Pioneer Petrotech Services Inc.

Proudly Canadian

PPS71 Geothermal Tools

www.pioneerps.com

PPS71 Geothermal Tools

PPS71 Geothermal Tools are designed for extreme, high temperature downhole conditions. The robust electronics combined with vacuum flask technology allow these products to perform at 350 °C (662 °F) continuously, for four hours.

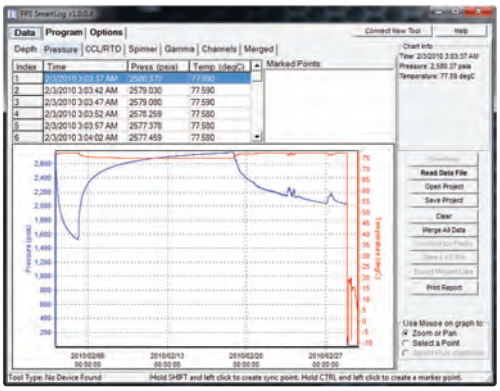
The tool measures pressure, temperature, casing collar location, flow profile (optional) and gamma ray (optional), when configured as either a memory tool or surface read out tool.

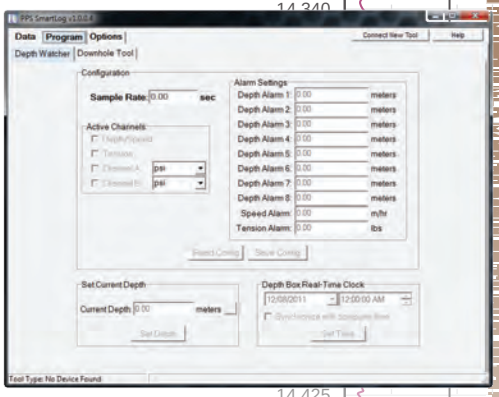
By combining the downhole measurements with a depth recorder, such as the PPS36 DepthWatcher, customers have the capability to create synchronized profile logs. Additionally the temperature and pressure profiles created in SmartLog, PPS's proprietary software, can be opened in any commercial logging software.

For more information on the PPS71 Tools, and to discover the best configuration of this tool for specific applications, please contact PPS.

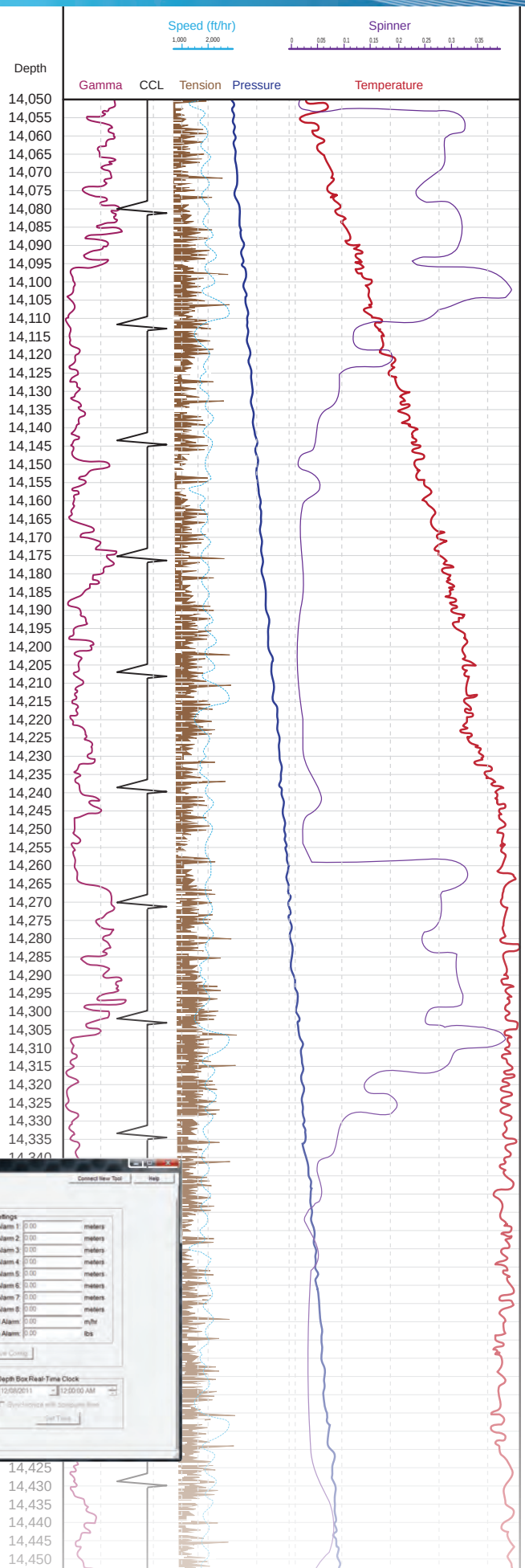
Tool Applications

- Steam Injection Profile Logging
- Geothermal Well Test
- Real-time Pressure Build-Up Tests
- Real-time Pressure and Temperature Gradients
- Tubing and Casing Leak Detection
- Fluid Production/Injection Profiles





PPS71 SmartLog Software



Components:

1. Casing Collar Locator
2. Gamma Ray Detector
3. Fast Response RTD Sensor
4. Pressure Sensor
5. Spinner
6. Bowspring Centralizer (Optional)
7. Flask Housing (Regular housing is also available)
8. SRO interface between the tool and the field laptop
9. SRO module
10. PPS36 DepthWatcher (Optional)

- **Real time (SRO) and memory logging capabilities**
- **Fast data transfer @10samples/sec**
- **Features robust electronics and vacuum flask technology for outstanding performance at 350°C (662°F)**
- **Creates complete profile logs when used in conjunction with PPS36 DepthWatcher**
- **Performs as an exceptional pressure and temperature tool when ordered without gamma and spinner**
- **Advanced customer support with online maintenance and software tutorials are available**
- **Can be used as regular temperature tool with regular housing (up to 177°C)**
- **Data is always saved in downhole tool as backup when running in SRO mode**
- **The tool automatically recognizes bidirectional flow**

Specifications

Pressure Measurement

Sensor Type	Silicon-Sapphire
Pressure Range	5K psi | 10K psi
Accuracy	± 0.03% FS
Resolution	0.0003% FS

Temperature Measurement

Sensor Type	RTD (Pt1000; 4-wire)
Temperature Range	300 °C (572 °F) | 350 °C (662 °F)
Accuracy	± 0.5 °C
Resolution	0.01 °C

Flow Measurement

Sensor Type	Reed switch/magnetic
Flow Rate Range	5 – 7,000 RPM
Accuracy (≥ 20 RPS)	± 0.5 revolution
Accuracy (≤ 20 RPS)	± 0.25 revolution
Resolution (≥ 20 RPS)	0.5 RPS
Resolution (≤ 20 RPS)	0.1 RPS

Gamma Measurement

Sensor Type	Crystal, NaI (scintillation type)
Sensitivity	1.0 CPS/API

Data Storage

Sampling Rate	0.1 s – 1.8 hrs/per sample
Datasets	Time / Pressure / RTD / CCL / Gamma Ray / Flow Profile (optional)
Memory Capacity	1,000,000 datasets

SRO Transmitter

Sampling Rate	0.1 s – 1.8 hrs/per sample
Communication Distance	7,000 meters

Environmental

Module Temperature Rating	177 °C (350 °F) with standard housing; or 300 °C (572 °F) OD 1.56"| 350 °C (662 °F) OD 1.75" with Flask housing
Electronics Rating	177 °C (350 °F)
Downhole Time (OD 1.75")	4 hours at 350 °C (662 °F) / 6 hours at 300 °C (572 °F) / 8 hours at 250 °C (482 °F) / 10 hours at 200 °C (392 °F) / 12 hours at 180 ºC (356 °F)
Downhole Time (OD 1.56")	4 hours at 300 °C (572 °F) / 5.5 hours at 250 °C (482 °F) / 7.5 hours at 200 °C (392 °F) / 10 hours at 180 ºC (356 °F)

PPS71 Geothermal Memory Tool

Operation Voltage	2.7 – 3.9 VDC
Battery	180 °C (356 °F) C-size Li-battery (5 A hr/3.6 V)
Power Consumption	Operation current 5 mA, Idle 3 mA
Connector	Lemo 6 pin with locker

Power supply (with Gamma)

Operation Voltage	5.5 – 7.2 VDC
Battery	165 °C (329 °F) Two C size Li-battery (5 A hr/7.2 V)
Power Consumption	Operation current 40 mA, Idle 35 mA
Connector	Lemo 4 pin with locker

Memory Tool Communication

Interface	USB
Rate	115,200 bits/s

Surface SRO Interface

Data Transmission Rate	9,600 bits per second via standard electrical cable
Data Transmission Distance	Up to 7,000 meters via standard electrical cable
Communication Port	USB 2.0 to PC
Power Input	100 - 240 VAC
Surface Unit Power Output	+60 VDC
Working Temperature	-40 °C (-40 °F) to 85 °C (185 °F)
Humidity	90%
Condensation	No
Material	Aluminum
Connectors	1 AC Power Connector, 1 DC Power Connector, 1 USB Port and 1 Gauge Interface
Dimensions–inches	7.75 (196 mm) x 4 (101 mm) x 3.25 (82 mm)
Interface	USB 2.0

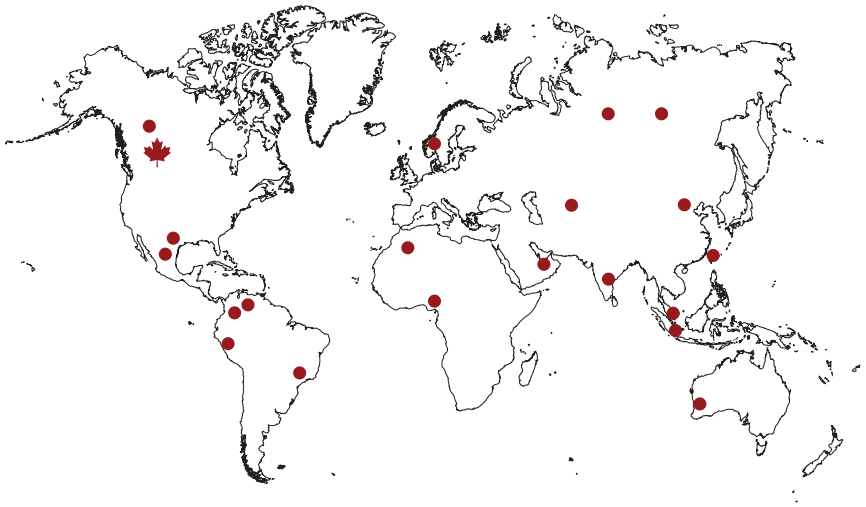
Mechanical and Materials

Service	H_2S
Outside Diameter–inches	1.56 (39 mm) | 1.75 (44 mm)
Overall Length without Gamma–inches	67 (1,702 mm)
Overall Length with Gamma–inches	82.5 (2,095 mm)
Housing Material	Inconel 718

PPS71 Specifications (Memory Rev. 01, 2015-04-02 & SRO Rev. 01, 2015-06-24)

PPS71 Geothermal SRO Tool

Smart Gauges and Simple Software



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