

GE Oil & Gas
Drilling & Production



precise, clean cutting

Sondex Wireline Pipe Recovery



imagination at work

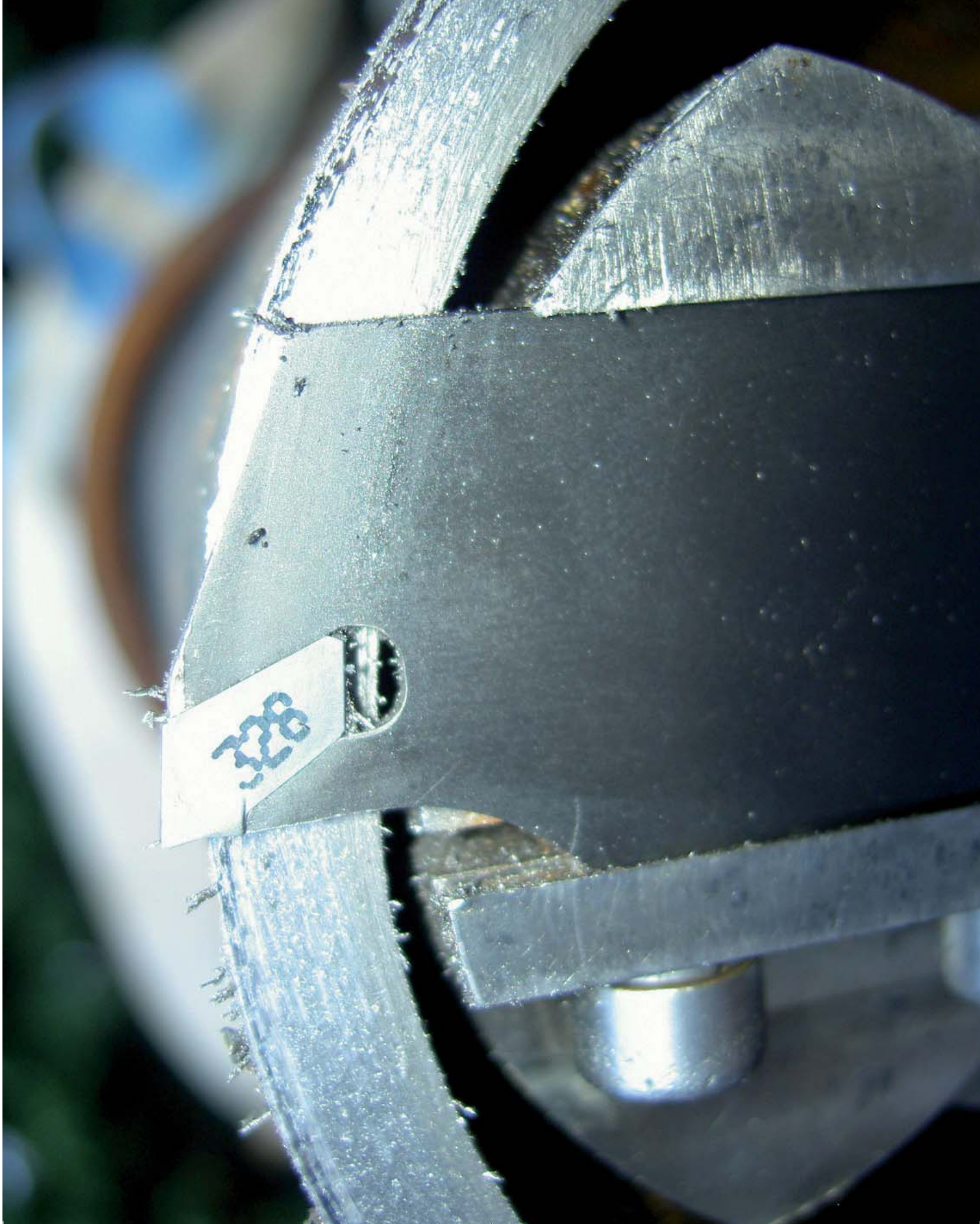
Cutting downhole tubulars quickly and cleanly with precise control means that everything except the target tubing remains intact.

GE's Sondex Wireline Pipe Recovery tools provide a clean, accurate and controllable method of downhole cutting across a wide range of sizes and applications.

Front cover
DECT001 tool. 2.75in for cutting options up to 5.1 inches OD.

Opposite
A 2.75in cutting head tip and blade on completion of tubing cut, used with No-Go system for individual and specialist operations.





World leaders in pipe recovery

GE Energy designs, develops and engineers state-of-the-art electro-mechanical equipment to run well site operations for oil and gas corporations. Our research and development is continuous, to ensure we always provide reliable technology, delivered on a global scale through exceptional customer service, specialist sales and local customer support.

Precise Cutting to Machine Quality

Cutting downhole tubulars quickly and cleanly can reduce the amount of rig downtime and therefore reduces costs. GE's downhole electric cutting tools are precise specialist tools used to cut tubing drillpipe and casing within a specified range.

High-Tech Solution

The DECT tools do not use explosives or dangerous chemicals. The toolstring has a main cutting section supported by downhole electronics which comprise two Casing Collar Locators (CCL), one is digital and the other is a 'shooting' CCL, a Head Tension tool and a Swivel Joint. When the tools are at the correct depth the anchor arms are set and the cutting head performs a controlled and accurate cutting operation.

Innovative Operation








GE's unique software has been specifically designed for maximum precision with minimal training. Logging functions are used to establish the exact tool position in real-time, the DECT then performs the cut. The cutting profile is recorded and can be included in reports for customer records.

Excellence You Can Rely On

Successful cutting jobs depend on obtaining good quality data, without costly failures and lost time. Our equipment is designed to consistently produce precise cuts and operate with high reliability. Our applied expertise ensures excellent sensor design and testing, combined with reliable components, appropriate materials and rigorous manufacturing procedures.



Comprehensive system at a glance

<p>Data Acquisition</p> <p>↓</p> <p>Tools</p> <p>↑</p>	<h3>DECT</h3> <h4>MCP Control Panel & Software p09</h4> <p>The DECT is controlled and monitored by a single portable power panel and laptop.</p> 	<h3>FPI</h3> <h4>Portable Combination Freepoint Panel p12</h4> <p>The PCFP for FPI performs all of the freepoint and back-off operations during pipe recovery.</p> 
	<h4>Downhole Electric Cutting Tool (DECT) p06</h4> <p>A unique, mechanical electric cutting tool for tubing, casing and drill pipe.</p> 	<h4>Freepoint Indicator Tool (FPI) p10</h4> <p>The FPI is an electromechanical tool designed to measure the amount of torque or stretch in tubing, drillpipe and casing.</p> 
	<h4>DECT Specialist Operations p07</h4> <p>These tools are designed for specialist operations.</p> 	<h4>FPI Accessories p11</h4> <p>A full range of accessories to help maximize productivity, efficiency and longevity of our pipe recovery tools.</p> 
	<h4>DECT Accessories p08</h4> <p>These tools and accessories enable centralization of the cutting head and provide important additional data.</p> 	



The Downhole Electric Cutting Tool (DECT) is a unique, mechanical electric cutting tool for tubing, casing and drill pipe. It's designed to have precise control, resulting in only the targeted tubing sections being cut with all the Mandrels and Sleeves remaining intact. This maximizes efficiency, reduces risk and enables normal operations to be resumed with minimal downtime.

The DECT contains a rotating cutting head with carbide tip plus a double set of anchoring arms which set the tool firmly inside the tubing. The family of DECT tools cut various pipe sizes in different conditions, all to machine shop standard.

Key Features

- Two head sizes which are easily transferable between tools
- A range of anchor arms for different sizes of tubing
- Pressure balanced for use in high-pressure operations
- Controlled by a single panel and laptop computer
- Helicopter transportable for rapid and simple deployment.

Components



DECT001 2.750in Head

Used to cut from 2.992in – 5.1in at 300°F and 15,000psi



DECT001 3.250in Head

Used to cut from 3.476in – 6.1in at 300°F and 15,000psi



DECT002 3.625in

Used to cut from 3.870in – 7.1in at 300°F and 20,000psi



DECT200 3.250in

Used to cut from 3.476in – 6.1in at 400°F and 15,000psi

Technical Overview

Confirm the material to be cut, and select the appropriate DECT to match the casing, tubing or well conditions. Change anchor arms if required.

Perform pre-job operational checks; rig the tool up either inside the pressure control lubricator assembly or directly over the open hole casing. Make a further electronic check before running in hole (RIH). RIH to the required depth and position using the CCL data or a No-Go system.

Set the anchor arms using the anchor arm calibration set procedure – gauging the precise anchor arm force against the tubing wall.

The anchor arms have two responsibilities: they firmly secure the tool inside the tubing, and they centralize the cutting head for cutting operations.

Proceed to cut. Send sufficient power to be able to turn the cutting head at the optimum speed of 65-67rpm.

The cutting tip will advance towards the tubing wall – typically at 0.004in per revolution. This takes a few minutes depending on the size of tubing. The current draw of the tool will start to increase when the cutting tip meets resistance against the tubing wall. The power can be increased to compensate, allowing the cutting speed to remain at the desired 65-67rpm.

A typical tubing cut will take around 3 ½ minutes. A microphone trace will indicate whether the cutting tip



Designed to offer total control and precision, the DECT provides an exceptionally clean downhole cut which means it is often used for specialist operations that aren't possible using chemicals or explosive cutters, for example Packer Sleeves and Mandrels.

The tool is ideal for these procedures as the cutting diameter is controlled at all times by an engineer allowing the operation to be stopped when the cutting tip breaks through, avoiding damage to the packer materials behind the sleeve.

No-Go systems can be made to customers specifications. They can be installed onto the DECT at any point above the anchor arm section.

Key Features

- Full user control of cut depth
- No-Go system ensures exact cut location within a Packer
- Minimal damage to materials behind Mandrel Sleeve
- Cuts chemically resistant materials.

Components

Specialist Operation

View of a Packer recovered to surface after the DECT has cut the inner release Mandrel.



is working against the tubing material or not. During the operation, the current will rise until on breakthrough, when it will reduce to the same rate as before the operation started. The cutting head is now retracted. Once complete, the anchor arms are relaxed and returned to the start point.

The tool can then be pulled out of the hole or set at another point in the well for another cutting operation.

The tool can be used to cut up to five times without extraction, depending on the material being cut.



Our range of additional tools and accessories are designed to assist with precise centralization of the cutting head and provide important additional data. Options are available for use in highly deviated wells or where rig height is limited.

DECT accessories also minimize issues related to well conditions. Roller Centralizers, CCL's, Head Tension Units and Swivel Joint's all combine to assist the user in gaining maximum advantage when dealing with problematic operations and easily configure with customer interfaces. Adaptors are supplied from Sondex GO connections.

Key Features

- Multiple sensors with real-time surface feedback
- Low friction centralizers for use in deviated wells
- Adaptors for major oil service company connections
- No-Go system configured to specific operations.

Components



Swivel Joint (PSJ)

Allows the release of torque that would otherwise build up in the cable so that the toolstring is not forced to spin, resulting in loss of log quality.



The Shooting CCL (CCL)

This CCL is simply controlled through third party logging systems for depth management.



4 Arm Roller Centralizer (PRC)

With the highest centralizing force, double rollers help tools run smoothly past casing joints. A contoured arm profile helps enter restrictions and it is particularly useful in horizontal wells.



AMG 003 Adaptor (AMG)

The AMG adaptor has a GO upper connection and can substitute the HTC/PSJ when rig-up height restrictions are in place.



Tool Electronics (DECTE)

The DECTE provides the telemetry link between downhole tools and the surface system. There is an integrated microphone that provides an indication of the cutting profile at the surface.



The DECT is controlled and monitored by a single portable power panel and laptop. The Surface Control Panel (MCP) is attached to the wireline and signals from the tool are gathered and fed to the logging laptop.

The MCP has a safety arming switch that needs to be depressed before the DECT can receive power from the panel. The tool is powered up by the variac controller monitored on the laptop.

The DECT software is Windows™ compatible, simple to use after minimal training, and provides all of the necessary tool functions and displays required for all operations. When power is sent to the DECT the software window automatically changes, the anchors and cutting head can be set and the whole operation can be monitored from the screen.

The logging window allows the user to monitor and log deployment using the CCL and HTU.

MCP Control System Key Features

- Portable and easily transportable
- Only mains power supply required
- Standard specification laptops can be used
- Safety arming switch avoids premature operation
- The panel operates on 110V and 240V AC power supplies.

Software Key Features

- Simple to use after minimal training
- Specific logging and cutting operation windows
- Excellent real-time, downhole parameter feedback.

Components

MCP002 Laptop
 The MCP has a safety arming switch that must be depressed to allow power output from the panel. The tool is then powered up by turning the variac controller to the required voltage, this is visible and monitored on the laptop computer.

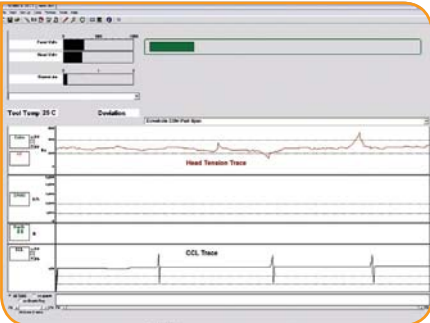


Control Panel


Control Panel

DECT Software Illustration

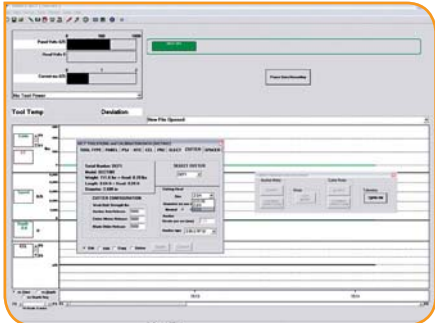
Logging Window



Cutting Window



Software Options



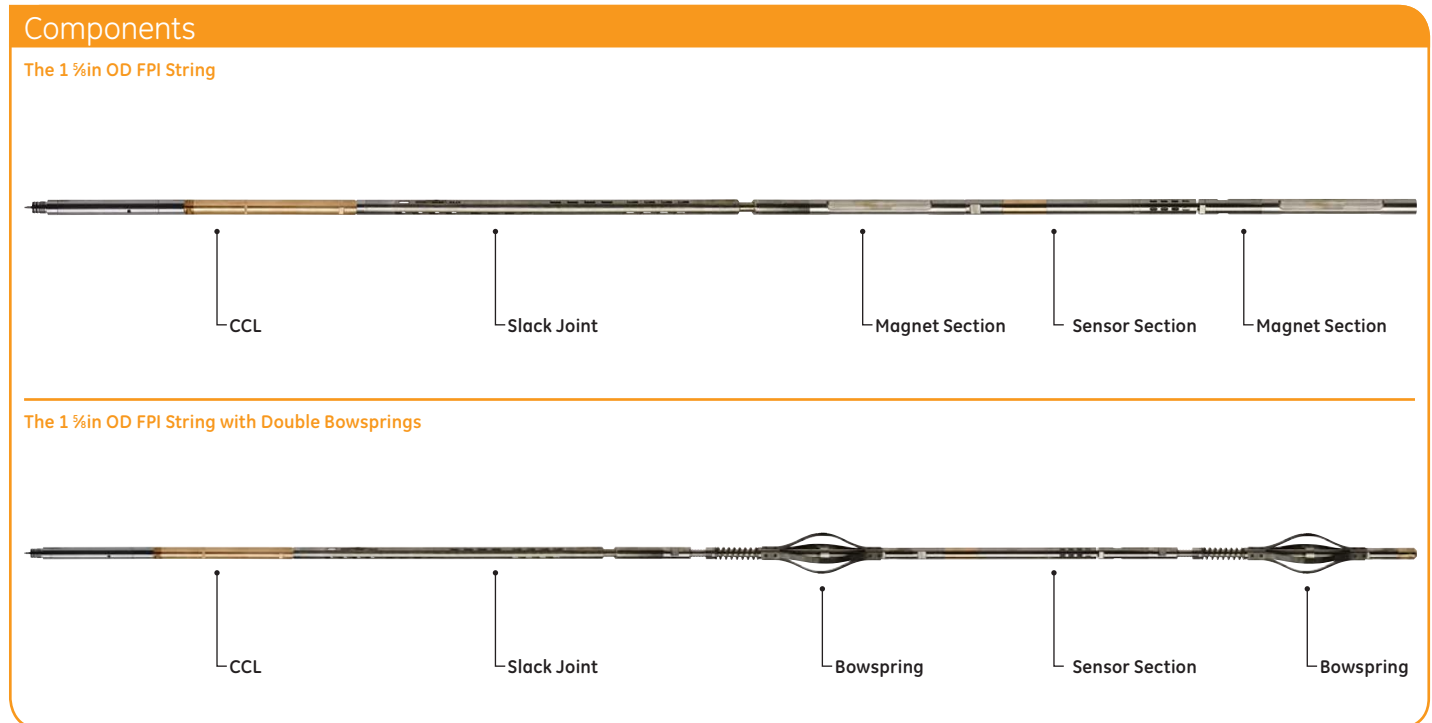

The Freepoint Indicator tool (FPI) is an electromechanical tool designed to measure the amount of torque or stretch of a given length of tubing, drillpipe or casing. It can also be adapted to use in casing with an optional casing bow spring section.

The system includes the FPI tool, Bowspring sections and Slack Joint for standard operations. There is also a Cable Head, CCL and Sinker weight bars for specific operations, plus magnetic sections for decentralization against the tubing wall.

The Portable Combination Freepoint Panel (PCFP) performs all of the freepoint and back-off operations during pipe recovery. The unit is enclosed in a single portable weatherproof case.

Key Features

- High pressure and temperature (21,000psi at 500°F)
- Low voltage inductance
- Capable of freepoint identification in casings up to 11in
- Minimal downhole electronics required.



Technical Overview

The FPI can be used for operations running inside 7/8in ID tubing (1in OD tool), 1 1/4in ID tubing (1 1/2in OD tool), 1 1/2in ID tubing (1 3/4in OD tool) and 1 3/4in ID tubing (1 3/4in OD tool). It uses low voltage, operating on 5 to 10VAC with + 100VDC setting voltage for the 1 1/4in, 1in, 1 3/4in tool. The 1 3/8in tool has an operating voltage of 5.6VAC and a setting voltage of +180VDC.

The 1 3/8in and 1 1/2in tools' circuitry makes combination runs possible by means of through circuit and a safety diode sub on the bottom Bowspring. The combination sub blocks positive voltage to the blasting cap and allows negative firing voltage through to fire a string shot.

The freepoint can be determined and a string shot fired to back-off the string in a single run, saving rig time and the possibility of complication, which might arise from making several runs.

All four tools have a temperature rating of 500°F and a pressure rating of 21,000psi.

The FPI tool uses Bowsprings or magnetic sections to anchor itself in the string pipe. There are three springs anchored around the upper and lower sections. A four spring option is available on the 1 3/8in string and is standard on the 1 1/2in string. Magnet sections are also available for all size tools.

The tool has four sections: an upper Bowspring, the Sensor Section a lower Bowspring and a Slack Joint. Sinker Bars are also available. Sinker Bars, Collar Locators and Slack Joints are run in conjunction with this tool. The Sinker Bars (steel or tungsten) and the number required are determined by well conditions, mud weight, drilling size, etc.

The Collar Locator is used to correctly position the tool overlapping a joint, and the String Shot in the case of a combination run. The Slack Joint has a sliding mandrel with a 16in and 24in stroke on the 1in, 1 1/4in and 1 1/2in OD tools; a 12in stroke on the 1 1/4in OD tool and a 38in on the 1 3/8in and 1 1/2in. It is used




Our range of accessories include Swivel Joints, Shock Subs, Skates, Shot Rods, Quick Change parts, Sinker Bars and Adaptors to assist in the successful deployment of our Freepoint tools.

Adaptors are equipped for containing pressure and have end connections of different nominal sizes to connect equipment of different API nominal sizes.


Key Features

- Accessories can be produced to customer specification
- The Freepoint Sensor section prevents erroneous readings
- Depth correlations with Casing Collar Locator
- Sinker Bars add weight for more control.


Components




Cable Head
Interfaces between the cable and the toolstring and contains the weak-point for ease of cable recovery should the toolstring become stuck in a hole.




Freepoint Slack Joint (FSJ)
The FSJ removes the weight of the wireline and sinkerbars so the tool anchors itself to the wall of the pipe and the weight above the tool does not force the tool to creep downhole, or cause erroneous readings.




Casing Collar Locator (CCL)
CCL is used for depth control.




Grounding Bull Plug or Combination Sub for Back-Off
This provides physical and electrical termination for the toolstring.



Freepoint Sensor Section
The sensor section measures stretch and rotation and is a pressure-balanced assembly. This prevents any external or hydrostatic pressure downhole from creating any erroneous readings of the tool.



Freepoint Bowspring Sections
The Bowspring is anchored on the bottom. It has a sliding sleeve and lock so that once the Bowsprings are set for OD they may be locked in place anchoring them on the tool while allowing the springs to collapse when passing through restrictions. The OD for the Bowspring settings depends upon the target pipe ID.



Sinker Bars
Sinker Bars add sufficient weight to the toolstring to aid descent into the well and maintain depth under pressure conditions.

to remove the weight of the line and sinker bars.

The FPI will anchor itself to the wall of the pipe and the weight above the tool does not force the tool to creep downhole or cause erroneous readings.

The Bowsprings on each section are anchored on the bottom and have a sliding sleeve and lock. So once the Bowsprings are set for desired OD they may be locked in place, anchoring them on the tool, and allowing the springs to collapse when passing through restrictions going downhole or coming out.

The OD for the Bowspring settings depends upon

the target pipe ID. The sensor section is a pressure balanced assembly. This is achieved by sealing the housing to the bearing mounted sensor shaft by means of a rubber boot.

This also allows movement of the shaft, filling the unit with a light synthetic oil and vacuuming all the air from the unit. This prevents any external or hydrostatic pressure downhole from creating erroneous readings of the tool. When the tool is in operation, the distance between the pole pieces that accounts for the surface reading is given in micro-amps.

A change in the inductance of a coil occurs when the distance between pole pieces is varied, indicating stretch or compression. The tool also measures right or left hand torque.



The Portable Combination Freepoint Panel (PCFP) is a light-weight easy to transport durable unit. Compatible with any single conductor wireline, it has all of the necessary surface electronics to perform all of the freepoint and back-off operations during pipe recovery.

Key Features

- Monitors CCL, freepoint and performs shooting operations
- Two hand safety fire
- Self-contained portable and rack mounted versions available
- The panel operates on 110V AC 60Hz power supply
- Custom designed panels available.

Components



Portable Combination Freepoint Panel (PCFP)

The Freepoint Section (FPI) includes the freepoint indicator meter, sensitivity and zero controls, and reset switch.

The Collar Locator Circuit (CLC) operates on a separate meter and has an audible CCL signal.

For back-off there is a Shooting Supply Circuit that provides the electrical power necessary for firing explosives downhole. The circuit produces AC or DC, positive or negative polarity. There are voltage and current meters to allow the operator to closely monitor back-off detonation.





GE's Sondex pipe recovery tools have been instrumental in providing clients all over the world with efficient, productive and cost-effective solutions to diverse issues and challenges. Below are just a few examples of our innovation in action across the globe.

North Sea, UK Sector: Cutting a release mandrel inside a downhole packer. On a North Sea site, the production company had a requirement to remove a packer from a well.

Challenge

A chemical cutter had failed to cut the 5in OD 13Cr 80 packer release mandrel due to the high corrosion resistance of the metal. Sondex was approached to supply the DECT to cut the packer sleeve, allowing the safe removal of the downhole packer.

Solution

Sondex ran a DECT001 with 3.25in head to cut the 5in 13Cr tubing sleeve. A No-Go system was employed to ensure precise location for the desired cut.

Results

The packer sleeve was cut as planned, and the removal of the packer made possible.

Northern Alberta, Canada: Cutting casing at 88° deviation in Tar Sand. Difficult well conditions play a part in the choice of cutting tool required for each operation. Tar sand wells provide a fine example of the mechanical DECT succeeding where a chemical cutter had failed. The use of explosives was deemed an unnecessary risk to personnel.

Challenge

To cut 5.5in OD J55 material at high deviation in tar sand at 105°C, whilst not damaging any of the tubulars behind the casing. It was also essential to ensure complete safety in the adjacent camp compound.

Solution

Whilst tar sands can be detrimental in conventional chemical cutter operations, the DECT design ensures that difficult well conditions have no undesirable effect on the operation and success of the tool. The DECT successfully performed the cuts and spared any damage behind the casing. There were no explosives involved, so the camp remained completely safe.

Results

Between July 06 and April 07 the DECT performed five successful cuts in Northern Alberta, Canada.

Algeria, North Africa: First DECT Field Operation. Cutting 4.5in P110 tubing: A section of 4.5in 13.5lbs/ft P110 tubing had to be cut at a depth of 10765ft. The well temperature was 100°C and the well pressure 5000psi.

Challenge

To provide a safer means to perform the cutting operation without utilising explosives or dangerous chemicals.

Solution

Sondex ran a DECT001 with 2.75in head to cut the 4.5in P110 tubing. The tubing was cut successfully in less than 5 minutes so enabling the removal of the tubing section.

Results

Performing pipe-severing operations in the area where we performed the cut normally requires a military escort. Using the DECT ensured no requirement for military intervention and as such saved the client the cost of having to use the military.



Tools	Max Cut Depth	Cut Range	Anchor Range	Temp	Pressure	Diameter	
						Body	Head
DECT							
DECT001 2.75in head	0.75in (19mm)	2.992in - 5.1in (76-130mm)	2.992in - 5in (76-127mm)	302°F (150°)	15k psi (103.4MPa)	2.75in (70mm)	2.75in (70mm)
DECT001 3.25in head	1in (25.4mm)	3.5in - 6.1in (89-155mm)	2.992in - 5in (76-127mm)	302°F (150°)	15kpsi (103.4MPa)	2.75in (70mm)	3.25in (82.5mm)
DECT002 3.625in head	0.75in (19mm)	3.87in - 7.1in (98.3-180.3mm)	3.87in - 6.54in (98.3-166mm)	302°F (150°)	15kpsi (103.4MPa)	3.625in (92mm)	3.625in (92mm)
DECT200 3.25in head	1in (25.4mm)	3.5in - 6.1in (89-155mm)	2.992in - 5in (76-127mm)	392°F (200°)	15kpsi (103.4MPa)	2.75in (70mm)	3.25in (82.5mm)

Tools	Total Length	Min Pipe Diameter	Max Pipe Diameter	With Optional Magnetic Anchors	Total Weight Inc CCL	Temp	Pressure
Freepoint Indicator Tool							
1 1/16in (17.46mm)	118in (2997mm)	1in (24.5mm)	4.5in (114.3mm)	13in (330mm)	9lbs (4.1Kgs)	500°F (260°C)	21kpsi (145MPa)
1in (25.4mm)	137in (3492.5mm)	1.5in (38.1mm)	4.5in (114.3mm)	13in (330mm)	20.5lbs (9.3Kgs)	500°F (260°C)	21kpsi (145MPa)
1 3/8in (9.5mm)	136.75in (3473.5mm)	1.75in (44.5mm)	4.5in (114.3mm)	13in (330mm)	38lbs (17.3Kgs)	500°F (260°C)	21kpsi (145MPa)
1 5/8in (15.9mm)	133.5in (3391mm)	1.75in (44.5mm)	5.625in (142.9mm)	13in (330mm)	50lbs (22.7Kgs)	500°F (260°C)	21kpsi (145MPa)





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