WellServ

DST TOOLS CATALOGUE

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DST (APR) Well TestingTools

Downhole Testing Equipment

The well testing and sampling operation is typically accomplished with an assortment of test tools. The basic downhole test tools required for a well test include:

- Reversing valve
- Tester valve
- Samplers
- Gauges (pressure and temperature recorders)
- Packer
- Tubing conveyed perforating guns

To determine the makeup of a teststring, a test objective must be established and well defined. If the objective of the test is to perforate underbalanced and then test, only tools with a full opening should be used. A rule of thumb to observe when selecting the components of a test string is to keep the string as simple as possible. Avoid redundancy unless there is a real benefit to be gained.
A variety of techniques and arrangements of DST(APR) test tools are used to handle diverse types of tests-from openhole to high-pressure/high temperature(HPHT) and underbalanced to name a few.

APR Annulus Pressure Response Test Tools

The DST full‐opening APR annulus pressure response system of testing tools allows for a well test to be conducted with the blowout preventer(BOP) rams closed and without pipe manipulation or rotation to control the test. The APR tools are operated by simply applying and releasing annulus pressure. If there is a need to close the tester valve in an emergency, bleeding the annulus pressure off will close the tool, permitting corrective measures tobe taken. If a leak in the workstring should develop during the test to such an extent that annulus pressure can not be bled off quickly enough to close the tester valve, the operator can then control the well by increasing the annulus pressure to the predetermined operating pressure of the APR rupture disk (RD) safety circulating valve.

Well Testing

Downhole Drill Stem Test (DST) Tools

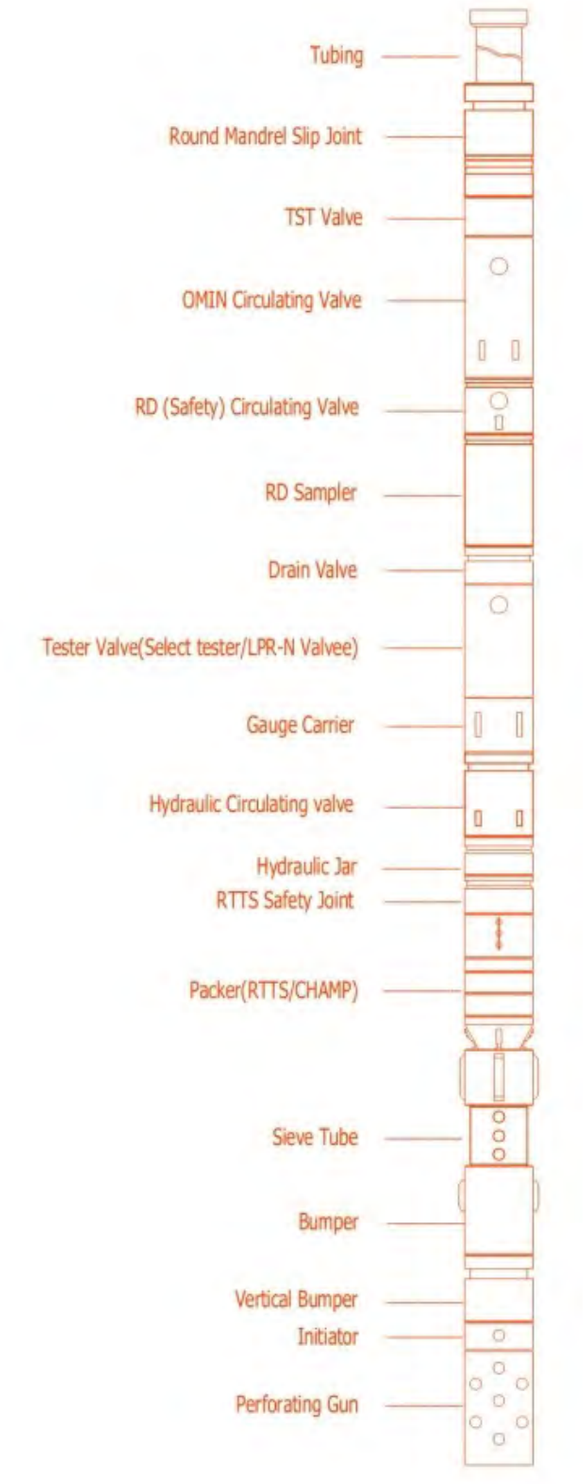
A properly conducted well test is a temporary completion of a well to acquire dynamic rate through time, pressure, and fluid property data. The well test often indicates how the well will perform when it is subjected to various flow conditions. An analysis is usually performed on the data to determine reservoir parameters and characteristics. Production decline may be predicted using these parameters and characteristics. The production decline can be used to predict cash flow. Once cash flow is known, improved drilling, completion, and production decisions can be made on this well and other wells in the field. Well test objectives can be classified as short term or long term.

- Short-term well test objectives typically involve gathering and analyzing sufficient well data to obtain a description of the reservoir system in the vicinity of the wellbore.
- Long-term well test objectives focus on gathering and analyzing data to obtain a complete description of the reservoir. The test time required to satisfy the test objectives varies for each reservoir. These test times are directly related to the testing costs and data needed.

The well testing and sampling operation is typically accomplished with an assortment of test tools. The basic downhole test tools required for a well test include:

- Reversing valve
- Tester valve
- Samplers
- Gauges (pressure and temperature recorders)
- Packer
- Tubing conveyed perforating guns

Typical DST Testing String for cased hole



DST TOOLS CATALOGUE

RTTS Packer

CHAMP 15k Packer

RTTS Circulating Valve

Operated (lPO) Circulating Valve

Rupture Disk (RD) Safety

Circulating Valve/ RD Circulating

Valve

OMNI Circulating Valve

RTTS Safety Joint

Round Mandrel Slip Joint

Tubing String Testing (TST) Valve

Rupture Disk (RD) Sampler

Select Tester Valve

LPR-N Tester Valve

Drain Valve

BIG JOHN Hydraulic Jar

Shock Absorber

BOP Safety Valve-Super Safety Valve

SSC Storm Valve

Side Wall Anchor (SWA)

Gauge Carriers

FUL-FLO Hydraulic Circulating Valve

RTTS Packer -10K Retrievable Packer

The RTTS Packer is a full opening, hookwall type packer for use in testing, treating, and squeeze cementing operations. The full opening permits pumping large volumes of fluid with a minimum pressure drop, and allows the passage of a through tubing type perforating gun. This helps make the tool usable for multiple operations with one trip in the hole-such as perforate, test, treat, squeeze, perforate, etc. Generally, the tool is composed of a packer body assembly and circulating valve assembly. It may also includes a safety joint.

Specification

Size(in)	Casing Range(lb/ft)	Size(in)	Casing Range(lb/ft)
4 1/2	9.5	8 5/8	24-49
	15.1-18.1	9 5/8	40-71.8
	11.6-13.5		29.3-53.5
5	23	10 3/4	32.75-55.5
	15-18		60.7-81
	11.5-13	11 3/4	38-54
5 1/2	23-26		60-71
	20-23	13 3/8	48-72
	13-20		72-98
6	15-23	16	75-109
6 5/8	24-32		109-146
7	17-38	18 5/8	78-118
	49.5	20	94-133
7 5/8	20-39		169-204

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CHAMP Packer -15K Retrievable Packer

The CHAMP Packer is improved from RTTS Packer. Compared with RTTS Packer, the CHAMP Packer has a concentric bypass. The CHAMP Packer has the capability of circulating below the packer and other parts have the same function as RTTS Packer. While going in the hole, the bypass is held open until slips are set by the J-Slot that controls the mechanical slips.
Each assembled tool includes the following components:

- J-slot mechanism
- mechanical slips
- packer elements
- hydraulic slips
- bypass

Specification

Size	Connection
5” 11.5-15#	2 7/8” CAS BXP
5” 18-21.4#	2 7/8” CAS BXP
7” 41-19.5# 6 5/8” 28-32#	3 1/2” IF BXP 3 7/8” CAS BXP
7” 17-26#	3 1/2” IF BXP 3 7/8” CAS BXP
7” 29-35#	3 1/2” IF BXP 3 7/8” CAS BXP
7” 38#	3 1/2” IF BXP 3 7/8” CAS BXP
9 5/8” 29.3-40#	4 1/2”IF BXP
9 5/8” 43.5-58.4#	4 1/2” IF BXP
9 5/8” 59.4-75.6#	4 1/2”IF BXP

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RTTS Circulating Valve

The RTTS Circulating valve is a locked-open/locked-closed valve that serves as both a circulating valve and bypass. The clearance between the RTTS packer (or any hookwall packer) and the casing ID is relatively small. To reduce the effect of fluid-swabbing action when the tool is run in or pulled out of the hole, a packer bypass is generally used.

RTTS
Circulating valve

Features

*The valve can be locked closed when the packer is unset to reverse fluid around the bottom of the packer.

*The tool's full opening allows tubing-type guns and other wire line equipment to pass

Specification

Casing size /in	Working pressure /Mpa	Service environment	Working temperature	Connection
7” -13 3/8”	70	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

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IPO Circulating Valve

The IPO (Internal Pressure operated) circulating valve allows circulation through the work string before trip-out and serves as a drain during trip-out. It can be run in cased holes or open holes and maintains a full bore through the tool.

Features

*Requires no string manipulation to operate tool.

*Permits passage of wire line tools through full opening bore.

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

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RD(Safety)Circulating Valve

The rupture disk (RD) safety circulating valve functions as both a safety valve and circulating valve. The tool functions as a safety valve when the annulus pressure reaches a predetermined value. This tool converts into a circulating valve when the ball valve section is removed and attach a lower adapter called RD Circulating Valve.

The valve can not be open when closed in downhole operation. RD Circulating valve is the same as RD Safety circulating valve except short of ball valve section, the annulus pressure made RD burst and the pressure goes into RD hole and push circulating mandrel forward, then open the circulating ports.

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

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OMIN Circulating Valve/Multi Cycle Circulating Valve

OMNI circulating valve is a full opening, annulus pressure-operated re-closable circulating valve which can be open and closed many times. The tool is operated by repeatedly cycling the annulus pressure up to a predetermined value and then releasing this pressure..

Features

*Full-opening formation testing in cased hole, oil tube tradition perforation, tube string testing and cycle operation in the conjunction of perforation and full-opening formation testing

*Make the test program simple and reduce the reconnoitering cost greatly.

Specification

OD/in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

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RTTS Safety Joint

The RTTS safety joint is an optional emergency backoff device. The safety joint releases the workstring and tools above the packer if the packer becomes stuck during operations.

To initiate the release of the safety joint, a tension sleeve must be parted by pulling on the workstring. For complete release, vertical and rotational movement must be applied.

Features

* Positive sequence of operation helps prevent premature release.
* Tools above it can be retrieved when string is stuck.

Specification

Casing size /in	Working pressure /Mpa	Service environment	Working temperature	Connection
4 1/2”-20”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

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Round mandrel slip joint

The round mandrel slip joint, like other slip joints, accepts the movement associated with ocean heave or temperature change without allowing the movement to disturb the placement of downhole tools.

Features

*Top of the mandrel slip joint has 4 3/4-in. (120.65-mm) drill collar profile for easy handling with the rig elevators and slips
*Maintains its full tensile rating when collapsed and locked
*Can be locked in the closed position for handling, reducing the risk of damage to the lifting/sealing mandrel
*Internally pressure and volume balanced
*String can be picked up with the slip joint locked; the slip joint can then be unlocked before it is run into the hole
*Provides free travel in the string to reciprocate tools without unseating the packer

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

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Tubing String Testing Valve

The tubing string testing (TST) valve is a full-opening valve used to pressure-test the work string while running in the hole. The valve is operated after it is stung into a permanent packer or a retrievable packer is set.


TST valve

Features

*Flapper valve requires only 4psi to open
*Testing string can be pressure-tested as many times as required as it is run in the hole.
*Valve shear rating can be pre-determined at 500psi increments.
*Valve can also be used for pipe flexing.

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

Rupture Disk (RD) Sampler

The rupture disk (RD) sampler is a full-open, full bore sleeve sampler for use on drill stem tests. The sampler is controlled by a rupture disk that is operated by annulus pressure, used for trapping formation fluid under pressure in downhole.

Features

*The operation pressure is certain and steady which controlled by high precise rupture disks.
*Full-open capabilities are retained after the tool has trapped its sample.
*Several samplers can be run on a test to allow sampling at different times.
*A piston pushing device is available, the trapped sample can be transported to other vessels to process PVT analysis under high pressure condition.
*One time operation, once the RD sampler is closed can not be open again, several samplers can be run on if different testings needed.

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

Select Tester Valve

The select tester valve is a full opening, annulus pressure operated downhole tester valve used in cased holes.The Tester Valve is an annulus pressure controlled ball valve and is designed to allow multiple cycles during cased hole testing and perforating operations.


Select
Tester Valve

Features

* Incorporates advanced materials and processes providing a unique metal-to-metal seal for exceptional gas-holding capabilities
* Has undergone extensive five-day qualification testing at 400°F and 15,000 psi including a 16,500 psi burst and collapse test
* Allows operator to reverse out/circulate to the lowest point of circulation below the Select Tester valve.
* Simplifies string design by eliminating the need for a bypass when stinging into or out of a production packer
* Maximizes flexibility during well kill operations since the Select Tester valve can be operated with the packer unset

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

LPR-N Tester Valve

The LPR- N Tester Valve is a full-opening, annulus pressure-operated valve. It permits measuring multiple closed-in pressures in cased holes where pipe manipulation is restricted and a full-opening string is required.

Features

*The ball valve operates independently of internal pressure changes, like with acidizing or fracturing operations, no need special bypass tools, but if a production packer is used, the pressure will transfer to formation directly if no bypass tool involved.
*Drastic temperature changes, like in acidizing operations, have little affect on the tool.
*Advanced materials and processes provide a unique metal-to-metal seal for exceptional gas-holding capabilities.
*An open-in feature allows the operator to run the valve in the hole with the ball valve opened or closed

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

Well Testing **DST TOOLS**

Drain Valve

Sleeve type drain valve is used to drain the volume fluid and release pressure when string testing finished.The drain valve consists of a ported body, sliding sleeve, and rotating nut, which controls the position of the sliding sleeve

Features

*Allows pressure trapped between two closed valves to be relieved in a controlled manner
*Used to recover large volume fluid samples

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

Hydraulic Jar

The Hydraulic Jar is a straight-pull operated jar with a closed hydraulic system and a unique balance piston used to equalize oil pressure with tubing pressure. The hydraulic jar is also able to transmit torque to the right at any position along full stroke and helps free a stuck tool or tool string by resisting a pull on the workstring.

Features

* Design of the hydraulic system ensures long life with little maintenance.
* Rig time is reduced.
* Jar can be re-cocked rapidly.
* Jar time delay is adjustable.
* Amount of pull to trip the jar can be varied within the limits of the time-delay system.

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

Shock Absorber

The radial shock absorber protect pressure-measuring equipment or sensitive components in the workstring for shock loads transmitted through the workstring by firing of TCP guns. It can also help straighten the workstring.

The V-Shock Absorber is designed to protect pressure measuring equipment from vertical shock loads transmitted through the workstring by the firing of tubing-conveyed perforating guns. The V-Shock Absorber can be used to protect other sensitive components in the tool string.

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
5” 3 7/8” 3 1/8”	70/105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	EUE/IF/CAS

BOP Safety Valve-Super Safety Valve

The Super Safety Valve is a Fail Safe Safety Valve for testing from a land or jack-up rig. It is normally run inside or below the Blow Out Preventer (BOP) and is used to control well flow.

*Controlled by two hydraulic lines and contains a chemical injection port
*Located below the vertical shock absorber
*Close by spring force but has a nitrogen charge chamber to quicken the closing time
*Held open by maintaining hydraulic control pressure on the control line

Specification

OD /in	Working pressure /Mpa	Service environment	Working temperature	Connection
8”	105	Mud, Crude Oil, Natural gas with H2S and acid	--29°C ~+204°C	ACME

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SSC Storm valve

The Storm valve is a combination of Back Pressure Valve and Safety Joint that is run above a RTTS Storm Packer, in order to provide well control protection during a temporary abandonment of the well, without having to pull the drillpipe. The Storm Valve allows the packers to be set and then permit disconnection and retrieval of the drill pipe and the upper sub of the valve, while at the same time automatically closing the Storm Valve, isolating the drillpipe below the Storm Packer.

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Side Wall Anchor (SWA)

The Side Wall Anchor (SWA) is designed to be used below a straddle packer in an openhole. It provides support for the mechanical weight required to set the packers and open the tester valve. With the side wall anchor, a section of the well can be tested without running anchor pipe from the well bottom to the testing depth. The tool consists of a set of mechanical-type slips with large wickers to engage the holewall, a set of openhole-type drag springs, and a J-slot locking mechanism to hold the slips in the unset position.

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Gauge Carriers

DST Gauge Carriers internal type with 4 Gauges

The Full Bore Gauge Carrier has been designed as a single body type carrier capable of housing up to four QUARTZ DIGITAL or Piezo- Resistive Electronic Memory Pressure/Temperature Gauges. The carrier can be configured to provide outside and inside position electronic recorders. The gauge carrier can be custom designed to client's requirements.

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FUL-FLO Hydraulic Circulating Valve

The FUL-FLO hydraulic circulating valve serves as a bypass around the packer or as a circulating valve to circulate a well after testing. When run below a closed valve, the tool serves as a bypass around the packer and helps relieve pressure buildup below the closed valve when it is stung into a production packer. When run above a closed valve, the tool can be used as a circulating valve when the workstring is picked up.