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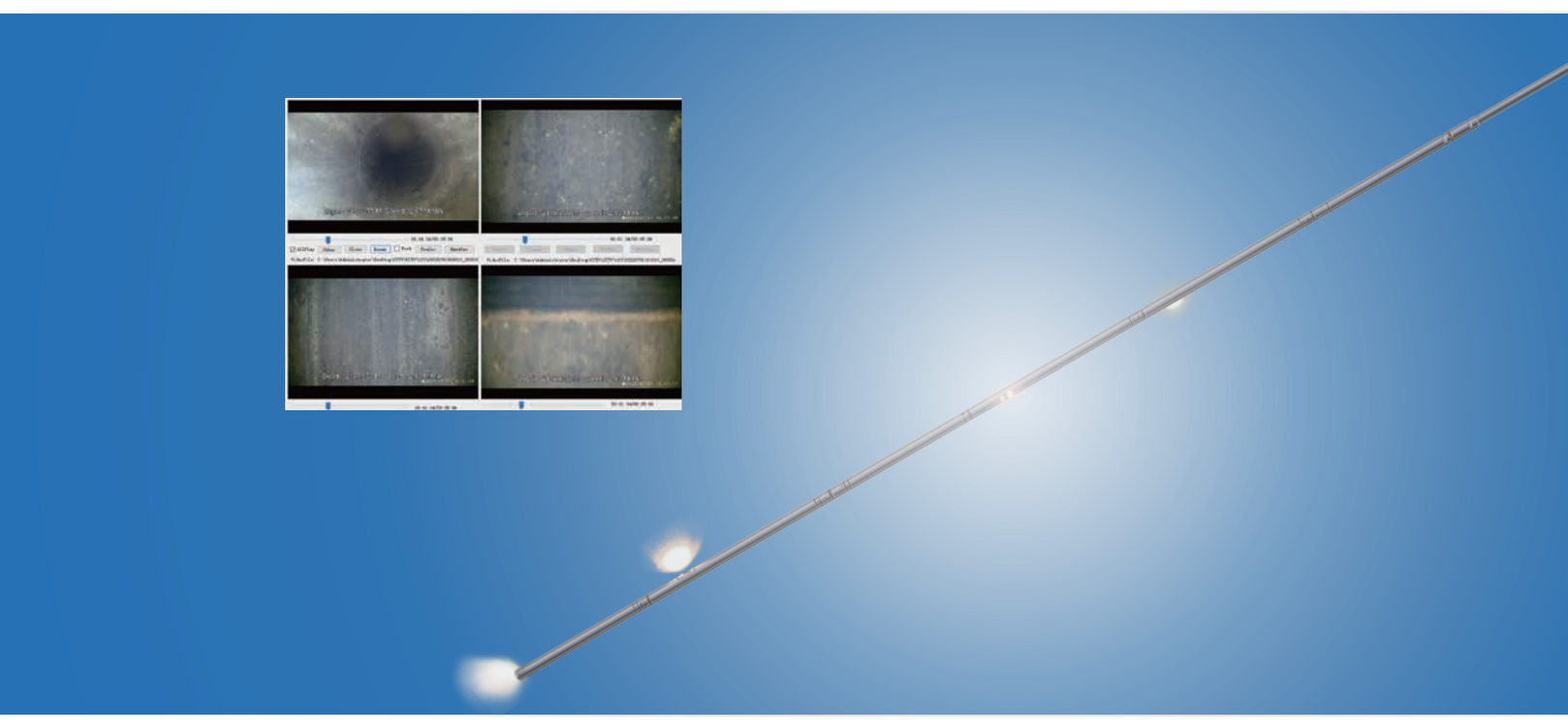
Multiple Corrosion Inspection System (MultiCIS)

- Gamma Ray Tool-Production (GRT-P)
- Platinum Thermometer Tool (PTT)
- Noise Detection Tool (NDT)
- Multi-Finger Imaging Tool (MFI)
- Magnetic Corrosion Inspection Tool (MCI)
- Magnetic Thickness Tool (MTT)
- Down Hole Camera (DHC)



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Multiple Corrosion Inspection System (MultiCIS)

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Applications

- Inspection and diagnosis the casing/tubing (Corrosion, Casing Wear, Deformation, Crack)
- Locate leaks in cased well
- Drill string damage inspection
- Fishing operations
- Downhole fluid identification (Gas, Water, Oil, etc.)

Features

- 24, 40 or 60 independent caliper readings
- Measures absolute wall thickness

Benefits

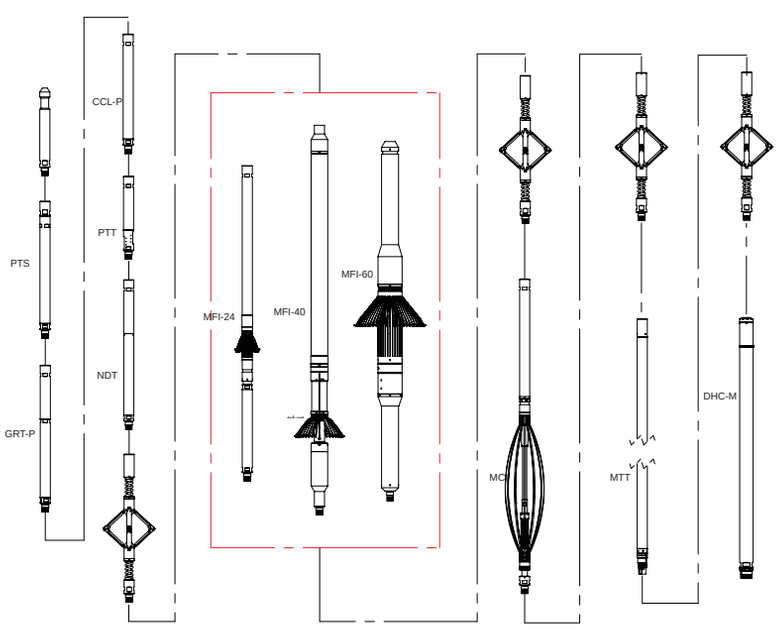
- Minimize the number of trips in the well and save time.
- High radial and vertical resolution help to detect fine features like pitting and perforation.

Introduction

Multiple Corrosion Inspection System (MultiCIS) comprises a telemetry controller (PTS) and tools like GRT-P, CCL-P, PTT, NDT, MFI, MCI, MTT and DHC-M. MutilCIS logging can get rich information in one logging pass, such as casing diameter, wall thickness, corrosion, casing wear, casing damage or leaks. It can be used in multiple casing strings to confirm internal and external casing damage, get data with magnetic signals that not easily affected by various well conditions. It also can get visual images and videos with memory mode.

Downhole Tool String

PTS	Production Telemetry Sub
GRT-P	Gamma Ray Tool-Production
CCL-P	Casing Collar Locator-Production
PTT	Platinum Thermometer Tool
NDT	Noise Detection Tool
MFI	Multi-Finger Imaging Tool
MTT	Magnetic Thickness Tool
MCI	Magnetic Corrosion Inspection Tool
DHC	Down Hole Camera
TCS-R	Three-Arms Centralizer Sub-Roller
CTT-C2	Four-Arms Centralizer Sub-Roller



PI Production Logging System (PLS)

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Applications

- Power supply to Downhole Tools
- Control the action of Downhole Tools
- Record logging data of Downhole Tools
- Record depth and tension

Introduction

It contains depth system, tension system, telemetry modem, toolstring power supply with protection, and a USB hub. Any laptop PC can be used in conjunction with logging system. The acquisition software is PI Production and Engineering Logging System (PIPES), and it runs on Windows Operating System

Specifications

Height	6.3 in. (0.16 m)
Depth	16.61 in. (0.422 m)
Width	19.09 in. (0.485 m)
Weight	55 lbs. (25 kg)
Operating Temperature	32°F to 131°F (0°C to 55°C)
Storage Temperature	-58°F to 149°F (-50°C to 65°C)
Power	
Power Input	110 Vac / 220 Vac
Out Line Voltage	25-225 Vdc
Maximum Output Current	400 mA
Polarity	Positive or negative
Connect to PC	USB

Production Telemetry Sub (PTS)

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Applications

- Convert high voltage from head line to low voltage to supply tools
- Communication between surface panel and downhole tools

Introduction

Production Telemetry Sub (PTS) serves as a communications interface and a programmable logging controller. It also incorporates a DC-DC converter to convert the high voltage on the head line to power the downhole tool bus. The PTS polls each tool on the toolstring for its data packet and assembles these data packets into frames for uplink to the surface.

Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.-6.97 in. (0.48 m)
Shipping Length	1 ft.-8.35 in. (0.51 m)
Weight	7.5 lbs. (3.4 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Toolbus Data Rate	500 kbits/s
Uplink Data Rates	50, 71, 100, 143 & 200 kbits/s
Downlink Rate	300 bits/s
Create Tool Bus	
Nominal	18 Vdc
Range	15-18 Vdc
Wireline Requirements	Mono-conductor
Toolbus Current at Ambient (Max)	800 mA
Toolbus Current at 177°C (Max)	400 mA
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)
Power Requirements	
Nominal	+200 Vdc
Functional	+120 to +300 Vdc
Absolute Max	+300 Vdc
Current Consumption	20 mA @ 200 Vdc (no load)

Gamma Ray Tool-Production (GRT-P)

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Applications

- Depth Correlation
- Identification of Radio Active Scale

Introduction

Production Gamma Ray Tool (GRT-P) measures gamma radiation from the formation surrounding the well bore or for particular applications. The tool comprises a crystal and photomultiplier to measure incident gamma radiation. The electronics interfaces to PTS.

Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103.4 MPa)
Length	1 ft.-11.1 in. (0.59 m)
Measure Point	5.3 in. (134 mm)
Weight	9.39 lbs. (4.26 kg)
Tool Diameter	1.69 in. (43 mm)
Recommended Logging Speed	30 ft./min (9 m/min)
Maximum Count Rate (API)	2000 cps
Nominal Calibration	1 count/API
Depth Resolution	6 in. (152.4 mm) typical
Dead Time	Negligible (below 1000API)
Sensitivity threshold	20 keV approx.
Nominal Calibration	1 count/API
Depth Resolution	6 in. typical
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	20 mA @ 18 Vdc

Casing Collar Locator-Production (CCL-P)

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Applications

- Confirmation of perforation depths or intervals
- Depth control

Introduction

Casing Collar Locator-Production (CCL-P) detects the casing collar. The tool comprises two opposing permanent magnets pass through a coil positioned between them.

Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.-6.5 in. (0.46 m)
Measure Point	6.5 in. (0.17 m) (Above Lower Tool Joint)
Weight	12.1 lbs. (5.9 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	16 mA @ 18 Vdc

Platinum Thermometer Tool (PTT)

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Applications

- Production and Injection Log interpretation
- Location of fluid entry, gas leaks and injection zones

Introduction

Platinum Resistance Temperature Tool (PTT) measure the borehole fluid temperature. The sensor of the tool is a platinum resistance wire housed in an inconel needle. The device is fast reacting, accurate, stable and repeatable.

Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Length	1 ft.-0.5 in. (0.317 m)
Weight	5.2 lbs. (2.35 kg)
Tool Diameter	1.69 in. (43 mm)
Measure Point	1.75 in. (44.5 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Resolution	0.0063°F (0.0035°C)
Acquisition Time (typical)	1 sec
Accuracy	±0.5°C
Linearity	0.15% of full scale
	(For 2 point cal only. Better for multipoint.)
Response Time	0.5 secs
Resolution	
For 1 Sec Acquisition Time	0.0035°C (0.0063°F)
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	20 mA @ 18 Vdc

Noise Detection Tool (NDT)

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Applications

- Locate of gas-liquid interfaces
- Locate of leaks in well
- Locate of channels behind casing

Introduction

Noise Detection Tool (NDT) is designed to measure downhole noise used to locate gas-liquid interfaces and leaks in well. It contains an extremely sensitive hydrophone that is highly effective in the detection of flow both inside and outside the cased well.

Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	20,000 psi (137.9 MPa)
Make-up Length	1 ft.-11.39 in. (0.59 m)
Shipping Length	2 ft.-3.21 in. (0.69 m)
Weight	9.92 lbs (4.75 kg)
Tool Diameter	1.69 in. (43 mm)
Measure Point	7.87 in. (200 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	15 mA to 20 mA @18 Vdc (Typical)

Multi-Finger Imaging Tool (MFI)

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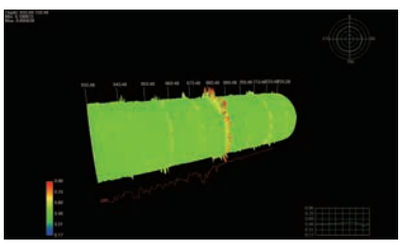
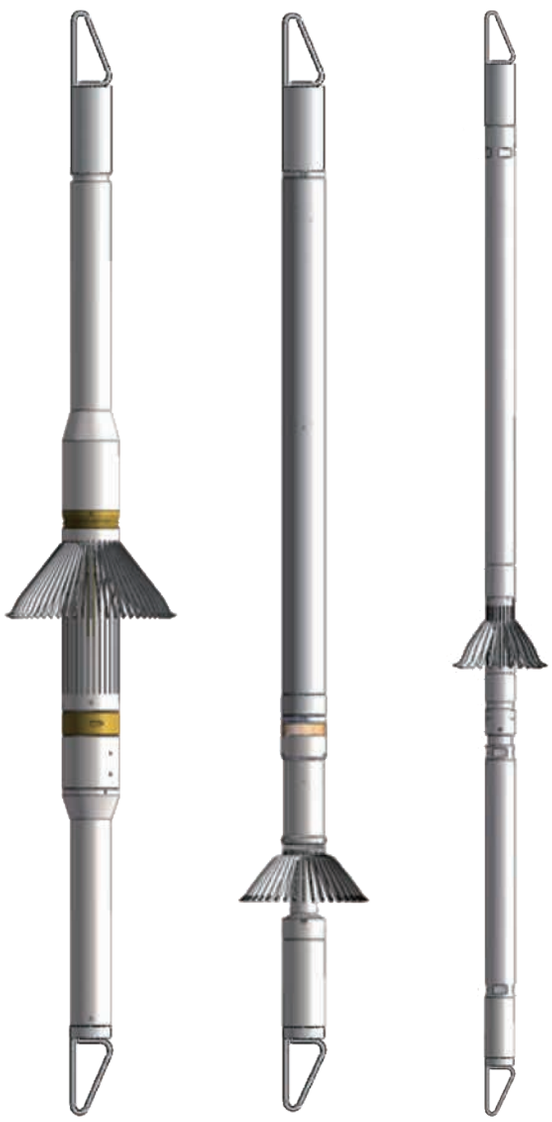
Applications

- Casing Deformation
- Casing Wear
- Perforation Mapping
- Accurate location of holes or anomalies



Introduction

The Multi-Finger Imaging Tool (MFI) is used to detect very small changes to the internal surface condition of tubing or casing with a high degree of accuracy. A range of tool sizes with 24, 40, or 60 fingers are available to suit different casing diameters and each tool has two types fingers to increase the measurement range. The tool includes an inclinometer to indicate well bore deviation and the tool bearing relative to the high side of pipe.



Specifications

Item	MFI-24	MFI-40	MFI-60
Max. Temperature	350°F (175°C)		
Max. Pressure	15,000 psi (103 MPa)		
Make-up Length	4 ft.-2.59 in. (1.285 m)	7 ft.-6.12 in. (2.29 m)	6 ft.-0.36 in. (1.84 m)
Shipping Length	5 ft.-4.57 in. (1.64 m)	7 ft.-11.64 in. (2.43 m)	6 ft.-5.88 in (1.98 m)
Weight	20.7 lbs. (9.38 kg)	79.4 lbs. (36 kg)	111.3 lbs. (50.5 kg)
Tool Diameter	1.688 in. (43 mm)	2.875 in. (73 mm)	4 in. (102 mm)
Min. Hole Diameter	1.97 in. (50 mm)	3.15 in. (80 mm)	4.5 in. (115 mm)
	(4.5 in. finger)	(7 in. finger)	(10 in. finger)
Max. Hole Diameter	4.5 in. (114.3 mm)	7 in. (177.8 mm)	10 in. (254 mm)
	(4.5 in. finger)	(7 in. finger)	(10 in. finger)
Recommended Logging Speed	22 ft./min (6.7 m/min)		
Max. Logging Speed	43 ft./min (13.3 m/min)		
Radial Accuracy	±0.02 in. (0.5 mm) STD ±0.02 in. (0.5 mm) EXT	±0.02 in. (0.5 mm) STD ±0.025 in. (0.64 mm) EXT	±0.025 in. (0.64 mm) STD ±0.03 in. (0.76 mm) EXT
Radial Resolution	0.0039 in. (0.1 mm)		
Rotation	±3°		
Inclinometer	±3°		
Power Requirements	18 Vdc (Nominal) 13-23 Vdc (Range)		
Current Consumption	30 mA @ 18 Vdc (Logging) 450 mA @ 18 Vdc (Motor operating)		
Extending Finger	7 in. fingers (EXT) Min: 1.97 in. (50 mm) Max: 7 in. (177.8 mm) Tool OD 1.688 in. (43 mm)	10 in. fingers (EXT) Min: 4.7 in. (119 mm) Max: 10 in. (254 mm) Tool OD 4.33 in. (110 mm)	14 in. fingers (EXT) Min: 4.5 in. (115 mm) Max: 14 in. (356 mm) Tool OD 4 in. (102 mm)

Magnetic Corrosion Inspection Tool (MCI)

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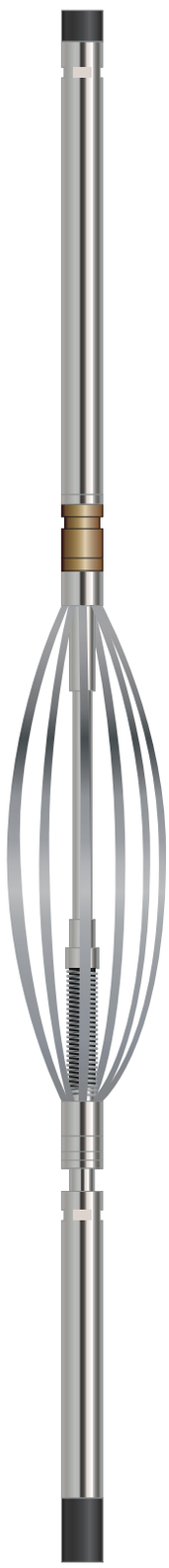
Applications

- Inspection of tubing and casing
- Measures absolute wall thickness

Introduction

The Magnetic Corrosion Inspection Tool (MCI) is designed to investigate variations of metal thickness within downhole tubular. The tool has an array of 12 specially developed miniature magnetic sensors on the inside of a set of bow spring.



Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	6 ft.-10.3 in. (2.09 m)
Weight	30 lbs. (13.6 kg)
Tool Diameter	1.69 in. (43 mm)
Number of Sensors	12
Magnetic Generator	One
	Multi-frequency sinusoidal waveform
Minimum Pipe Size	2 in. (50.8 mm) I.D. tubing
Maximum Pipe Size	7 in. (177.8 mm) I.D. casing
Thickness Accuracy	Depends of size of defect.
	In undamaged pipe,
	accuracy is better than 15% of wall thickness.
Defect Resolution	Depends on size of defect.
	3/8 in. dia defect: 50% wall thickness,
	35% metal loss.
	3/4″ dai defect: 30% wall thickness,
	20% metal loss.
Coverage	100% with 12 sensors
	up to 5 in. (127 mm) I.D. casing
Power Requirements	
Nominal	+18 Vdc
Functional	+14 Vdc
Max	+24 Vdc
Typical Current Consumption	
100 mA	Transmitter off
350 mA	Transmitter on

Magnetic Thickness Tool (MTT)

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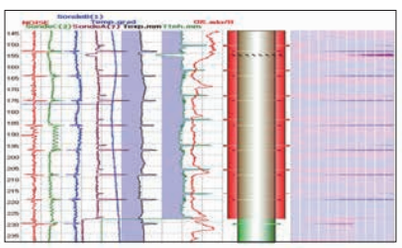
Applications

- Casing inspection
- Determine the location of perforation and leakage
- Accurately determine the wall thickness of casing and tubing
- Corrosion detection of inside and outside casing walls



Introduction

Magnetic Thickness Tool (MTT) is based on the principle of electromagnetic induction which deliver high energy electromagnetic pulses into the pipes surrounding the tool. MTT records the composite decay of the eddy current signals that are used to evaluate the pipe conditions. The induced electromotive force changed with the column wall thickness, magnetic conductivity, and electrical conductivity changes. Therefore, the casing cracks, holes and corrosion can be judged.

Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	6 ft.-8.71 in. (2.05 m)
Shipping Length	7 ft.-8.13 in. (2.34 m)
Weight	29.1 lbs. (13.2 kg)
Tool Diameter	1.69 in. (43 mm)
Minimum Hole Diameter	2.48 in. (63 mm)
Maximum Hole Diameter	12.75 in. (324 mm)
Maximum Logging Speed	9.8 ft./min (3 m/min)
Wall thickness measurement range	0.12-0.47 in. (3-12 mm)
Wall thickness measurement error	0.0078 in. (0.2 mm) (Monolayer)
	0.020 in. (0.5 mm) (Multilayer)
Vertical crack	2.36 in. (60 mm)
Horizontal crack	1/3 of the circumference
Power Requirements	200 Vdc (Nominal)
	180-220 Vdc (Range)
Current Consumption	90 mA @ 200 Vdc

Down Hole Camera (DHC)

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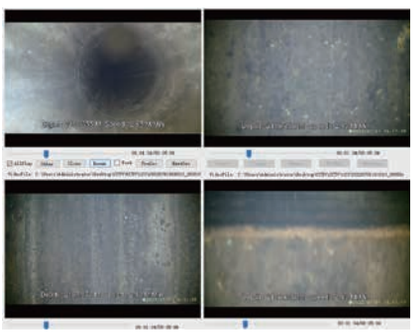
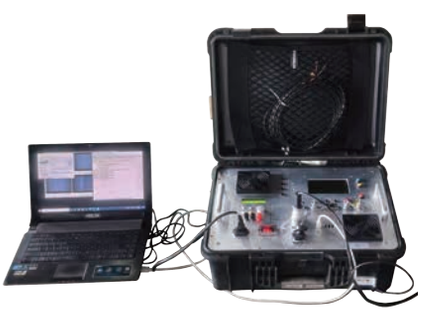
Applications

- Downhole Fluid Identification (Gas, Water, Oil etc.)
- Fishing operations
- Perforation inspection
- General problem identification





Introduction

The DHC tool has two operating modes: Memory and Real-Time. The Memory mode can record downhole videos, and the media files can be played back on the surface. The Real-Time mode allows for real-time viewing of downhole conditions. With high-efficiency LEDs and the latest image sensing technology, the tool ensures the highest probability of quality pictures, providing high-resolution images that eliminate guesswork from a range of diagnostic tests and troubleshooting operations.

Downhole Tool String

DHC-FV	Front Video Assembly
DHC-SV	Side Video Assembly
DHC-ME	Memory Electronic Assembly
DHC-RE	Real-Time Electronic Assembly
DHC Battery Sub	Battery Assembly
DHC-SC	Slipover Centralizer

Specifications

Maximum Temperature	300°F (150°C)	
Maximum Pressure	10,000 psi (70 MPa)	
Make-up Length	13 ft.-8.39 in. (4.18 m)	
Weight	94.14 lbs. (42.7 kg)	
Tool Diameter	2.125 in. (54 mm)	
Minimum Hole Diameter	2.44 in. (62 mm) I.D.	
Maximum Hole Diameter	10 in. (25.4 cm) (centralizer)	
Recommended Logging Speed	16.4 ft./min (5 m/min)	
Resolution Ratio	16 million pixels	
Frame Rate	1080 p: 60 fps	
Front Camera Angle	60°	
Side Camera Angle	45° (3-9 cameras)	
Memory	128 GB / Camera	
Power Requirements	Real-Time	220 Vac
	Memory	Battery 18 cells
		57.6 Vdc (Nominal)
		44-59 Vdc (Range)
Wireline Requirements	Real-Time	7-Conductor
		Mono-Conductor
	Memory	Slick Line
		Coiled Tubing

Note: Every camera with microphone.

Three-Arms Centralizer Sub-Roller (TCS-R)

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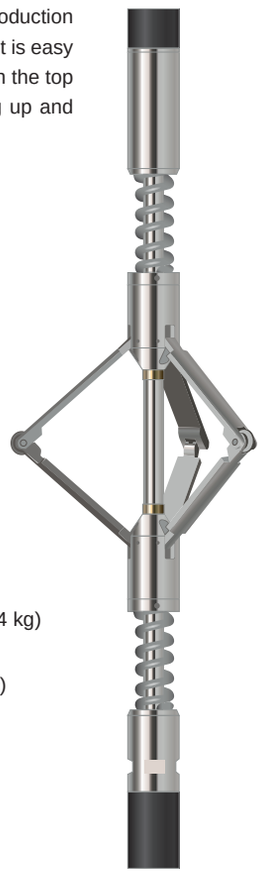
Applications

- Centralize the downhole tools

Introduction

Three-arms Centralizer Sub-Roller (TCS-R) is special designed for production logging both invertical and deviated cased hole. It is an online tool and it is easy to combine with many tools at any point in the tool string. The rollers on the top of arms can help the tools decrease friction so that it can easy to rig up and down.



Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103.4 MPa)
Make-up Length	1 ft.-11.3 in. (0.59 m)
Shipping Length	2 ft.-3.1 in. (0.69 m)
Weight	7 lbs. (3.18 kg)
Tool Diameter	1.69 in. (43 mm)
Minimum Hole Diameter	2.375 in. (60.3 mm)
Maximum Hole Diameter	9.625 in. (244.5 mm)
Number of Arms	3
Maximum Tensile	14,200 lbs. (6441 kg)
Centralising Force	25 lbs. (11.33 kg) or 40 lbs. (18.14 kg) (Depends on springs selected)
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)

Centralizer-2 (CTT-C2)

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Applications

- Center the logging tool accurately

Introduction

CTT-C2 is a kind of inline centralizer with four arms. It can run both in vertical and horizontal cased hole. With fours arms, this centralizer can keep the tool string center in the hole accurately. Two rollers on the support arms can decrease the friction and make tool string can easy to move up and down.It is can combine with MFI-40, MFI-60.

Specifications

Maximum Temperature	350°F (175°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	2 ft.-10.49 in. (0.876 m)
Shipping Length	3 ft.-1.99 in. (0.965 m)
Weight	29.3 lbs. (13.3 kg)
Tool Diameter	2.125 in. (54 mm)
Minimum Hole Diameter	2.375 in. (60.3 mm)
Maximum Hole Diameter	9.625 in. (244.5 mm)
Centralizing Force	70 lbs. (31.7 kg)
Number of Arms	4
Max. Tensile	15,873 lbs. (7,200 kg)

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