



OPENFIELD™
TECHNOLOGY

MICRO INSTRUMENTS FOR HARSH ENVIRONMENTS

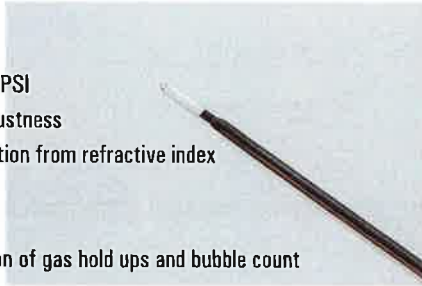
LOCAL PROBES FOR PRODUCTION LOGGING

COMPATIBLE WITH THE OPENFIELD™
FLOW ARRAY SENSING TOOL
OR THIRD PARTY TOOLS
HIGH SPEED · HIGH DETECTIVITY

FLUID IDENTIFICATION

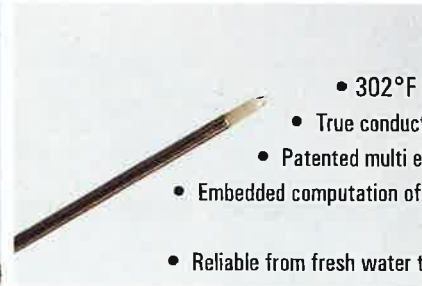
OPTICAL PROBE FOR GAS HOLD UP

- 302°F (150°C) - 15 kPSI
- Sturdy design for robustness
- Liquid/gas discrimination from refractive index
- Integrated coupler
- Dynamic thresholds
- Embedded computation of gas hold ups and bubble count



ELECTRICAL PROBE FOR WATER HOLD UP

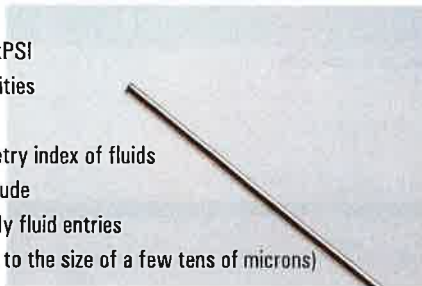
- 302°F (150°C) - 15 kPSI
- True conductivity measurement
- Patented multi electrode technology
- Embedded computation of water hold ups and bubble counts
- Reliable from fresh water to high salinity brine



FLOW RATE

MINIATURE DOPPLER TRANSDUCER

- 302°F (150°C) - 15 kPSI
- Computation of velocities from the Doppler shift
- Qualitative granulometry index of fluids from the Doppler amplitude
- Detection of very early fluid entries (detects particles down to the size of a few tens of microns)



MICRO SPINNERS

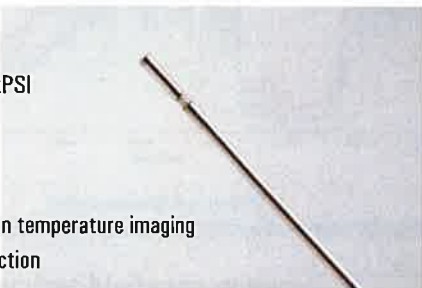
- 302°F (150°C) - 15 kPSI
- Diameter 7/16 in (11 mm)
- Fluid velocities:
Minimum velocity threshold 2 cm/s
Maximum spinning rate 10 m/s
- Smart magnetic detection



PRESSURE AND TEMPERATURE

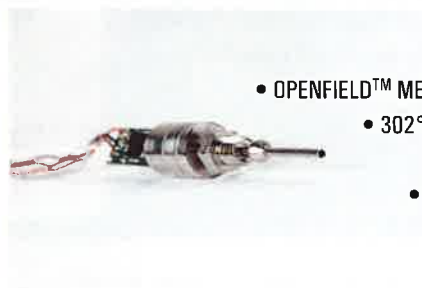
ULTRA FAST FLUID TEMPERATURE

- 302°F (150°C) - 15 kPSI
- Accuracy 0.1°C
- Resolution 0.01°C
- Data rate 16 Hz
- Enables high resolution temperature imaging
- Early fluid entry detection



PRESSURE

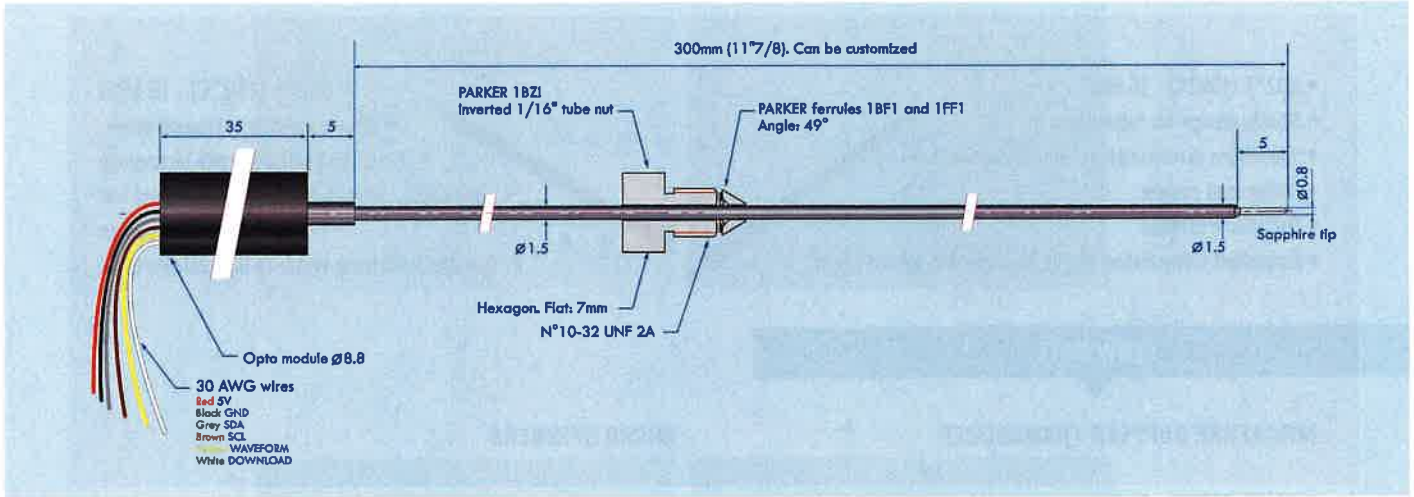
- OPENFIELD™ MEMS Pressure sensor
- 302°F (150°C) - 15 kPSI
- Accuracy 1 PSI
- Resolution 0.01 PSI
- Tube shape
- Metal-metal seal



HIGH SPEED - HIGH DETECTIVITY
LOCAL PROBES FOR PRODUCTION LOGGING
 COMPATIBLE WITH THE OPENFIELD FAST OR THIRD PARTY TOOLS

STAND-ALONE PROBES

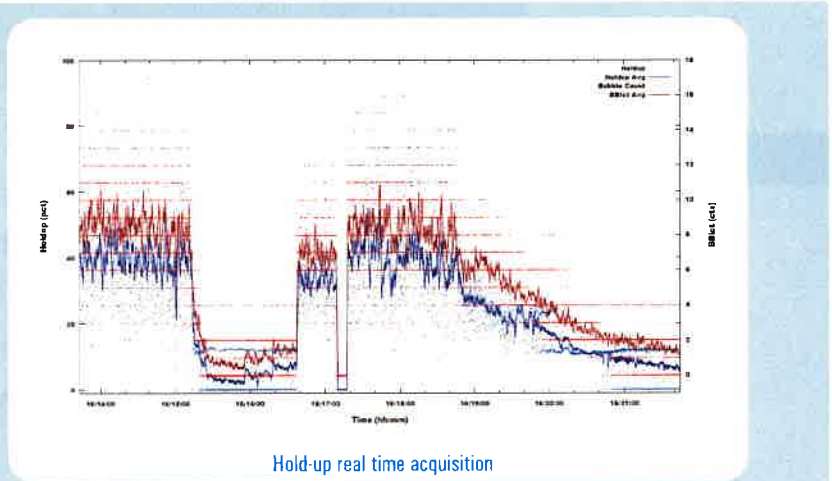
Each probe integrates its electronics module with embedded pre-processing, outputting I²C digital data, which are directly ready for flow imaging interpretation. The acquisition can be made through any master board, in memory or real time. Additionally, a dedicated analog output provides full speed waveforms for fast events analysis. Thanks to the compact size, low power consumption and smart embedded processing, the local probes offer easy integration into various tools such as array production logging tools or fluid samplers.



Typical dimensions of a local probe

HIGH RESOLUTION MEASUREMENT

The conductivity and the refractive index of the fluid in contact with the tips of the fluid identification probes are measured at high rate (1 ms) and compared to thresholds in order to discriminate fluid phases and compute bubble counts and holdups. Data are updated on the I²C bus every 62.5 ms. Average, minimum, maximum and majority values are also transmitted which can be used for finer analysis.



Hold-up real time acquisition

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