

# PRESSURE-TEMPERATURE TOOL

Slimhole high resolution Pressure and Temperature Tool

## OPERATING PRINCIPLE:

The pressure and temperature tool is commonly used in the oilfield, geothermal or mining wells alike. It records the temperature and pressure gradients in a well. The temperature log is interpreted by looking for anomalies or departures from the reference gradient. This reference may be the geothermal gradient, a log recorded before production started or a log recorded with the well shut-in. Most of these anomalies are related to the entry of fluids in the well or fluid exit into the formation. Since temperature is also affected by all the surrounding material, including the material outside the casing, a temperature log is sensitive both to the borehole, the formation and the casing-formation annulus. Since temperature takes time to dissipate, temperature usually gives information about the behaviour of the well over a longer period of time than other measurements.

Temperature logs are the only logs to be measured while the sensor is being lowered into the well. This is to reduce any temperature perturbation caused by the logging tool itself.

These logs have many applications such as identifying which zones are producing and which are taking fluid. They are also commonly used to evaluate a cement or fracturing treatment, and locate the lost circulation zones and casing leaks.

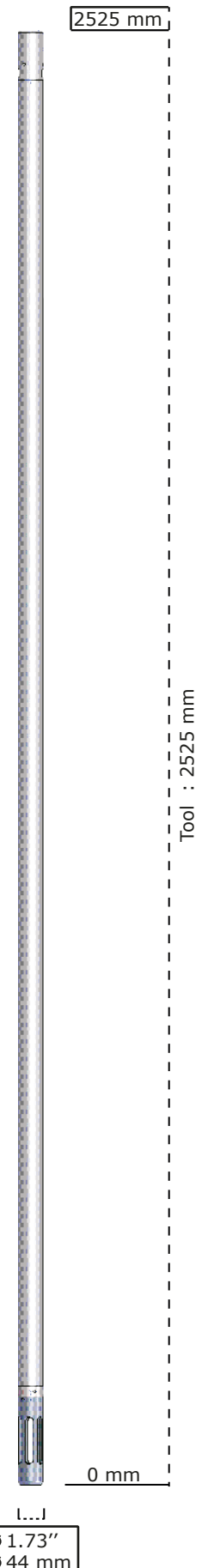
Continuous temperature logs can observe intervals of raised (or lowered) temperature caused by the influx of hotter (or colder) fluids into the borehole through the rock matrix, or more usually, through patent fractures. This effect may also be due to cold drilling fluid escaping into the rock. Continuous logs also note the presence of overpressured zones, where the hot overpressured fluids escape into the borehole and can be detected by a rise in the measured temperature.

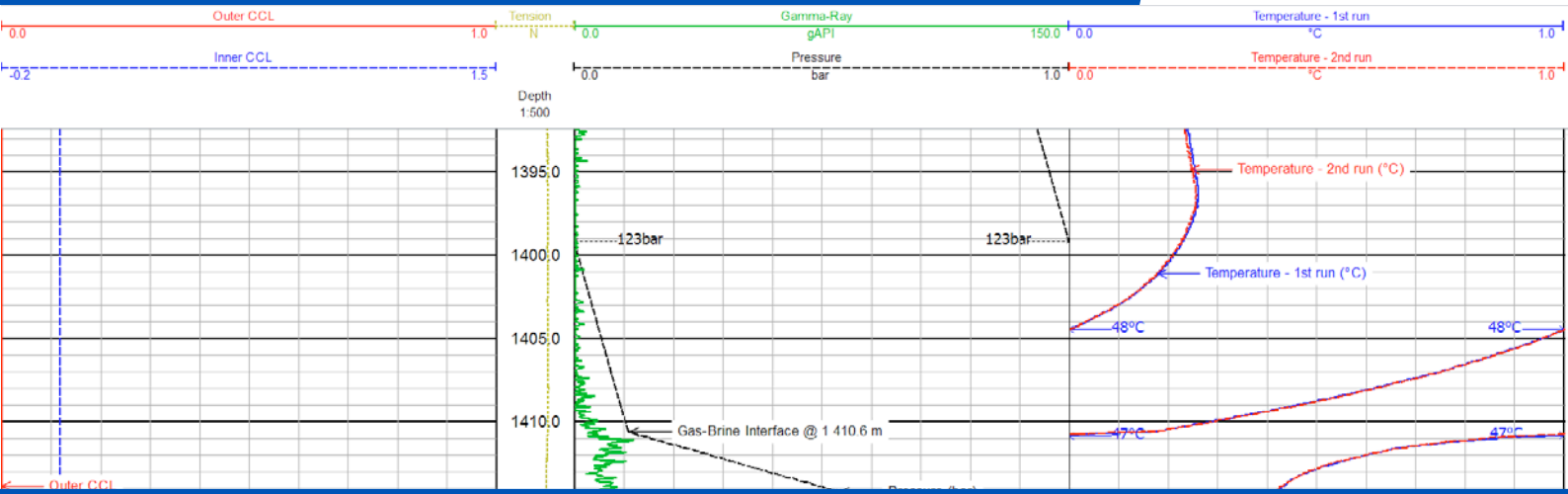
## APPL ICAT IONS

- / Geothermal wells
- / Well Testing
- / Production Logging
- / Identification of producing and injection zones
- / Cement/Hydraulic fracture treatment evaluation
- / Locate lost circulation zones
- / Detection of Fluid movement, Leakage, channelling
- / Structural / Stratigraphic faults detection
- / Geochemical modelling of formations
- / Maturity of hydrocarbons

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- / Well integrity verification
- / Real-time, fast results
- / Continuous or instantaneous logging
- / Fluid movement identification
- / Leakage/channelling identification
- / Smart-cost logging





## SPECIFICATIONS:

### Technical Specifications

|           | imperial                 | metric      |
|-----------|--------------------------|-------------|
| Max OD    | 1" 11/16                 | 43 mm       |
| Length    | length: 99.4"            | 2 525 mm    |
|           | Transport length: 100.6" | 2 554 mm    |
| Weight    | 28 lbs                   | 13 kg       |
| Max Temp  | 185° F                   | 85° C       |
| Max Press | 3 000/10 000psi          | 200/700 bar |

### Logging Parameters

|                   |  |                                     |
|-------------------|--|-------------------------------------|
| Borehole diameter | 2.95"-11.81"                           | 75 - 300 mm                         |
|                   | 4800 ft/hr @ 6 samples/ft              | 25 m/min @ 20 samples/m             |
| Logging Speed     | 2000 ft/hr @ 3 samples/ft <sup>1</sup> | 10m/min @ 10 samples/m <sup>1</sup> |

<sup>1</sup> Logging speed determines the pressure system accuracy. For the highest possible accuracy, do not exceed 3m/min @ 10 samples/m (10 ft/min @ 3 samples/ft)

|                    |                     |
|--------------------|---------------------|
| Data Transmission  | Digital             |
| Cable requirements | Mono, 4-conductors  |
| Max Cable length   | 6500 ft             |
| Cable Head Voltage | 120-160 V, 30-40 mA |

### Measuring Parameters

|                   |  |
|-------------------|--|
| DSCL              | Dual String Collar Locator<br>Range: 2 strings of casing, cemented shoe of 3rd casing<br>Vertical Resolution : 300mm |
| Natural Gamma Ray | 1" x 4" NaI (Ti) scintillation crystal<br>Range: 0- 3000 GAPI<br>Accuracy +/- 5% of measured values <sup>2</sup>     |

<sup>2</sup> Gamma Ray measurements are radioactive measurements and hence subject to statistical variations. These variations depend inter alia on logging speed and filter strength.

| Pressure              | Quartzdyne            | Temperature         | PT 1000            |
|-----------------------|-----------------------|---------------------|--------------------|
| Range                 | 0-10 000 psi          | Vertical Resolution | 2" / 50 mm         |
| Accuracy              | +/- 1.25 psi          | Range               | 0-185° F / 0-85° C |
| Resolution            | 0.004 psi             | Accuracy            | 6° F / +/- 1° C    |
| Repeatability         | 0.750 psi             | Resolution          | 0.06° F / 0.01° C  |
| Zero Drift (aging) at | 25°C, 15 psi: 3 psi/y | Repeatability       | 1.2° F / 0.2 °C    |

### Output

|                    |                   |                                |                      |                                   |
|--------------------|-------------------|--------------------------------|----------------------|-----------------------------------|
| Cable Head Voltage | Logging Speed     | Electronics Temperature        | Borehole Temperature | Differential Borehole Temperature |
| Quartz Temperature | Borehole Pressure | Differential Borehole Pressure | Gamma Ray            | DSCL (Inner CCL, Outer CCL)       |