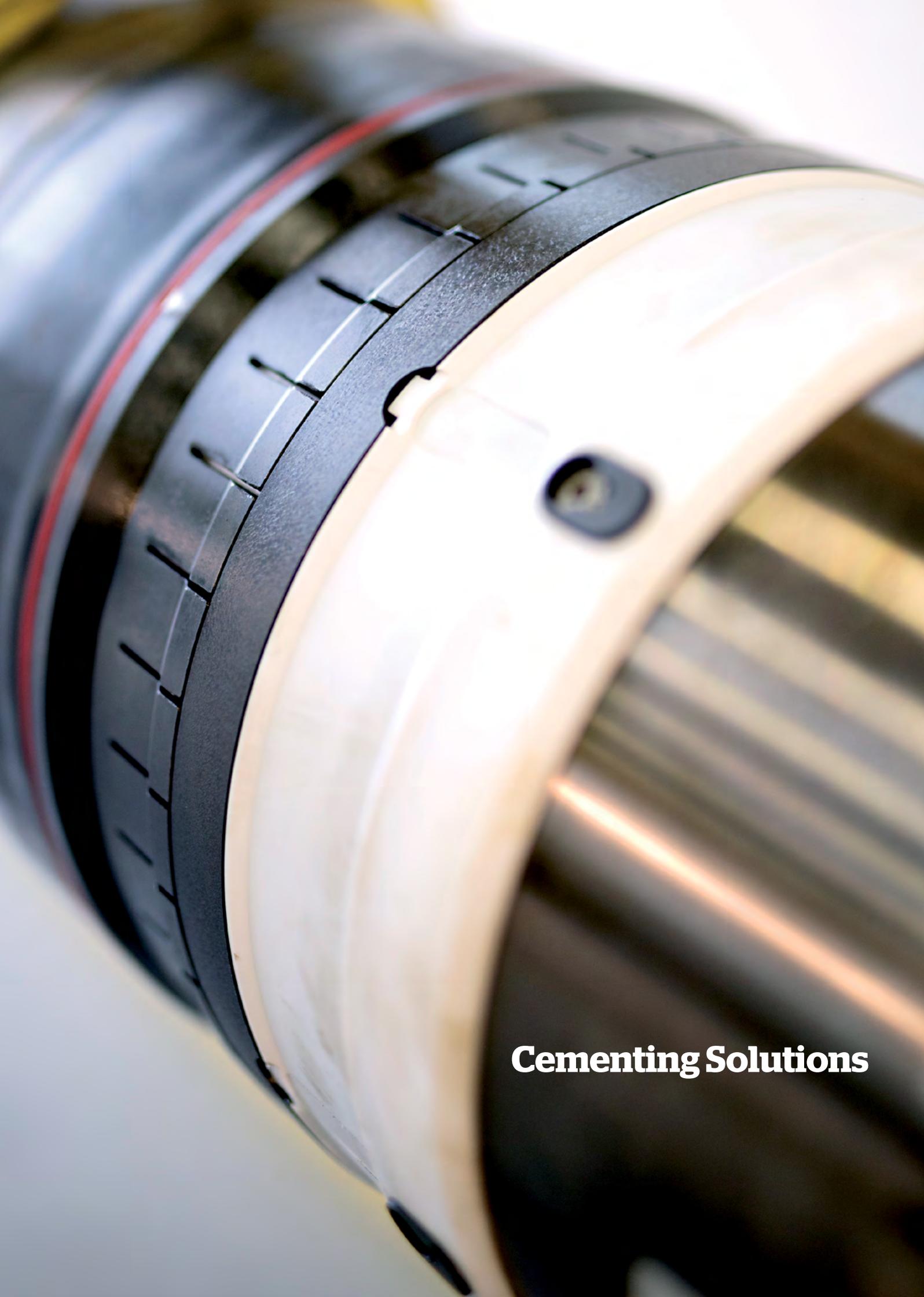


Slot Recovery and P&A Solutions Case Studies

Our case studies are listed under each product on our website

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Cementing Solutions

Cflex®

Improved annulus integrity

Multistage cementing system

Cflex® technology enables high-performance multistage cementing. Qualified “gas tight” equivalent to ISO 14998 VO: 2013 and with a permanent lock system, Cflex® performs to the highest integrity standards.

Despite advances in cement technology, annulus integrity is one of the biggest challenges facing the industry, both in terms of frequency and impact. The Cflex® cementing system improves annular seal integrity and overcomes the shortcomings of previous stage cementing technology. In designing Cflex®, our engineers focused on four key areas, integrity, flexibility, efficiency and performance.

Integrity

Cflex® is engineered to the highest possible integrity standards. In addition to its high tensile strength, burst and collapse ratings, Cflex® is VO qualified through rigorous testing equivalent to the ISO 14998 standard, which means it provides an absolute “gas tight” seal. Locking Cflex® permanently closed following a successful operation adds further security.

Flexibility

Cflex® is available in a wide range of sizes and materials, and can be custom-built. Multiple Cflex® devices can be positioned within the casing string and accessed selectively for any number of cementing stages. Cflex® also accommodates different equivalent circulating density (ECD) and

flow rate requirements. Four circulating ports provide a large flow area, expanding the envelope of possible flow rates. Taking flexibility one step further, because Cflex® provides secure controlled access to the casing annulus, it can be used for other applications that require this functionality.

Efficiency and performance

Operating Cflex® is straightforward, fast and precise. The multifunction operating tool is designed to both operate the Cflex® valve and inject fluids. And if multiple Cflex® devices are present, each can be accessed and controlled selectively according to the multistage program. Another key feature of Cflex® is its slim design. The full bore internal diameter (ID) matches the casing ID, offering unrestricted passage; and the outside diameter is no larger than the casing collar, thereby minimising ECD effects and reducing the risk of surge or swab. Finally, cementing performance is enhanced by the large flow area ports, which enable high circulation rates and a significantly improved cement job.



Specifications

Size, in	7 - 16
Temperature rating, degF [degC]	40 - 302 [4-150]
Standard material	Carbon steel
Elastomer material	HNBR
Permanent lock feature	YES
Max. flow BPM	14
Qualification	ISO 14310 and 14998 VO

Other grades, material and sizes available upon request

Applications

- Controlled, secure and selective access to casing annulus
- Multistage cementing
- Annulus cleanout
- Fracturing

Features

- Sealing system qualified to ISO 14998 VO equivalent
- High burst, collapse, torque and tensile ratings
- Full bore ID matches casing ID and slim OD
- Closing utilising push/pull movement
- Permanent close function
- Unlimited number can be installed in liner or casing string
- Can be shifted with high differential pressure without damaging seal
- Large port flow area; 4.4 sq.in. minimum
- Inner sleeve hard coated to reduce wear; anti-rotation system
- Suits all type of premium casing threads
- Wide range of sizes, materials available

Benefits

- Improved annulus integrity and zonal isolation
- Security and confidence in gas tight sealing capability and mechanical integrity
- Easy installation and single-trip operation of multiple Cflex® devices
- Precise and conclusive operation for open, close and lock; no risk of accidental lock
- Improved operational efficiency and effectiveness
- Versatility and flexibility for multiple applications
- Slim design minimises ECD effects
- Large flow area ports maximise possible flow rate



Cflex® multifunction operating tool controls Cflex® selectively and precisely.



Cflex® dart catcher

Cflex[®] with annulus fundament

Enhanced well integrity

Multistage cementing system, cement placement control

Cflex[®] technology is now available with a flexible annulus cement base to deliver high-performance multistage cementing. It provides cement placement control and aims to enable a desired cementing height when performing a stage cementing job.

The Cflex[®] cementing system now includes a flexible annular cement base, which improves annular seal integrity and overcomes the shortcomings of previous stage cementing technology.

This particular Cflex[®]'s built-in fundament is activated during the opening of the cement ports, so it prevents a mixture of fluids and creates a solid base for the cement. Qualified "gas tight", tested according to ISO 14998, and with a permanent lock system, Cflex[®] performs to the highest integrity standards.

With this Cflex[®], it is possible to activate permanent lock with hydraulic pressure. Its fundament prevents cement contamination and can hold differential pressure. It is mechanically activated, so there is no need to pressure the well to activate the fundament.

Integrity

Cflex[®] is engineered to the highest possible integrity standards. In addition to its high tensile strength, burst and collapse ratings, Cflex[®] is VO qualified and tested according to ISO 14998 standard, which means it provides an absolute "gas tight" seal. Locking Cflex[®] permanently closed following a successful operation adds further security.

Flexibility

Cflex[®] is available in a wide range of sizes and materials, and can be custom-built. Multiple Cflex[®] devices can be positioned within the casing string and accessed selectively for any number of cementing stages. Cflex[®] also accommodates different equivalent circulating density (ECD) and flow rate requirements. Various circulating ports provide a large flow area, expanding the envelope of possible flow rates. Taking flexibility one step further, because Cflex[®] provides secure controlled access to the casing annulus, it can be used for other applications that require this functionality.



Cflex® MKII-F

Efficiency and performance

Operating Cflex® is straightforward, fast and precise. The multifunction operating tool is designed to both operate the Cflex® valve and inject fluids. And if multiple Cflex® devices are present, each can be accessed and controlled selectively according to the multistage program. Another key feature of Cflex® is its slim design. The full bore internal diameter (ID) matches the casing drift ID, offering unrestricted passage; and the outside diameter is no larger than the casing collar, thereby minimizing ECD effects and reducing the risk of surge or swab. Finally, cementing performance is enhanced by the large flow area ports, which enable high circulation rates and a significantly improved cement job.

Applications

- Controlled, secure and selective access to casing annulus
- Multistage cementing
- Annulus cleanout
- Fracturing

Features

- Cement valve included in an ISO 14310/14998 VO Cflex stage cementing valve, which ensures no bubbles.
- Steel enforced rubber ring that is expanded to the ID of the next casing/open hole.
- The cement fundament eliminates the need to use additional equipment such as ICP or “basket type” to form a fundament for the cement.
- The fundament is fully mechanical, will always be activated when the valve is opened.

Benefits

- Provides cement direction control.
- Improved method of retaining cement.
- Minimizes cement contamination.
- No extra operation needed to activate the cement fundament.



MCAP™

Mechanical Casing Annulus Packer

The MCAP™ is a mechanically set packer designed to seal off the annulus between two casings. It is activated by a drill pipe deployed activation tool, having over pull when latched into the MCAP™.

Benefits

- Mechanically activated
- Un-restricted ID compared to casing string
- High pressure rating
- High temperature rating
- High tensile and compression rating

The MCAP™ is qualified as a gas barrier according to ISO 14998/14310, pressure rating up to 10,000 psi.

The MCAP™ can be used as a stand alone tool for isolation of the annulus between two casing and also in combination with a Cflex where the MCAP™ will create a fundament for placing cement above.

Features

- AISI14310 VO qualified
- 10,000 psi pressure rating
- Sour Service qualified

Specifications

Typical casing sizes	9 5/8" x 13 5/8"	13 5/8" x 18 5/8"
Pressure rating burst-collapse, psi (bar)	6422-3976 (452-274)	7305-7305 (504-504)
Temperature rating °F (°C)	149- 350 (65 - 177)	68-266 (20-130)
ISO 14310 VO qualified	Yes	Yes
Setting range element, in	12 - 12,592	17,249 - 17,981
Typical application	Casing Annulus Packer - Fundament for cement	Casing Annulus Packer - Fundament for cement
Type of service	Sour Service	Sour Service
Elastomer	Aflas	Aflas
Conveyance methods	MCAP™ run as part of the casing, activation tool run on drill pipe	MCAP™ run as part of the casing, activation tool run on drill pipe

Specifications may be subject to change.



Remote Controlled Cement Head

Safe and efficient well cementing



Designed to the highest standards of safety, consistency and reliability, Archer's Remote Controlled Cement Head (RCCH) allows the controlled release of setting balls and drillpipe darts without the need to stop circulation or rotation, or break connections.

Controlled entirely from the rig floor using rig air, the RCCH has the flexibility to operate safely and effectively with both drilling/cementing kelly and top drive systems. Casing cementing, expandable screen deployment, perforating and squeezing, and cement injection operations are completed without the need for manriding above drill floor.

The RCCH is pre-loaded with the drillpipe dart(s) or setting ball(s) and can be stored in the derrick. No redress is required between operations. Utilizing hydraulically controlled valve actuators, the RCCH is able to drop balls and/or drillpipe darts while circulating and/or rotating, saving valuable rig time. Upon completion of the operation, controlled flushing eliminates all cement residues.

The smooth outside diameter eliminates externally mounted manifolds and valves while the unique activating sequence prevents incorrect opening. No welding on the head ensures that components will not fail due to metal fatigue or incomplete weld penetration.

The RCCH has a 1500 klbs load capacity and delivers 50 kft/lbs of torque, exceeding the capacity of most drill pipe and casing connections, whilst its maximum operating pressure of 10 k psi meets the demands of longer, deeper completions.

Remote Controlled Cement Head

Specifications

Tool size	2 Valve	3 Valve
Nominal OD, in [mm]	13 [330]	13 [330]
Minimal OD, in [mm]	4 [102]	4 [102]
OAL, in [mm]	98.74 [2508]	130.61 [3,317]
Rated torque, ft lbs [N.m]	50,000 [67,791]	50,000 [67,791]
Max. Hook load, lbs [kg]	1,594,000 [723,026]	1,594,000 [723,026]
Max. Hook load at rated torque, lbs [kg]	1,496,000 [678,574]	1,496,000 [678,574]
Working pressure, psi [bar]	10,000 [689]	10,000 [689]
Test pressure, psi [bar]	15,000 [1,034]	15,000 [1,034]
Chamber sizes, in [mm]	15 [381] 25 [635]	15 [381] 24 [610] 25 [635]
Make-up torque, ft lbs [N.m]	Upper connection	50,000 [67,791]
	Lower connection	50,000 [67,791]

Applications

- Casing and liner cementing
- Expandable screen deployment
- Perforating and squeezing cement
- Cement injection

Features

- 10 kpsi maximum operating pressure
- 1500 klbs load capacity and 50 kft/lbs torque
- Large 4 in internal diameter

Benefits

- Fully compatible with drilling/cementing kelly and top drive systems
- No man riding
- Controlled flushing eliminates any cement residues in all areas
- Multiple operations can be completed without the need for redress
- High pump rate during washing and clean-up
- No externally mounted valves and manifolds
- Large plug holder I.D. minimizes plug wadding
- Can be stored safely in the derrick

Wireless Controlled Cement Head

Safe and efficient well cementing

Designed to the highest standards of safety, consistency and reliability, Archer's Wireless Controlled Cement Head (WCCH) allows the controlled release of setting balls and drillpipe darts without the need to stop circulation, rotation, or break connections.

Controlled entirely from the rig floor, the WCCH has been specifically designed for use with top drive cementing systems. The WCCH can be shipped pressurized or de-pressurized either with breathing air or nitrogen according to customer requirements. Casing cementing, expandable screen deployment, perforating and squeezing, and cement injection operations are completed without the need for manriding above drill floor.

The WCCH is pre-loaded with the drillpipe dart(s) or setting ball(s) and can be stored in the derrick. No redress is required between operations. Utilizing hydraulically controlled valve actuators, the WCCH is able to drop balls and/or drillpipe darts while circulating and/or rotating, saving valuable rig time. Upon completion of the operation, controlled flushing eliminates all cement residues.

The smooth outside diameter eliminates externally mounted manifolds and valves while the unique activating sequence prevents incorrect opening. No welding on the head ensures that components will not fail due to metal fatigue or incomplete weld penetration.

The WCCH has a 1500 klbs load capacity and delivers 50 kft/lbs of torque, exceeding the capacity of most drill pipe and casing connections, whilst its maximum operating pressure of 10 k psi meets the demands of longer, deeper completions.

Supplied with offshore support kit including

- Three-phase 16A/400 V compressor for refill of breathing air; or an air-driven Nitrogen booster for refill of nitrogen.
- High pressure quick connector with gauge and bleed of valve
- 24 V charger for internal battery pack
- Remote control unit with 4.8 V charger
- Equipment for reloading of darts

Remote control includes indicators for

- Tank pressure
- Working pressure
- Battery status cement unit
- Battery status handheld unit
- Radio link
- Valve status



Wireless controlled cement head

Specifications

Tool system	2 Valve	3 Valve
Nominal OD, in [mm]	13 [330]	13 [330]
Minimal OD, in [mm]	4 [102]	4 [102]
OAL, in [mm]	98.74 [2508]	130.61 [3,317]
Rated torque, ft lbs [N.m]	50,000 [67,791]	50,000 [67,791]
Max. Hook load, lbs [kg]	1,594,000 [723,026]	1,594,000 [723,026]
Max. Hook load at rated torque, lbs [kg]	1,496,000 [678,574]	1,496,000 [678,574]
Working pressure, psi [bar]	10,000 [689]	10,000 [689]
Test pressure, psi [bar]	15,000 [1,034]	15,000 [1,034]
Chamber sizes, in [mm]	15 [381] 25 [635]	15 [381] 24 [610] 25 [635]
Make-up torque, ft lbs [N.m]	Upper connection	50,000 [67,791]
	Lower connection	50,000 [67,791]

Technical Specifications

Operating temperature, °C [°F]	20 - 50 [68 - 122]
Radio frequency, Mhz	434,375 - 434,400
Digital communication distance, m [ft]	50 [164]
Battery type	24 V NiCD / 4.8 V NiMH
Battery standby time	3 weeks
Actuator drive medium	Breathing air or nitrogen
Medium vessels	3 x 2.9 ltr 300 bars composite
Complete cycles on one gas filling	10 (3 valve and flag)

Applications

- Casing and liner cementing
- Expandable screen deployment
- Perforating and squeezing cement
- Cement injection

Features

- Wireless control through digital radio communication
- Injection control  flameproof certified
- Remote control  intrinsically safe certified
- Self-contained compressed non-flammable gas power source
- No separate cement hose connected to the head
- No tigger lines to arrest rotation of the head
- No control umbilical to the head
- 10 kpsi maximum operating pressure
- 1500 klbs load capacity and 50 kft/lbs torque
- Large 4 in internal diameter

Benefits

- No personnel in the red zone
- No man riding
- Controlled flushing eliminates any cement residues in all areas
- Multiple operations can be completed without the need for redress
- High pump rate during washing and clean-up
- No externally mounted valves and manifolds
- Large plug holder I.D. minimizes plug wadding
- Can be stored safely in the derrick



Cementing Solutions Case Studies

Our case studies are listed under each product on our website

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Well Cleaning Solutions

Tornar® Wellbore Cleaning Technology

Clean and solids-free wellbore

Features

- Superior annular velocity
- Balanced annular velocity in each wellbore
- Non-stop displacement
- Up to 150 rpm rotation speed
- Extra large bypass areas for eliminating flow restrictions
- Large ID to increase flow

Benefits

- Time saving non-stop displacement
- Superior wellbore debris removal
- Easy operation
- Enhanced chemical cleaning



Contact your local Archer representative for more information on Tornar® wellbore cleaning technology for your well needs.

www.archerwell.com

A clean well is essential prior to running expensive and sensitive completion strings or other debris sensitive equipment. Therefore, the removal, collection, and verification of debris are extremely important in a wellbore. Archer's Tornar® wellbore cleaning equipment optimizes these operations.

Superior annular velocity

The name Tornar® is derived from the word **Tornado** and **Archer**. Like a vortex of a tornado, Tornar's wellbore cleaning technology swiftly draws in and expels debris from the wellbore.

Coincidentally Tornar® is also a Spanish word which means return to or give back, which is exactly what Tornar® technology does; it returns the wellbore to a pristine and clean condition.



Elements in efficient wellbore cleaning:

- **Balanced Annular Velocity** is essential to avoid debris settlements when there is a change in liner or casing ID. Through the use of innovative circulation valve technology, all sections of the wellbore will have a high annular velocity simultaneously.
- **Non-stop Displacement** is of the essence to enhance the chemical cleaning of a wellbore. Through the use of innovative circulation valve technology the wellbore can be displaced without stop in pumping. This saves time and optimizes the displacement process.
- **High Rotation speed** is important to create a turbulent flow and transport debris into the flow regime in the vertical section of a well.
- **High Annular Velocity** is important to transport debris out of the well. Each tool is designed to optimize and enhance annular velocity. The result is a constant superior annular velocity in all wellbore sections.
- **Fluid Rheology** is equally important to create a viscous coupling with the drillpipe and suspend debris in the flow regime.

All these elements together make Tornar wellbore cleaning technology the best option for a **Clean and Solids Free Wellbore**.

Tornar® BOP Cleaner

Clean and solids-free BOP

Advanced vortex cleaning technology for BOPs

The Tornar® BOP Cleaner removes wellbore debris from blow out preventer cavities safely, rapidly and reliably. Tornar® flow ports create a high-velocity fluid vortex which combines with powerful proprietary magnets to extract debris from ram and annular cavities—without harming the BOP.

Benefits

- Rapid and effective BOP cleaning
- Reduced BOP maintenance and non-productive time
- Higher success rate and efficiency of BOP performance testing
- Cleans even deep cavities

Applications

- Clearing debris from BOP rams and cavities

Features

- Tornar® technology creates powerful vortex suction effect
- Tornar® industrial magnets ensure maximum metallic debris extraction
- Configured to suit BOP requirements
- Standard drill pipe connection
- One piece mandrels
- Non-rotating stabilizer and magnet
- Fishing magnet can be fitted at the bottom of the string to add further cleaning assurance

Specifications

Cleaner string size, inch [mm]	13.375 [339.7]	17.45 [443.2]
BOP size, inch [mm]	13.625 [346]	18.75 [476.3]
Recommended pump rate	6,500	6,500
Min. recommended pump rate, lpm	3,500	3,500
Material (main body)	AISI 4145M	AISI 4145M
Max. working temp, degC [degF]	150 [302]	150 [302]
Max. OD, inch [mm]	13.375 [339.7]	17.45 [443.2]
Drift ID, inch [mm]	2.83 [71.9]	3.5 [88.9]
Tool joint OD, inch [mm]	6.535 [166]	7.25 [184.2]
Connections	NC-50 b/p	5 1/2" FH b/p
Magnet rods	6pcs @ 360°	8pcs @ 360°

Specifications may be subject to change

Debris management is a serious oilfield challenge and is responsible for many of the operational difficulties and costs of maintaining BOPs.

Drilling debris and mud solids can accumulate within BOP cavities causing them to malfunction; and milling operations generate an abundance of metallic junk and other particles that can seriously hinder the correct operation of the BOP. Even small objects can jeopardize well control, with potentially hazardous consequences to people, the environment and surface assets.

Cleaning debris from BOP cavities is especially challenging. Traditional cleaning methods may force debris further in to the BOP workings, and it is critical that cleaning operations are performed safely and efficiently.

Archer's Tornar® BOP Cleaner combines Tornar® flow ports with powerful proprietary magnets to ensure the maximum extraction of harmful debris from BOP cavities and the well.

The Tornar® BOP Cleaner can be configured to suit operational requirements to maximize debris retrieval.



Tornar® Sub Sea BOP Cleaner

Clean and solids-free BOP and riser
Advanced vortex cleaning technology for BOPs and risers

The Tornar® Sub Sea BOP Cleaner removes wellbore debris from blow out preventer and marine riser cavities safely, rapidly and reliably. Tornar® flow ports create a high-velocity fluid vortex, which combines with powerful proprietary magnets to extract debris – whilst maintaining full well control.

Benefits

- Rapid and effective single-trip BOP and riser cleaning
- Reduced BOP maintenance and non-productive time
- Higher success rate and efficiency of BOP performance testing
- Allows short tripping with wellbore clean-up string
- Cleans even deep cavities

Applications

- Clearing debris from BOP's and marine risers

Features

- Tornar® technology creates powerful vortex suction effect
- 3-stage circulation ports enable full well control
- Tornar® Extreme magnets ensure maximum metallic debris extraction
- Easily configured to suit BOP and riser requirements
- Premium drill pipe connection
- One piece mandrels
- Non-rotating stabilizer and magnet.
- Built-in junk basket; spring-loaded self-adjusting dual brush
- Optional fishing magnet can be fitted to bottom of string

Debris management is a serious oilfield challenge and is responsible for many of the operational difficulties and costs of maintaining BOPs, especially in a deep water environment. Drilling debris and solids can accumulate within BOP and riser cavities causing BOPs to malfunction; and milling operations generate an abundance of metallic junk and other particles that can seriously hinder the correct operation of the BOP. Even small objects can jeopardize well control, with potentially hazardous consequences to people, the environment and surface assets.

Archer's Tornar® Sub Sea BOP Cleaner ensures the maximum extraction of harmful debris from BOP cavities and marine risers—without harming the BOP.

The Tornar® Sub Sea BOP Cleaner can be configured to suit operational requirements, for example by adjusting the ratio of flow ports to magnets, in order to maximize debris retrieval.



Tornar® Sub Sea BOP Cleaner

Specifications

Cleaner string size, inch [mm]	17.45 [443.2]
BOP size, inch [mm]	18.75 [476.3]
Recomended pumprate	6,500
Min. recommended pump rate, lpm	3,500
Material (main body)	AISI 4145M
Max working temp, degC [degF]	150 [302]
Max. OD, inch [mm]	17.45 [443.2]
Drift ID, inch [mm]	2.637 [67]
Tool joint OD, inch [mm]	7.252 [184.2]
Connections	5 1/2" FH b/p or VX-57 b/p

BOP magnet

Max. OD, inch [mm]	17.45 [443.2]
Drift ID, inch [mm]	3.5 [88.9]
Tool joint OD, inch [mm]	7.252 [184.2]
Magnet rods	8pcs @ 360°

Riser magnet

Max. stabilizer OD, inch [mm]	17.45 [443.2]
Brush OD, inch [mm]	18.75 to 20 [476.3 to 508]
Brush segment	8 rows, dual brush strips
Bristle type	Straigh flat wire
Magnet rods	8 pcs @ 360°
Junk bucket OD, inch [mm]	16 [406.4]



Riser Brush Magnet



BOP Magnet



3-Stage Tornar® BOP Cleaner



Well Filter



Tornar® Wash Magnet

Tornar® Grab Magnet

Reliable well cleaning

High circulation fishing magnet

The Tornar® Grab Magnet retrieves magnetic object debris from the wellbore rapidly and reliably. With its combination of Tornar® flow ports and the most powerful magnetic elements, it can remove irregular shaped objects such as bearings, bit cones and lost tools simply and effectively.



Benefits

- Tornar® flow ports clear particle debris to ensure full contact
- Up to 1200 kg lifting capacity
- No limitations in running speed
- No run in hole restrictions

Applications

- Retrieval of magnetic objects from the wellbore
- Run as integral part of drillpipe toolstring to attract and retain magnetic debris

Features

- Tornar® flow ports
- One piece mandrel
- Stabilizer blades for support on low side
- Up to 150 rpm rotation
- Multi-magnet element
- Drill pipe connection

Magnetic debris is a serious oilfield challenge, and is responsible for many of the operational difficulties and costs of well production and maintenance, particularly in high deviations and hostile conditions. Even small objects can severely jeopardize well control and integrity, with potentially hazardous consequences to people, the environment and well components.

The Tornar® Grab Magnet is equipped with the strongest magnetic elements - with a lifting capacity of over 1000 kg with full contact. To ensure that full contact is established and maintained, its unique Tornar® flow ports create a powerful cyclone effect, clearing away cuttings and other debris that may interfere with or prevent contact with the magnet.



Specifications

Casing size, in	4 1/2	5 1/2	7	9 5/8
Casing range, lb/ft	95 - 216	13 - 28.4	17 - 38	32.3 - 58.4
Max running speed in casing	No limit	No limit	No limit	No limit
Nozzle diameter, mm	Ø9mm x 6	Ø9mm x 6	Ø14mm x 12	Ø20mm x 12
Max pump rate, LPM	2800	3200	3200	5500
Min recommended pump rate, LPM	1000	1500	2800	3200
Max set down weight on magnet, kg	500	500	2000	3000
Max magnet lift capacity, kg	100	150	up to 950	up to 1200
Max rotation speed, RPM	150	150	150	150
Max OD, in	3.30	4.40	5.787	8.300
Min OD, in	1	1	2.687	3.0
Connection	2 3/8" Reg box	2 3/8" Reg box	NC38 Boxup	NC50 Boxup
Temperature rating, °C	4 - 150	4 - 150	4 - 150	4 - 150

Specifications may be subject to change

Archer

Tornar® Circulation Magnet

Reliable well cleaning

High circulation magnetic wellbore cleaning

The Tornar® Circulation Magnet retrieves magnetic objects and particle debris from the wellbore rapidly and reliably. Its unique design utilizes the most powerful magnetic elements, combined with thru-magnet Tornar® flow ports, for fishing and wellbore cleaning operations.



Benefits

- Thru magnet Tornar® flow ports clear particle debris to ensure full contact
- Up to 1000 kg lifting capacity
- No limitations in running speed
- No run in hole restrictions

Applications

- Wellbore cleaning operations
- Retrieval of magnetic objects from the wellbore
- Run as integral part of drillpipe toolstring to attract and retain magnetic debris

Features

- Thru-magnet Tornar® flow ports
- One piece mandrel
- Stabilizer blades for support on low side
- Up to 75 rpm rotation
- Multi-magnet element
- Drill pipe connection

Magnetic debris is a serious oilfield challenge, and is responsible for many of the operational difficulties and costs of well production and maintenance, particularly in high deviations and hostile conditions. Even small objects can severely jeopardize well control and integrity, with potentially hazardous consequences to people, the environment and well components.

Designed to remove magnetic objects and accumulated debris from the wellbore rapidly and efficiently, the Tornar® Circulation Magnet is equipped with the strongest magnetic elements available - with a lifting capacity of over 1000 kg with full contact. Its unique thru-magnet Tornar® flow ports create a powerful cyclone effect around objects and the surrounding wellbore, ensuring full contact with the magnet and optimal debris extraction.

Specifications

Casing size, in [mm]	9 5/8 [244.5] and up
Max running speed in casing	No limit
Nozzle diameter, in [mm]	0.79 [20] x 12
Max pump rate, gal/min [l/min]	1,453 [5,500]
Min recommended pump rate, gal/min [l/min]	845 [3,200]
Max set down weight on magnet, lb [kg]	6,614 [3,000]
Max magnet lift capacity, lb [kg]	3,086 [1,400]
Max rotation speed, RPM	75
Max OD, in [mm]	8.30 [210.8]
Connection	NC50 Boxup
Temperature rating, °F [°C]	39 - 302 [4 - 150]

12 x 12 circulation ports in magnet nose sub





Tornar[®] Express

Compact wellbore cleanup

Do you want an all-in-one wellbore cleanup tool to scrape, polish and collect debris from your well?

Tornar[®] Express is a cost efficient solution that quickly removes mud solids, cement sheath, scale and perforation burrs in any wellbore.

Benefits

- Saves rig time
- Cleans 360 degrees without rotation
- Eliminates casing wear
- Multiple runs are possible
- Withstands drilling and milling operations

Typical applications

- Cleaning debris from wellbores in wellbore cleanup operations
- Post perforation cleaning
- Cleaning after sidetrack operations
- When cleaning is required in drilling operations

Features

- One piece mandrel
- Non-rotating stabilizers
- Non-rotating sleeve assembly
- No external nuts or bolts
- Standard drillpipe connections
- Extra large bypass areas for eliminating flow restrictions

Specifications

Casing sizes	9 5/8" and 10 3/4"
Thread	API and Premium
ID	76,2 mm / 3.00"
Maximum rotation speed	150 rpm
Working temperature	150°C / 302°F
Max. trip speed in casing	Limited by rig equipment
Max. pump rate	Limited only by surface equipment
Material (main body)	AISI 4145M 125 KSI

Specifications may be subject to change

Tornar[®] Express is perfect for a quick and efficient clean-up in any wellbore before displacement, side-tracks, drilling or post perforation. It can be rotated and reciprocated without fear of damage to the casing or tool due to its rugged design and the fact that it does not have external bolts that could become loose under extreme conditions.

Tornar[®] Express consists of a magnet, brush and scraper attached to a one-piece body that is supported by non-rotating stabilisers for self-centralisation. Its rough and flexible design provides the force needed remove and clean 360 degrees without rotation.

The one-piece body rotates through the non-rotation stabilizers and compact cleaning components to avoid wear or damage to the casing during a drill string rotation.



TORNAR[®]



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Tornar® Balanced Circulation Valve

Clean and solids-free wellbore

The Tornar® Balanced Circulation Valve is a circulating sub for wellbore clean-up and displacement applications, boosting the annular velocity in the wellbore casing and liner annulus. It can be part of a complete wellbore cleaning tool string used during the displacement process before running completion.



Features & Benefits

- Fluid velocity balance in different size wellbores
- Operation at maximum parameters
- No external nuts or bolts
- Heavy duty clutch assembly
- High strength mandrel
- Simple to run
- Multiple run possible

The Tornar® Balanced Circulation Valve achieves a higher flow rate to be pumped up the production casing, circulating through the liner and the production casing. The result is a balanced fluid velocity in the wellbore annulus during displacement. The valve can isolate the lower drill string rotation during circulation. It is in first position when run in hole, allowing torque transmittal to upper and lower drill string while circulating 100% of the flow through the tool. In this position, the velocity booster ports are closed.

The Tornar® Balanced Circulation Valve can open velocity booster ports to the annulus, allowing a higher flow rate to be pumped up the production casing than normally possible in liner and production casing. This balances the fluid velocity in the different size wellbores during displacement. It is used for displacements, post-perforating, pre-fracturing, multi-zone completions, milling, burning, fishing, and smart completions.

Specifications

Casing size	9 5/8 and up
Comm. no	601-09-0001
Max OD	17145 mm / 6.75"
Thread	NC 50 box/pin
ID	50,8 mm / 2"
Overall length	2020 mm / 79.53"

General Operating Parameters

Size	9 5/8"
Tensile Yield	460 tons / 1014684 lbs.
Torsional strength	51114 Nm / 37700 ft. lbs.
Max rotation RPM	150
Working temperature	150°C / 302°F
Max. trip speed in casing	45 m/min / 150 ft/min
Maximum operation pressure	345 bar - 5000 psi
Material (main body)	AISI 4145M 110 KSI / 125 KSI
Force to open	87 kN - 348 kN / 20 000 - 80 000 lbs.



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Tornar® Circulation Valve

Clean and solids-free wellbore

The Tornar Circulation Valve removes debris from the wellbore rapidly and reliably. Its unique design utilizes Tornar® flow ports to create a powerful cyclone to clean and optimize well fluid velocity.

Benefits

- Secure wellbore integrity
- Reduced downtime
- One run BOP and wellhead cleaning
- Large flow areas
- Cyclone effect keeps solids afloat
- Increased fluid pressure for more effective cleaning
- No limitations on running speed
- No run in hole restrictions

Specifications

Size	8.30
Max OD, in	8.30
Drift ID, in	2.25
Tool Joint OD	6 5/8
Nozzle diameter, mm	Ø18mm x 12
Max tripping speed in casing	200 ft/min
Recommended cleaning speed in casing	0.5 ft/min
Recommended rotation speed while cleaning	15 rpm
Max pump rate	6,500 lpm
Min recommended pump rate	3,500 lpm
Max rotation speed	75 rpm
Max allowed Tensile (lbs)	1,175,450 lbs
Torsional Strength (ft. lbs)	116,206 ft. lbs
Pressure rating - shifting sleeve*	1200 - 1700 psi
Shifting method	2 3/4" steel ball
Max working temp	150°C
Material main body	AISI 4145M
Connection	NC-50 box/pin

* can be used without the shifting sleeve



Applications

- Cleaning debris from wellbores in any wellbore cleanup operations
- Cleaning wellheads in combination with BOP and riser cleaning
- Boosting annular velocity above plug
- When extra circulation is required

Features

- Optional flow split sleeve
- Tornar® flow ports
- Stabilizer blades for support on low side
- Drill pipe or premium connection
- One piece mandrels. No parts lost in hole
- Up to 75 rpm rotation
- Large flow by area
- High circulation rates (6500lpm)

The Tornar® Circulation Valve can be integrated as a part of a complete wellbore cleaning string used during displacement process for optimum fluid velocity and cleaning. Improper cleaning can possibly damaging or plugging the productive zone, and impeding the running of the completion assembly. Proper cleaning contributes to a successful completion and reduces the potential for wellbore contamination.

The Tornar® Circulation Valve can also be integrated as a part of the Tornar® Sub Sea BOP cleaning string for cleaning Wellhead areas prior to cleaning BOP and Riser. The Tornar® Circulation Valve is then positioned bellow the Tornar® BOP Cleaner. You can now clean the Wellhead and BOP in one run.



Tornar® Casing Scraper (Non-Rotating)

Clean and solids-free wellbore

Tornar® Casing Scraper is a mechanical tool for cleaning and polishes the casing or liner ID to remove mud solids, cement sheath, scale and perforation burrs in any wellbore.



Benefits

- Clean 360 degrees without rotation
- Eliminates casing wear
- High strength mandrel
- Simple to run
- Multiple run possible
- Withstand drilling and milling operations
- Suitable for HP wells and can withstand chemical or acid attack

Applications

- Cleaning debris from wellbores in any wellbore cleanup operations
- Post perforation cleaning
- Cleaning after side track operations
- When cleaning is required in drilling operations

Features

- One piece mandrel
- Non rotating stabilizers
- Non rotating scraper sleeve
- No external nuts or bolts
- Standard drill pipe connections
- Extra Large bypass areas for eliminating flow restrictions

The Tornar® Casing Scraper can be integrated as a part of a complete wellbore cleaning tool string used during the displacement process prior to running completion. It can be rotated and reciprocated without fear of damage to casing or tool due to the rugged design and the fact that it doesn't contain external bolts that could work loose under extreme conditions.

A Tornar® Casing Scraper tool consists of a onepiece Body, non-rotating Stabiliser and Scraper assembly. The main mandrel rotates through the stabiliser and Scraper assembly to avoid wear or damage to the casing during drill string rotation.

The Scraper assembly is self-centralising inside the casing or liner to ensure equal cleaning at all well conditions. It's also rough, flexible and has the force needed remove and clean 360 degrees without rotation.

Specifications

Casing sizes	4 1/2" to 14"
Thread	API and Premium
ID	1 3/4" to 4"
Maximum rotation speed	150 rpm
Working temperature	150°C / 302°F
Max. trip speed in casing	Limited by rig equipment
Max. pump rate	Limited only by surface equipment
Material (main body)	AISI 4145M 110 KSI
Burst pressure	690 bar - 10 000 psi

Specifications may be subject to change



Archer

Tornar® Casing Brush (Non-Rotating)

Clean and solids-free wellbore

Tornar® Casing Brush is a mechanical tool for clean and polishes the casing or liner ID to remove mud solids, cement sheath and scale in any wellbore.



Benefits

- Clean 360 degrees without rotation
- Eliminates casing wear
- High strength mandrel
- Simple to run
- Multiple run possible
- Withstand drilling and milling operations

Applications

- Cleaning debris from wellbores in any wellbore cleanup operations
- Post perforation cleaning
- Cleaning after side track operations
- When cleaning is required in drilling operation

Features

- One piece mandrel
- Non rotating stabilizers
- Non rotating center sleeve
- No external nuts or bolts
- Extra large bypass areas for eliminating flow restriction
- Fluted spiral stabilizer sleeves for generous fluid and debris bypass

Specifications

Casing sizes	4 1/2" to 14"
Thread	API and Premium
ID	1 3/4" to 4"
Maximum rotation speed	150 rpm
Working temperature	150°C / 302°F
Max. trip speed in casing	Limited by rig equipment
Max. pump rate	Limited only by surface equipment
Material (main body)	AISI 4145M 110 KSI
Burst pressure	690 bar - 10 000 psi

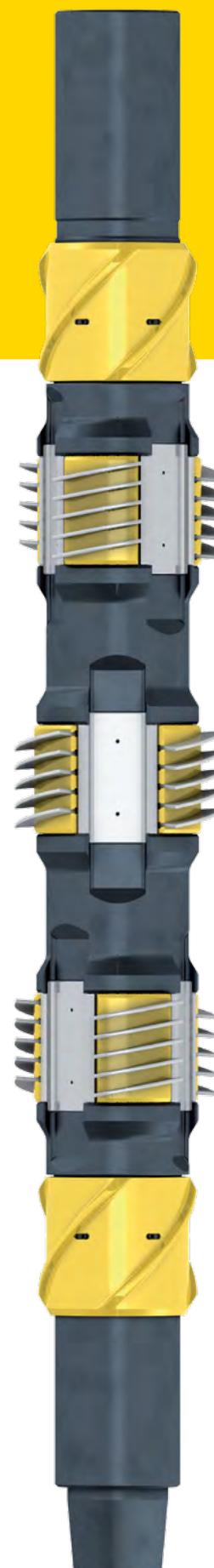
Specifications may be subject to change

The Tornar® Casing Brush can be part of a complete wellbore cleaning tool string during the displacement process prior to running a completion. It can be rotated and reciprocated without damaging the casing or tool.

Rotation up to 150 rpm may be applied to create a turbulent flow and remove the cutting bed. The non-rotating stabilizers on the Tornar Brush provide a standoff and a generous flow area for fluid by-pass around the tool.

A Tornar® Casing Brush tool consists of a one-piece Body, non-rotating Stabiliser and Brush assembly. The main mandrel rotates through the stabiliser and Brush assembly to avoid wear or damage to the casing during drill string rotation. The Brush assembly is self-centralising inside the casing or liner to ensure equal cleaning at all well conditions. It's also rough, flexible and has the force needed remove and clean 360 degrees without rotation.

The tool is suitable for HPHT wells and can withstand chemical or acid attack.



Archer

Tornar® WellFilter

Clean and solids free wellbore

The Tornar® WellFilter validates effectiveness of the displacement operation by filtering well fluids while pulling out of hole. It is designed to remove debris from any wellbore.



Benefits

- Easy to empty debris window
- Verification of a clean wellbore
- High strength mandrel
- Simple to run
- Large debris capacity
- One piece mandrel
- Multiple run possible
- Withstand drilling and milling operations

Applications

- Wellbore clean-up operations
- Shallow or deep wells operation
- Debris barrier for barriers plugs
- Junk basket when cleaning BOP and Riser
- Wells with any type of downhole fluids
- Allows running in combination with any LOCK® Plug for BOP testing, pipe hang off and well cleaning

Features

- Verification and capture of debris within any wellbore using proprietary in-house developed technologies
- Automatically close filter bypass valve
- Diverter cup for debris risk management
- Load bearing for supported diverter cup to manage wear of critical parts
- Rupture disk to prevent swabbing when pulling out of hole fully
- One piece mandrel for higher strength
- No external nuts or bolts
- Large bypass areas for limiting flow restrictions

The Tornar® WellFilter can be integrated as a part of a complete wellbore cleaning tool string used during displacement process prior to running completion.

The WellFilter is positioned in the casing below the wellhead during BOP and Riser cleaning. This creates a wellbore debris barrier. The same applies for running a combination of Tornar® BOP Cleaner and LOCK where the WellFilter create a barrier for debris to fall on top of the LOCK.

As the wellbore cleanup string with the Tornar® WellFilter is run in hole, the wiper cup cleans and removes debris from the casing ID. The Tornar® WellFilter is equipped with an automatic by-pass valve for fluid by-pass when running in hole. This valve eliminates swab, surge and debris to bypass the filter.

Specifications

Casing sizes	9 5/8" to 14"
Max tripping speed	Limited by rig equipment
Flow area thru sliding valve	from 28 241 mm ² - 43,77 in ²
Flow area around tool	from 7292 mm ² / 11.303 in ²
Debris volume	30 liter
Burst discs	4 with 0.60 in ² area each
Maximum operational rotation	120 rpm
Max working Temperature	120°C / 248°F
Material (main body)	AISI 4130 125 KSI
Connections	XT50 Box/pin

Specifications may be subject to change



Archer

Tornar® String Magnet (Non-Rotating)

Clean and solids-free wellbore

Tornar® String Magnet is a mechanical tool that collects metallic debris in the casing or liner IDs from any wellbore. It is designed to capture a large volume of metallic debris while maintaining large flow volumes.



TORNAR®

Benefits

- Large debris capacity
- High strength single pole magnets
- Eliminates casing wear
- High strength mandrel
- Simple to run
- Multiple run possible
- Withstand drilling and milling operations

Typical applications

- Cleaning debris from wellbores in any wellbore cleanup operations
- Post perforation cleaning
- Cleaning after side track operations
- When cleaning is required in drilling operations
- In combination with BOP and riser cleaning
- Allows running in combination with any LOCK® Plug for BOP testing, pipe hang off and well cleaning

Features

- One piece mandrel
- Non rotating stabilizers
- Non rotating magnet sleeve
- No external nuts or bolts
- Extra Large bypass areas for eliminating flow restrictions
- Fluted spiral stabilizer sleeves for generous fluid and debris bypass

The Tornar® String Magnet can be integrated as a part of a complete wellbore cleaning tool string during the displacement process prior to running completion. It can be rotated and reciprocated without damaging the casing or tool. This is due to its rugged design and the fact that it does not contain external bolts that could become loose under extreme conditions.

As the Tornar® String Magnet is run in hole the high capacity magnets remove debris from the casing ID and drilling fluid. The non-rotating stabilizers on the Tornar® String Magnet provide a standoff as well as a generous flow area for fluid by-pass around the tool. The non-rotating stabilizers also reduce any possible casing wear. The non-rotation magnet sleeve ensures no debris is washed away during rotation. Rotation up to 150 rpm may be applied to create turbulent flow and remove cutting bed.

The Tornar® String Magnet should be run when significant ferrous debris may potentially exist.

Specifications

Casing/liner sizes	4 1/2" to 14"
Thread	API and Premium
ID	1 3/4" to 4"
Maximum rotation speed	150 rpm
Working temperature	150°C / 302°F
Max. trip speed in casing	Limited by rig equipment
Max. pump rate	Limited only by surface equipment
Material (main body)	AISI 4145M 110 KSI
Burst pressure	690 bar - 10 000 psi
Debris capacity	Up to 94 kg / 207 lbs
Magnet force	Up to 1850 kg

Specifications may be subject to change



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Tornar® Ditch Magnet

For a clean and solids-free wellbore

High Strength Ditch Magnet

The Tornar® Ditch Magnet is a leader in magnetic capture and hold power.



Applications

- Casing exits
- Section milling
- Packer and bridge plug milling
- PBR and tieback milling and reaming
- General wellbore milling operations
- BOP and riser cleaning
- Wellbore cleaning operations
- General drilling operations

Features

- Advanced magnetic circuit design
- High strength Rare Earth magnet technology
- Stainless Steel housing
- Large flow areas for unlimited flow restrictions
- Quick Look System®

Benefits

- Light weight modules for better HS&E
- Fits any flow line
- Can be stacked or fitted stand alone
- Easy to clean

The Tornar® Ditch Magnet features a unique magnetic circuit that provides extremely high magnetic field strength in an optimum alignment. The magnet is designed to recover the maximum amount of ferrous contaminants from the fluid stream in all drilling and milling operations, yet remains easy to clean.

The Tornar® Ditch Magnets are a modular system that can be built together into many shapes for optimum alignment in the fluid stream, and no specialized or costly modification is required.

Each magnetic section is equipped with a quick look® system on all sides so that the magnets can be built to fit any flow line while still clearly showing debris build-up. Each of the Tornar® Ditch Magnets' sections has a small nonmagnetic area at the bottom that allows easier cleaning with a special design cleaning tool.

The light weight magnetic sections are built to comply with all HS&E manual handling requirements.



Single Ditch Magnet



Double Ditch Magnet

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Well Cleaning Solutions Case Studies

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