



**Geo-Vista**

## **Production Logging System (PLTLog)**

Flow Imaging Scanner (FIS)

Reservoir Monitor Tool (RMT)

Optical Gas Hold-up Tool (OGH)

Ultrasonic Sand Detection Tool (USD)

Head Tension Sub (HTS)

Casing Collar Locator-Production (CCL-P)

Gamma Ray Tool-Production (GRT-P)

Quartz Pressure Tool (QPT)

Platinum Thermometer Tool (PTT)

Noise Detection Tool (NDT)

Tuning Fork Fluid Density Tool (TFD)

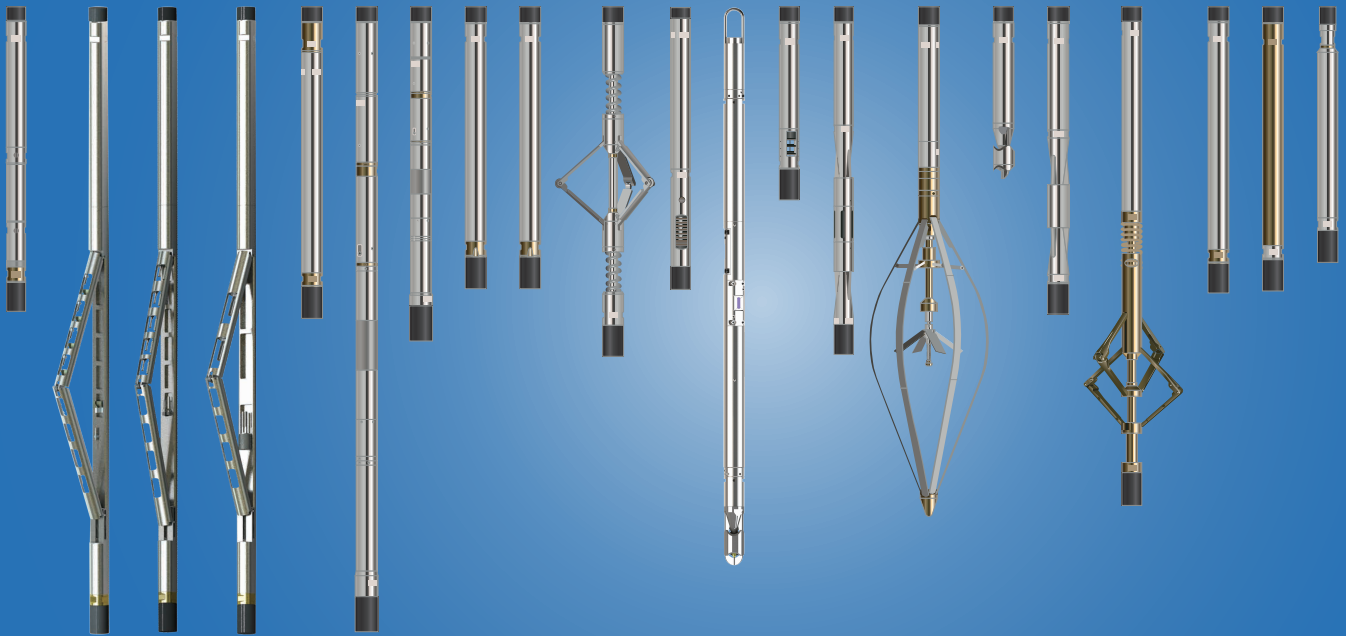
Water Hold-up Tool-Capacitance (WHT-C)

Full Bore Flowmeter-Caged (FBF-C)

Jewelled-bearing Continuous Flowmeter (JCF)

Spinner In-Line Flowmeter (SIF)

Four-Arms Dual Caliper (FDC)



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## Applications

- Production profile logging
- Injection profile logging
- Multiple parameters logging
- Injection profile
- Water problem
- Excessive gas problem
- Mechanical problem

## Introduction

PI Production Logging System comprises a series of production logging tools. Initially, the system is designed to profile the downhole production. Later on, it is usually to facilitate optimal reservoir management and production problem diagnosing.

PLT system acquires the pipe information as: CCL, Caliper, Inclination; Fluid information as: Temperature, Pressure, Density, Flowrate, Water Holdup, Gas Holdup; Formation information as: Gamma Ray. The other auxiliary information like fluid resistance, formation sigma is acquired on demand for advanced purpose.

The toolstring could be deployed by wireline (real-time mode) or slickline (memory mode).

## Downhole Tool String

FIS:	Flow Imaging Scanner
RMT:	Reservoir Monitor Tool
OGH:	Optical Gas Hold-up Tool
USD:	Ultrasonic Sand Detection Tool
PTS:	Production Telemetry Sub
HTS:	Head Tension Sub
CCL-P:	Casing Collar Locator-Production
GRT-P:	Gamma Ray Tool-Production
QPT:	Quartz Pressure Tool
PTT:	Platinum Thermometer Tool
NDT:	Noise Detection Tool
TFD:	Tuning Forking Fluid Density Tool
WHT-C	Water Hold-up Tool-Capacitance
FBF-C:	Full Bore Flowmeter-Caged
JCF:	Jewelled-bearing Continuous Flowmeter
SIF:	Spinner In-Line Flowmeter
FDC:	Four-Arms Dual Caliper
PLM:	Production Logging Memory
MBS:	Memory Battery Sub
CHM:	CableHead Mono-conductor

## Surface System

PLS:	PI Production Logging System
MCP:	Memory Control Box
DTP:	Depth Time Panel

## Applications

- Multiphase flow profiling in nonvertical wells
- Identification of fluid and gas entries in multiphase well or liquid in gas wells
- Detection of fluid recirculation
- Stand-alone, real-time, three-phase flow interpretation
- Real-Time Mode or Memory Mode

## Benefits

- Unambiguous flow profiling in nonvertical wells regardless of phase mixing or recirculation
- More accurate flow measurements than possible with conventional logging tools in highly deviated and horizontal wells
- Three-phase flow rates computed in real time using dedicated algorithms

## Features

- All sensor measurements simultaneous
- Direct, localized measurements of phase velocities and calculation of a multiphase velocity profile
- Full three-phase holdup answer
- Scanning sensors across the vertical axis for more accurate detection of phase interfaces
- Measurement of mixed and segregated flow regimes
- Independent measurement of gas velocity in multiphase horizontal wells
- Detection of heavy phase recirculation downhole
- Software optimization and real-time display of data from all sensors
- Caliper and relative-bearing measurements for continuous sensor location

## Introduction

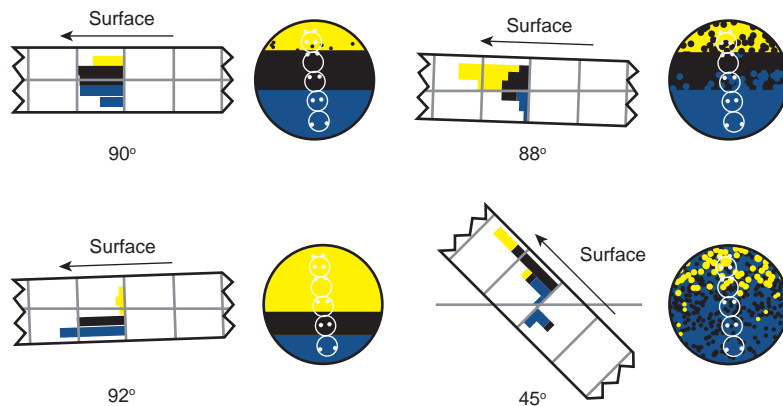
The FIS can identify fluid and gas entries multiphase in horizontal well or liquid in gas well, and it can scan fluid and get imaging flow characteristic. And it is a radioactive source free system.

The FIS has a small outside diameter of 1.77 in. (45 mm), and it can be run in holes ranging from 2 in. to 6.5 in. (50.8 to 165.1 mm) using coiled tubing, wireline, or downhole tractor. The system operates in temperatures to 300°F (150°C) and at pressures to 15,000 psi (103 MPa).

The FIS has three section parts. Each part can be run individually or in combination.

## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Outside Diameter	1.77 in. (45 mm)
Hole Size	2.0 in. to 6.5 in. (50.8 mm to 165.1 mm)
Sensor Type & Number	
Resistance	6
Capacitance	6
Flow Meter	5
Fluid Density	3
Optical Fiber	6
Inclination	1 each tool
Borehole Coverage	90% in 6 in. ID
Three-phase Holdup Accuracy	±10%
Velocity Accuracy	±10%



Real-time flow rate and phase distribution data are continuously optimized and displayed on the FIS monitor.



## Applications

- Phase & Fluid identification in horizontal & highly deviated wells
- Injection Flow Measurement
- Plotting of phase composition, fluid velocity and direction along the wellbore
- Calculation of the percentage of each phase present.
- Identification of water entry areas.
- Changes of wellbore fluids with time or different production rates.
- Real-Time Mode or Memory Mode

## Introduction

The tool has an array of specially developed resistance sensors and flowmeter sensors, mounted on the inside of a set of front arms. Each resistance and flowmeter sensor detects the apparent resistance and flowmeter of the fluid at a specific point across the area of the pipe so that the time variation of the characteristics can be monitored.

## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	5 ft.-3 in. (1.6 m)
Weight	16.54 lbs. (7.5 kg)
Tool Diameter	1.77 in. (45 mm)
Minimum Hole Diameter	2.0 in. (50.8 mm)
Maximum Hole Diameter	6.5 in. (165.1 mm)
Measure Point	24 in. ( 0.61 m)
	(from the bottom of the tool)
Maximum Logging Speed	30 ft./min (9 m/min)
Resistance Measurement Range	0.2-40,000 ohm•m
Resistance Measurement Accuracy	±5%
Relative Bearing Accuracy	±3°
Threshold	12 ft./min
Maximum Fluid Velocity	3000 ft./min
Output	10 pulses/rev
Number of Sensors	11 (6 resistance sensors + 5 flowmeter sensors)
End Threads (top/bottom)	1.5-12 SA
End Connectors	
Upper	10-Conductor female socket
Lower	10-Conductor male pin
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	100 mA @ 18 Vdc





## Applications

- Phase identification in horizontal & highly deviated wells
- Calculation of the percentage of each phase present
- Plotting of phase composition along the wellbore
- Identification of water entry areas.
- Changes of wellbore fluids with time or different production rates.
- Multi-phase flow profiling.
- Fluid Identification.
- Gas Entry Detection.
- Real-Time Mode or Memory Mode

## Introduction

The tool has an array of specially developed miniature capacitance sensors and optical fiber sensors, mounted on the inside of a set of front arms. The sensors provide a reliable full bore measurement of gas volume fraction, independent of flow regime or well deviation. The tool response is representative of the entire cross section of the well-bore within the casing and is almost completely independent of salinity, water hold-up, oil/water densities and material outside the casing.

## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	5 ft.-3 in. (1.6 m)
Weight	27.5 lbs. (12.5 kg)
Tool Diameter	1.77 in. (45 mm)
Minimum Hole Diameter	2.0 in. (50.8 mm)
Maximum Hole Diameter	6.5 in. (165.1 mm)
Measure Point	24.9 in. ( 0.63 m) (from the bottom of the tool)
Maximum Logging Speed	30 ft./min (9 m/min)
Water Holdup	
Measurement Range	0-100% (0-40% of the best working range.)
Measurement Accuracy	± 2% (water holdup rate < 40%) ± 10% (water holdup rate 40%-100%)
Relative Bearing Accuracy	5°
Relative Bearing Range	>5°/175° From vertical
Gas Hold-up	
Measurement Range	0-100% gas hold-up within 2-6.5 in. pipe internal diameter
Measurement Accuracy	±3%
Resolution	1%
Number of Sensors	12 (6 capacitance sensors + 6 optical fiber sensors)
End Threads (top/bottom)	1.5-12 SA
End Connectors	
Upper	10-Conductor female socket
Lower	10-Conductor male pin
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	49 mA @ 18 Vdc





## Applications

- Production profiling
- Fluid Identification
- Horizontal and highly deviated wells
- High fluid flow rates
- Real-Time Mode or Memory Mode

## Introduction

The purpose of the FIS-FD is to measure the fluid density of a sample as it flows through the tool. The average density of this volume is measured whether the fluid is flowing or is static.

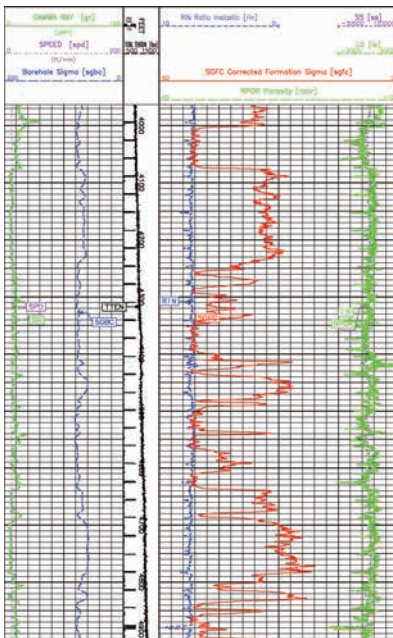
## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103.4 MPa)
Make-Up Length	5 ft.-3 in. (1.6 m)
Weight	18 lbs. (8.25 kg)
Tool Diameter	1.77 in. (45 mm)
Minimum Hole Diameter	2.0 in. (50.8 mm)
Maximum Hole Diameter	6.5 in. (165.1 mm)
Measure Point	21.7 in. ( 0.55 m) (from the bottom of the tool)
Maximum Logging Speed	30 ft./min (9 m/min)
Sensor Details	
Density	
Measurement Range	0 g/cc-1.25 g/cc (1-50 cp)
Measurement Accuracy	±0.03 g/cm <sup>3</sup>
Resolution	0.01 g /cm <sup>3</sup>
Viscosity	
Measurement Range	1.0-50 cp
Measurement Accuracy	±0.5 cp
Resolution	0.1 cp
End Threads (top/bottom)	1.5-12 SA
End Connectors	
Upper	10-Conductor female socket
Lower	10-Conductor male pin
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	40 mA @ 18 Vdc



## Applications

- Oil, gas, water interface monitoring, to determine the movement pattern of oil-water interface, improve oil recovery.
- Calculate the remaining oil saturation, analyze the use of production wells reservoir, to determine remaining oil distribution. In the latter part of oil field development, oil evaluation can be more effective.
- Single well residual oil saturation defined by RMT can be combined with the injection profile, it can be used to provide reservoir, adjusting the oil field development program
- Real-Time Mode or Memory Mode



## Introduction

The RMT is a slimhole, multi-detector, pulsed-neutron reservoir monitoring instrument. The following modes of operation are available:

- Pulsed Neutron Capture (PNC)
- C/O mode
- Pulsed Neutron Holdup Indicator (PNHI)
- Hydrolog mode

## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-Up Length	
RMT-EA (Electronics Ass.)	4 ft.- 5.74 in. (1.37 m)
RMT-FA (High Voltage Control Ass.)	4 ft.- 8.32 in. (1.43 m)
RMT-PA (Neutron Generator & Detector)	9 ft.- 4.82 in. (2.87 m)
RMT-TT (Telemetry)	4 ft.- 9.09 in. (1.45 m)
RMT-PS (Power Supply)	3 ft.- 8.88 in. (1.14 m)
RMT-GR (Gamma Ray)	3 ft.- 1.40 in. (0.95 m)
Shipping Length	
RMT-EA (Electronics Ass.)	5 ft.- 3.56 in. (1.61 m)
RMT-FA (High Voltage Control Ass.)	5 ft.- 1.67 in. (1.57 m)
RMT-PA (Neutron Generator & Detector)	9 ft.- 8.32 in. (2.95 m)
RMT-TT (Telemetry)	5 ft.- 6.54 in. (1.69 m)
RMT-PS (Power Supply)	4 ft.- 2.39 in. (1.28 m)
RMT-GR (Gamma Ray)	4 ft.- 3.18 in. (1.3 m)
Weight	133 lbs. (60.5 kg)
Measure Point (From bottom of RMT-FA)	
Source	8 ft. - 11.75 in. (2.74 m)
Short Space	10 ft. - 1.07 in. (3.08 m)
Long Space	10 ft. - 10.61 in. (3.32 m)
Extra Long Space	12 ft. - 11.46 in. (3.95 m)
Combination	Telemetry Tool/Power Supply/ Gamma Ray/RMT
Tool Diameter	1.70 in. (43 mm)
Minimum Hole Diameter	1.90 in. (48 mm)
Mechanical Systems	Winch capable of smooth low speed operation (2 ft./min) for C/O logging
Hole Deviation	0° to 100°
Bend Radius	30° in. 100 ft.
Maximum Tensile Force	22,000 lbs. (9979 kg)
Maximum Compressive Force	570 lbs. (258.6 kg) buckling unsupported
Power Requirements & Current	150 Vdc @ 350 mA
Neutron Pulse Generator Neutron tube voltage	100 kV Energy: 14 MeV

Gamma  
Ray  
Detector

Extra  
Long-Spaced  
Detector

Long-Spaced  
Detector

Short-Spaced  
Detector

Neutron  
Source



## Applications

- Phase identification in horizontal & highly deviated wells
- Calculation of the percentage of gas holdup volume
- Plotting of phase composition along the wellbore
- Changes of wellbore fluids with time or different production rates.
- Bubble point determination
- Multi-phase flow profiling.
- Fluid Identification.
- Gas entry detection.
- Production Flow Measurement
- Indication of Flow Pattern Changes

## Benefits

- Annular array overlay
- Identify the gas volume layout between layers

## Feature

- 3-6 optical sensors

## Introduction

OGH has an array of specially developed miniature 3-6 optical sensors, spirally mounted on the surface of the instrument. The sensors provide a reliable wellbore measurement of gas volume fraction. The tool response is almost completely independent of salinity water hold-up oil/water densities and material of tubing and casing.

Jewelled-bearing Continuous Flowmeter is combined with OGH, it works in high fluid velocity wells, such as gas wells. The spinner can also be used wheresome sand production occurs. This flowmeter performs in all well orientations from vertical to horizontal, and gives the lowest possible threshold.

## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	10,000 psi (68.9 MPa)
	15,000 psi (103 MPa) (Optional)
Tool Weight	25.4 lbs. (11.5 kg)
Make-up Length	3.24 ft. (98.7 cm)
Tool Diameter	1.77 in. (45 mm)
Minimum Hole Diameter	2 in. (50.8 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Gas Holdup	
Measurement Range	0-100%
Measurement Accuracy	±3%
Resolution	1%
Number of Sensors	3-6 Optical Sensors
Measure Point	2 in. (51 mm) (From Bottom of tool)
Maximum Flow Speed	2,000 ft./minute
Minimum Flow Speed	8.5-15.5 ft./minute
End Threads (Top)	1.5-12 Stub Acme Male
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	40 mA @ 18 Vdc





## Applications

- Identify the sources of sand production
- Understand sand production dynamics
- Better reservoir management decisions by eliminating sand production problem
- Improve well performance and extend productive life

## Features

- Record in memory way

## Introduction

USD is designed for diagnostic studies of wells. Autonomous memory instrument is equipped with a highly sensitive ultra sound sensor. The sand coming out of the formation generates noise at ultrasonic frequencies. The device counts the number of sand particles. The device counts the number of sand particles by calculating the frequency and amplitude response of the ultrasound signal. It deletes the noise of leakage of liquid and gas. Delete all sounds caused by mechanical shocks. The tool for the qualitative analysis of the sand and can delete background noise caused by liquid or gas leaks and mechanical shock of the moving tool.



## Specifications

Maximum Temperature	302°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Tool Diameter	1.69 in. (43 mm)
Length	2.6 ft. (0.8 m)
Weight	8.8 lbs. (4.0 kg)
Maximum Logging Speed	30 ft./min (9 m/min)
Sensor Dynamic Range	90 dB
Sensor Operating Freq Range	< 300 kHz
Sensor Operation Mode	Stationary / Continuous
Sensor Nb Spectral Channels	1024 (512 + 512)
Memory	
Capacity	8 GB
Sampling	0.5 to 255 sec
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

## 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)



## Applications

- Measure tension up to 1200 kg and compression up to 400 kg

## Introduction

Head Tension Sub (HTS) detects longitudinal force in the tool string that may be either tensile or compressive. The HTS is run below the controller PTS and measures tension up to 1200 kg and compression up to 400 kg. When either using coiled tubing or during tractor operations, the ability to measure compression can help to avoid tool string damage. This function is most useful when an obstruction is encountered. The HTS can be used in both wireline and memory operation, dependant on the system controller (e.g. PTS). Power for the tool is also supplied by the system controller. The HTS can be used at any position in the tool string. It is situated in the tool string below the Controller, PTS is intended to be placed as high up as possible.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103.4 MPa)
Shipping Length	2 ft.-0.6 in. (625 mm)
Make-up Length	1 ft.-11.2 in. (589 mm)
Weight	11.6 lbs (5.26 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Sensor Measure Point	14.1 in. (358 mm)
Resolution	1.0 lb (0.45 kg)
Accuracy	±15 lb (6.6 kg)
End Threads (top/bottom)	1-3/16 in. 12 UN-2A (female/male)
Using Nominal Scale	-400 kg (compression) to +1200 kg (tension)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	19 mA (typical) @ 18 Vdc



## 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



## 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



## Applications

- Pressure Transient Analysis
- Downhole Pressure Gradient Measurement

## Introduction

Quartz Pressure Tool consist the electronics interfaces and two sensors. There is a sensor of precision quartz crystal pressure transducer and Gauge temperature.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.-7.01 in. (0.48 m)
Measure Point	2.9 in. (74 mm) above lower tool joint
Maximum Logging Speed	30 ft./min (9 m/min)
Weight	8.8 lbs. (4.0 kg)
Tool Diameter	1.69 in. (43 mm)
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
Sensor	Quartsdyne
Pressure Performance	
Pressure	16,000 psi (110.3 MPa)
Pressure Range	0 to 16,000 psi (0 to 110.3 MPa)
Accuracy	0.02 % FS
Temperature Performance	
Temperature	350°F (177°C)
Accuracy	0.9°F (0.5°C)



## 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



## 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)







## Applications

- Fluid Identification
- Multiphase production profiling

## Introduction

The purpose of the TFD is to measure fluid density of a sample as it flows through the tool. The average density of this volume is measured whether the fluid is flowing or static.

## Specifications

Maximum Temperature	350°F (177°C)
Normal Operating Temperature	302°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.- 8.55 in. (0.52 m)
Shipping Length	2 ft.- 0.3 in. (0.62 m)
	Including the thread protectors
Measure Point	3.0 in. (76.2 mm) From the lower joint
Weight	7.81 lbs. (3.54 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Outside Diameter	1-11/16 in. (42.86 mm)
Range of Density Measurement	0.0 g/cc to 1.25 g/cc
	On the viscosity range of 1 cSt to 150 cSt
Accuracy/Repeatability	±0.03 g/cc
Resolution	0.01 g/cc
Range of Viscosity Measurement	1 cSt to 100 cSt
Accuracy/Repeatability	±1 cSt
Response Time	<1 seconds
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	35 mA @18 Vdc (Typical)





## Applications

- Multi-phase Production Profiling
- Water Holdup Calculations

## Introduction

Water Hold-up Tool-Capacitance (WHT-C) measures the water volume fraction in fluid mixtures flowing in the borehole. The tool is essentially an annular capacitor with the central probe and external cage acting as the capacitor plates. The capacitance measured depends on the dielectric constant and the distribution of the fluids between the electrodes.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Length	2 ft.-2.2 in. ( 0.67 m)
Measure Point	8.6 in. (0.22 m) (Measure point above lower tool joint)
Weight	9.92 lbs. (4.5 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Resolution	0.1% External limitation (PLM, 1 sec acquisition)
Accuracy	±1% (Yw < 40%)
Range (Yw-Water fraction)	0-100% (0-40% best operating range)
Acquisition Time	1 sec typical (External limitation)
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	16-17 mA @ 18 Vdc





## Applications

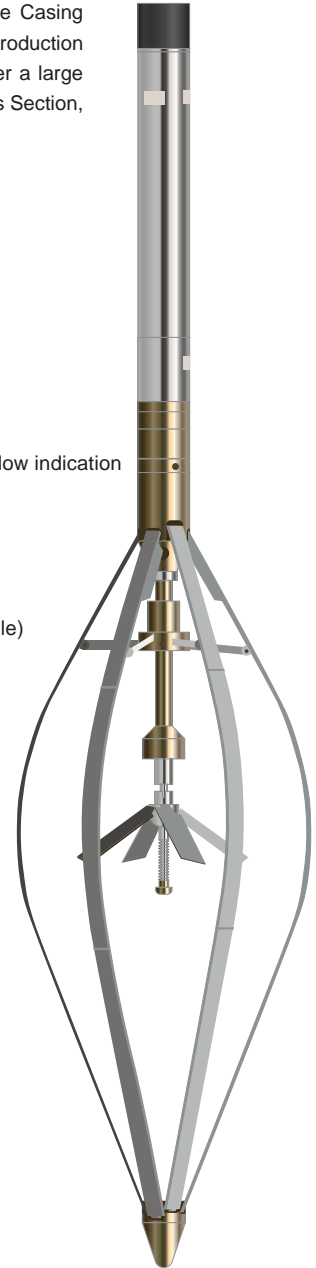
- Fullbore Casing Production Flow Measurement
- Injection Flow Measurement

## Introduction

Full Bore Flowmeter-Caged (FBF-C) is usually used in fullbore Casing Production and Low Flow Rates. It is used at the bottom of the Production Logging toolstring, providing accurate flow data information over a large cross section of the casing. It comprise of three units: Electronics Section, Sensor Section and Spinner Section.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	3 ft.-3.76 in. (1.01 m)
Shipping Length	3 ft.-4.94 in. (1.04 m)
Weight	12.5 lbs. (5.7 kg)
Tool Diameter	1.69 in. (43 mm)
Output	10 pulses/revolution with flow indication
Measure Point	1 ft.-3.75 in. (349 mm)
Minimum Hole Diameter	4.5 in. (114 mm)
Maximum Hole Diameter	9.625 in. (245 mm)
Apparent Threshold	1.7 ft./min (0.52 m/min)
End Threads (top)	1-3/16 in. 12 UN-2A (female)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	10 mA @ 18 Vdc





## Applications

- Production Flow Measurement
- Indication of Flow Pattern Changes

## Introduction

Jewelled-bearing Continuous Flowmeter (JCF) works in high fluid velocity wells, such as gas wells. The JCF spinner can also be used where some sand production occurs. This flowmeter performs in all well orientations from vertical to horizontal, and gives the lowest possible threshold.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.-2.21 in. (0.361 m)
Shipping Length	1 ft.-4.77 in. (0.416 m)
Measure Point	2 in. (51 mm) (From Bottom of tool)
Weight	11 lbs. (4.99 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Apparent Threshold	1.5 ft./mintue
End Threads (top)	1-3/16 in. 12 UN-2A (female)
Power Requirements	
Nominal	+18 Vdc
Range	+13 to +23 Vdc
Absolute Max	+24 Vdc
Current Consumption	16 mA @ 18 Vdc



## Applications

- Tube leak detection
- Back-up spinner in horizontal wells

## Introduction

Spinner In-line Flowmeter (SIF) is a short flowmeter with an electrical through connection. When run in combination with a fullbore flowmeter, the SIF allows for production profiling in tubing and casing within one logging run.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.-5.3 in. (0.44 m)
Shipping Length	1 ft.-9.1 in. (0.54 m)
Weight	10.8 lbs. (4.9 kg)
Tool Diameter	1.69 in. (43 mm)
Measure Point	4.3 in. (109.2 mm)
Minimum Tubing diameter	1/8 in. greater than tool OD
Output	10 pulses/revolution with flow indication
Materials	Corrosion resistant throughout
Apparent Threshold	12 ft./min
Maximum Fluid Velocity	>3,000 ft./min
Maximum Working Pull	5,600 lbs.
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	10 mA @ 18 Vdc



## Applications

- Measure borehole geometry

## Introduction

Four-Arms Dual Caliper (FDC) is run centralized in the production logging tool string. And it is also a Dual X-Y Caliper tool, the Caliper arm mechanisms set at 90 degrees to each other to measure diameter in the X-Y axes.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Length	3 ft.-1.5 in. ( 0.95 m)
Weight	31.97 lbs. (14.5 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Measure Point	
Lower arms (Y)	6.75-8.25 in. (0.17-0.21 m) closed-open
Top arms (X)	9.75-11.25 in. (0.25-0.29 m) closed-open
Caliper Measure Range	2 in.-9 in. (50.8-228.6 mm) diameter
Caliper Accuracy	0.1 in. (2.54 mm)
Resolution	0.015 in.
Accuracy	0.1 in. (Up to 150°C)
	0.2 in. (Above 150°C)
	0.3 in. (Above 165°C)
Acquisition Time	1 sec (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	24 mA (typical) @ 18 Vdc





## Applications

- Memory logging run on slick line or coiled tubing

## Introduction

Production Logging Memory (PLM) can be run on slickline or coiled tubing to acquire and store data from borehole logging tools and Inspection tools. A Memory section is programmed and downloaded using a PC. Once powered by a high capacity Lithium battery within a separate MBS, data is acquired and stored in accordance with a user defined 'profile'. This controls the sensors logged, the sampling rates and the profile scheduling.

## Specifications

Maximum Temperature	350°F (177°C)
Maximum Pressure	15,000 psi (103 MPa)
Length	2 ft.- 6 in. ( 0.76 m)
Weight	11 lbs. (5 kg)
Tool Diameter	1.69 in. (43 mm)
Maximum Logging Speed	30 ft./min (9 m/min)
Memory Capacity	128 MBytes
Sampling Interval	From 0.1 seconds to several days.
Power Requirements	18 Vdc (Nominal)
Current Consumption	25 mA @ 18 Vdc



## Applications

- Memory logging run on slick line

## Introduction

Memory Battery Sub (MBS) houses a motor battery pack used for example with the Memory Production Logging tool string. The battery pack fitted contains 5 high current 'C' cells.

## Specifications

Maximum Temperature	300°F (150°C)
Maximum Pressure	15,000 psi (103 MPa)
Make-up Length	1 ft.- 4.6 in. ( 0.42 m)
Weight	8 lbs. (3.6 kg)
Tool Diameter	1.69 in. (43 mm)
Wireline Requirements	Slick Line
Battery Pack Type	Lithium Chloride
	Batteries are not supplied as part of the MBS; order batteries separately
End Threads	
Top	15/16 10 UN
Bottom	1-3/16-12 UN





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## Introduction

CHM is a single conductor cablehead. The design incorporates a soft brass tapered cone which fits inside a tapered rope socket, the wireline armor strands being trapped in between them.

## Specifications

Maximum Temperature	350°F(175°C)
Maximum Pressure	15,000 psi (103.4 MPa)
Tool Diameter	1.5 in. (38 mm)
Make-up Length	10.0 in. (25.3 cm)
Shipping Length	15.3 in. (38.9 cm)
Weight	6.6 lbs. (3 kg)
Isolation	>500 Mohms (25°C) >200 Mohms (175°C)
Wireline Requirement	Mono Conductor
Bottom Thread	1-3/16-12 UN
Weak Point	Adjustable (Based on the number of wireline steel wires)
Maximum Tensile Force	33,000 lbs.





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

**Geo-Vista**

## Applications

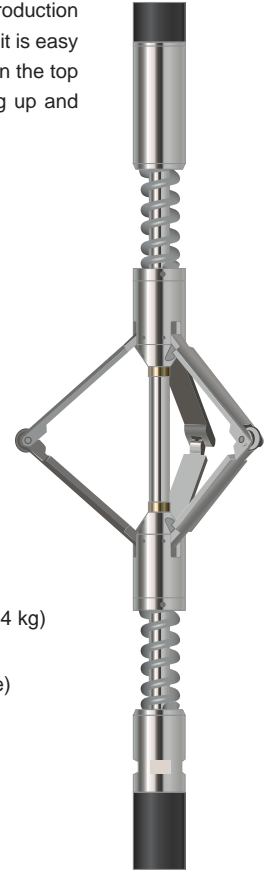
- Centralize the downhole tools

## 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)





## 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

## Applications

- Power supply to Downhole Tools
- Program and download data from memory tools

## Introduction

Memory Control Panel (MCP) is designed to operate on surface. It program and download data from memory tools as PLM. It can also supply power to downhole tools to replace the battery.

## Specifications

Height	1.65 in. (0.042 m)
Depth	6.2 in. (0.157 m)
Width	9.0 in. (0.229 m)
Weight	2.5 lbs. (1.13 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	18 Vdc (Nominal) 13 Vdc-23 Vdc (Range)
Maximum Output Current	2.5 A
Polarity	Positive
Connect to PC	USB

## Applications

- Display depth and tension
- Record depth and tension
- Record other analogue data input
- Data download to PC

## Introduction

Depth Time Panel (DTP) is designed to record data about depth, tension and other information on surface. It usually works with memory equipment like MCP. After a log, the information can be downloaded and the data would be processed with logging data from downhole tools.

## Specifications

Height	3.92 in. (0.099 m)
Depth	7.6 in. (0.193 m)
Width	9.45 in. (0.24 m)
Weight	11.68 lbs. (5.3 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	12 Vdc / 110 Vac / 220 Vac / 4*D type cells
Connect to PC	USB



## Applications

- Highly deviated wells
- H<sub>2</sub>S and CO<sub>2</sub> resistance conditions
- Wireline powered interventions
- Perforating operations
- Production logging, analysis behind casing, and cement and corrosion evaluation
- High-temperature wells

## Benefits

- Efficiency gains from high-speed, maneuverable, bidirectional, intelligently controlled tractoring
- Reduced risk for tubing reentry and sticking with enhanced navigation of independently controlled drive sections and reverse tractoring capability in complex completion profiles
- Real-time informed decision making enabled by logging while tractoring
- Operational time saving via modular configurability to address well and surface complexities
- Access to hostile condition wells

## Features

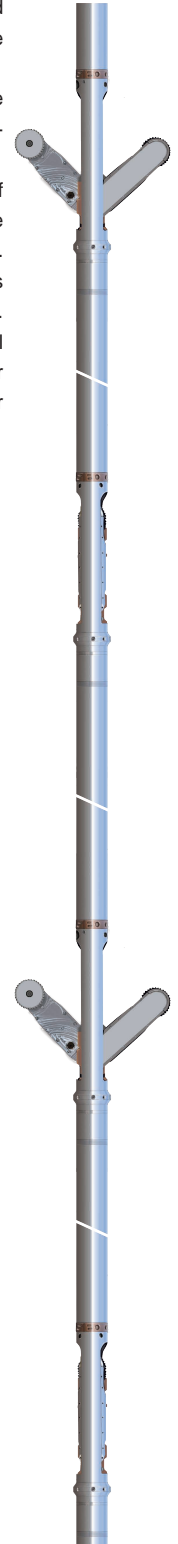
- Twice as fast as comparable conventional tractors
- H<sub>2</sub>S and CO<sub>2</sub> resistance service qualified
- High Pressure and High Temperature rated
- Bi-directional logging while tractoring
- Versatile individual drive opening and closing operations
- Debris tolerant
- Explosive services shock resistant
  - Fully combinable with
    - Production logging tools
    - Perforating gun systems
    - Powered intervention services
- Gamma ray and optional active CCL while tractoring for any application

## Introduction

Slimhole Downhole Hydraulic Tractor (DHT-S) is a 2-1/8 in. diameter and bi-directional high speed tractor provides large pull and push forces that are precisely controlled and monitored.

Navigation is guided by data reported in real-time from downhole sensors. The engineer operates each drive section-comprising a set of two wheels-independently in both directions.

Active traction control is built inside the DHT-S, providing continuous control of the radial force applied by the tractor arms. When slippage is detected by the downhole sensors, the radial force can be increased to increase the traction. Once the difficult section of the well is successfully traversed, the radial force is decreased to extend the lifetime of the wheels and other drive components. Because the tractor incorporates an opening cam system design, the radial force that the arms apply is independent of the wellbore size. This means that for their slim diameter, DHT-S can achieve the same tractoring force in well inner diameters up to 9.5 in. to support a large range operating of hole size.



## Specifications

Maximum Temperature	350°F (175°C)
Maximum Pressure	20,000 psi (138 MPa)
Outside diameter*	2-1/8 in. (54 mm)
Hole Size	2.2 in. (55.9 mm) to 9.5 in. (241.3 mm)
Minimum Length*	
(two drive sections)	22.31 ft. (6.8 m)
Weight* (two drive sections)	176.37 lbs. (80 kg)
Output	Optional Gamma Ray and CCL Logging while tractoring
Drive Section Operation	Up and down directions Independent opening and closing
Wireline Requirements	Mono-conductor 7-conductor
Maximum Continuous Load	Each drive section: 264.6 lbs. (120 kg) Up to 8 drive sections
Creeping Speed	60 ft./min (18 m/min)
Operating Voltage	600 Vdc
Operating Current	0.7 A (Each drive section)
Maximum Tension Force	25,000 lbf. (111,000 N)
Maximum Compression Force	20,000 lbf. (89,000 N)
Special Applications	NACE MR0175 compliant for H <sub>2</sub> S and CO <sub>2</sub> resistance API RP-67 compliant for explosives operations Cased hole completions

\* Configuration dependent



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