**SURFACE DATA ACQUISITION**

ETS is introducing Wireless data communication from the well head to the data cabin.

The QM 200 measures pressure and temperature and includes Replaceable 200°C memory module (part no. 101864).

---

**/Quartz “DMB”, QM 200, 1.25” OD, INCONEL 718, 200°C**

<table>
<thead>
<tr>
<th>Kit</th>
<th>Calibrated Module</th>
<th>Kit</th>
<th>Calibrated Module</th>
<th>Kit</th>
<th>Calibrated Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>150° C</td>
<td>177°C</td>
<td>200°C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pressure (ksi)</th>
<th>10</th>
<th>16</th>
<th>20</th>
<th>25*</th>
</tr>
</thead>
<tbody>
<tr>
<td>101040</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>101039</td>
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<tr>
<td>101473</td>
<td>101467</td>
<td>105057</td>
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<td>-</td>
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<tr>
<td>101467</td>
<td>101862</td>
<td>101860</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>101469</td>
<td>101863</td>
<td>101861</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>101475</td>
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</tr>
<tr>
<td>104305</td>
<td>103263</td>
<td>103975</td>
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<td>-</td>
</tr>
</tbody>
</table>

*Do not exceed maximum external pressure specifications of 20 ksi

---

**Battery Specifications:**

**/Lithium Battery Pack Description (sorted on Temperature)**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Type</th>
<th>Voltage</th>
<th>CAP (Ah)</th>
<th>Temp (°C)</th>
<th>OAL (inch)</th>
<th>Connector</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 C (Parallel)</td>
<td>3.9</td>
<td>12.4</td>
<td>150</td>
<td>6.6875</td>
<td>4 PIN</td>
<td>102122</td>
</tr>
<tr>
<td></td>
<td>for short battery barrel only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LEMO</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 CC (Parallel)</td>
<td>3.6</td>
<td>24.2</td>
<td>180</td>
<td>10.8</td>
<td>4 PIN</td>
<td>104793</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td>LEMO</td>
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</tr>
<tr>
<td>1</td>
<td>4 C (Parallel)</td>
<td>3.6</td>
<td>18</td>
<td>200</td>
<td>10.8</td>
<td>4 PIN</td>
<td>101925</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>LEMO</td>
<td></td>
</tr>
</tbody>
</table>
**General Specifications:**

<table>
<thead>
<tr>
<th><strong>Pressure</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum external pressure</td>
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<tr>
<td>Sensor type</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
<tr>
<td>Long term stability</td>
</tr>
<tr>
<td>Drift</td>
</tr>
<tr>
<td>Resolution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Temperature</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Temperature</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
<tr>
<td>Repeatability</td>
</tr>
<tr>
<td>Resolution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Power</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery type</td>
</tr>
<tr>
<td>Operating Voltage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Memory</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling interval</td>
</tr>
<tr>
<td>Capacity</td>
</tr>
<tr>
<td>Record contents</td>
</tr>
</tbody>
</table>

**Downhole Gauges:**

Eastern Testing Services has a full range of gauges for any pressure and any temperature. We carry up to 20K Psi gauges. We have gauges capable of downhole temperatures as high as 200 °C (392 °F). We use quartz gauges only, the best answer when it comes to accuracy and resolution. In addition to the usual methods of landing gauges, we can mount slim hole gauges in a gauge carrier and run them in the well on the tubing with great success. We can run gauges under a plug for Frac tests. And of course, we do the more conventional static gradients and build-up tests. All of our trucks are capable of e-mailing data from location for rush jobs, as well as the ability to generate field reports in electronic or hard copy right in the truck. Eastern Testing Services knows how important your data is. That’s why we only use the most reliable downhole gauges. We use Canada Tech gauges. We have a goal of sending out test results within 24 hours of completion of the test. Within that time, we make every effort to send you a copy of the report in pdf format, as well as in ascii file formats. The printed copy with files on disc usually follows the next day. Our reporting department is located in Islamabad, Pakistan so we can get you your results ASAP.
Base Radio Logger

Description

The Base Radio Logger is a key component of the AKS Technologies wireless monitoring systems. It communicates with remote field sensors Units using a secure, reliable, and robust communications protocol. The Base Radio easily connects to existing control systems, PCs and satellite collection systems making the integration of AKS systems with existing infrastructure simple and low cost. A unique feature of the Base Radio Logger is that data are also recorded to an internal, removable, high-capacity compact flash memory card. This provides local, independent and redundant data storage.

A single Base Radio can communicate with up to 100 remote sensors. A wide variety of these sensors are available for measuring pressure (gauge, absolute and differential), temperature, level, events, and flow.

AKS Technologies has integrated the Base Radio Logger into integrated packages for production well testing, long-term well-site monitoring and artificial lift applications providing complete monitoring solutions.

Specifications:

Integrated Application Package
- Production Well Test Package
- Well Site Monitoring Package
- Artificial Lift Optimization Package

Wireless Sensor
- Up to 100 individual wireless sensors per case logger
- Configurable "Virtual" sensors

Wired Sensor
- Direct interface to surface readout systems for permanent down-hole tool monitoring

Communications (standard)
- (2) RS-485 digital communications lines (RTU Modbus, User defined)
- (1) RS-232 serial communications line
- Serial RTU Modbus
- Satellite/Cellular Interface
- Complete, real-time web-based monitoring capability

Data Storage
- Internal Compact Flash Card (up to 2 GB) - millions of measurements
- Multiple concurrent data streams (simultaneously log data, communicate with satellite, monitor locally)

Configuration and Display
- May be configured directly using front-panel push-buttons
- Display network status.

Power Options
- 10-28VDC (0.2 amps - normal load < 60 ma)
- 120/240 VAC adapter
- Optional battery and solar panel systems
**Enclosure / Packaging**

- Baked enamel explosion-proof, weather-proof (NEMA 4x) and corrosion proof housing.
- NEMA4X enclosure with solar and satellite control - Well Site Monitoring Package

**RF Characteristics**

- Up to 3000' range to Field Units with clear line of sight; 500' to 1000' range with obstructions.
- 902 MHz - 928 MHz Frequency Hopping Spread Spectrum (FHSS), FDD certified ISM license-free band. Ultra-secure and reliable data communications protocol.

**Industrial Certification with Integral Antenna**

- Rated for industrial use FM Rated -40° F to + 185° F (-40° C to +85° C);
- CSA Rated -40° F to +104° F (-40° C to +40° C)
- FM Approved as explosion-proof (XP) for Class 1, Division 1, Groups B, C, & D, T6 @ ambient temperatures +400; T5 @ ambient temperatures +85°C; as dust ignition-proof for Class II/III, Division 1, Groups E, F, & G, T6; indoor and outdoor (Type 4X) hazardous (classified) locations.
- CSA Approved as explosion-proof (XP) for Class I, Division 1, Groups B, C, & D, T4@ ambient temperatures +40° C; as dust ignition-proof for Class II/III, Division 1, Groups E, F, & G; indoor and outdoor (Type 4X) hazardous (classified) locations.

**Remote Antenna Options**

- Available with high-gain remote antenna (2x standard range).
- NEMA 4X weather-proof housing
- Meets EN 50082-1 general immunity standard and EN 55011 compatibility emissions standard.
**Differential Pressure Gauge**

**Description**

The wireless differential pressure gauge is a key component of the AKS FieldPORT™ wireless monitoring systems. The Differential Pressure Field Unit is a complete, integrated differential pressure sensor, signal conditioner and RF transceiver with self-contained power operating in the 902 MHz to 928 MHz ISM Incense-free band.

The Differential Pressure Field Unit may be operated in anyone of four modes:

- Differential Pressure
- Orifice Flow
- Open Channel Flow
- Level

(See configuration options below)

Data from the sensor are transmitted to a Base Radio Logger for centralized monitoring and data acquisition. You may specify updates between once per second and once per minute based on how frequently the process is monitored and how often the data is transmitted.

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>WI-DP-I-1001N</td>
<td>= 100 in H2O</td>
</tr>
<tr>
<td>WI-DP-I-3001N</td>
<td>= 300 in H2O</td>
</tr>
<tr>
<td>WI-DP-I-25PSI</td>
<td>= 25 PSI</td>
</tr>
<tr>
<td>WI-DP-I-100PSI</td>
<td>= 100, -25 PSI</td>
</tr>
<tr>
<td>WI-DP-I-300PSI</td>
<td>= 300, -25 PSI</td>
</tr>
</tbody>
</table>

**Specifications:**

**Integrated Application Packages**

- Production Well Test Package
- Well Site Monitoring Package
- Artificial Lift Optimization Package

**Accuracy**

- ±0.2% of sensor URL including combined effects of linearity, hysteresis, repeatability and temperature.

**Stability**

- Less than ±0.25% of sensor URL per year at ambient temperature.
**Static Pressure Effect**

- ± 1.0% of URL pre-1000 PSI typical.

**Return from Overpressure**

- ±0.04%

**Sensitivity in Reverse Pressure Direction**

- Within 1.0% of forward direction.

**Mounting and Positioning Effect**

- ± 1.5 in H2O, correctable with position zero.

**Operating Ambient Environment**

- Operating: -40°F to + 185°F (-40°C to +85°C).
- Process: -40°F to + 250°F (-40°C to 121°C) process temperature, steady state sensor.
- Humidity limits: 0 to 95%. non-condensing.

**Power Characteristics**

- Self-contained power
- 'C' size 3.6 V lithium battery
- Up to five-year battery life (depends on sample rate and RF update rate (field replaceable))

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**RF Characteristics**

- 902 MHz - 928 MHz Frequency Hopping Spread Spectrum (FHSS) FCC certified field ISM license-free band
- Up to 3000' range from Base Radio with clear line of sight; 500' to 1000' typical range with obstructions
Wireless Pressure Gauge

Description

The wireless pressure gauge is a key component of the AKS FieldPORT™ wireless monitoring systems. There are a wide variety of pressure ranges available with more on the way. Each gauge is fully characterized over temperature providing outstanding performance at a reasonable price. Each gauge is self-powered and contains a pressure sensor, signal conditioning circuitry and an RF transceiver operating in the 902 MHz to 928 MHz ISM license-free band. Remote mount sensors and high-gain antennas are available as options for the gauge pressure units.

Data from the sensor are transmitted to a Base Radio Logger for centralized monitoring and data acquisition. You may specify updates between once per second and once per minute based on how frequently the process is monitored and how often the data is transmitted.

Gauge Pressure Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKS-GP-15</td>
<td>15 PSIG</td>
</tr>
<tr>
<td>AKS-GP-30</td>
<td>30 PSIG</td>
</tr>
<tr>
<td>AKS-GP-100</td>
<td>100 PSIG</td>
</tr>
<tr>
<td>AKS-GP-250</td>
<td>250 PSIG</td>
</tr>
<tr>
<td>AKS-GP-1000</td>
<td>1,000 PSIG</td>
</tr>
<tr>
<td>AKS-GP-5000</td>
<td>5,000 PSIG</td>
</tr>
<tr>
<td>AKS-GP-10000 Available July, 2007</td>
<td>10,000 PSIG</td>
</tr>
</tbody>
</table>

Specifications:

Integrated Application Packages
- Production Well Test Package
- Well Site Monitoring Package
- Artificial Lift Optimization Package

Accuracy
- ±0.1% of sensor URL including combined effects of linearity, hysteresis, repeatability and temperature.

Stability
- Combined zero and span stability: less than: ±0.1% of sensor URL per year at 70°F.

Operating Ambient Environment
- Operating: -40°F to + 185°F (-40°C to +85°C)
- Process: -40°F to + 250°F (-40°C to 121°C) process temperature, steady state sensor
- Humidity limits: 0 to 95%, non-condensing

Power Characteristics
- Self-contained power
- 'C' size 3.6 V lithium battery
- Up to five year battery life (depends on sample rate and RF update rate (field replaceable)

RF Characteristics
- 902 MHz - 928 MHz Frequency Hopping Spread Spectrum (FHSS) FCC certified ISM license-free band
- Up to 3000' range from Base Radio with clear line of sight; 500' to 1000' typical range with obstructions
Self-Diagnostics
- Low battery alarm—indicates the need to replace the battery (approximately one-month warning)
- Extensive self-diagnostics

Local Configuration
- Integrated LCD display with membrane switch buttons
- Configure sampling and RF parameters locally using membrane switches.
- Enhanced configuration includes 22-point fit table

Materials of Construction
- Type 316 stainless steel base and diaphragm
Wireless Temperature Gauge

Description

The wireless level gauge is a key component of the AKS FieldPORT™ wireless monitoring systems. The temperature gauge comes in both RTD and thermocouple versions. The selection of sensor type depends on the AKS Technologies package that is selected and the specific measurement required.

Each gauge is self-powered and contains a temperature sensor, signal conditioning circuitry and an RF transceiver operating in the 902 MHz to 928 MHz ISM license-free band. Remote mount sensors and high-gain antennas are available as options for the gauge pressure units. Sensor lengths may be selected and options for weld or spring-load are available.

Data from the sensor are transmitted to the Base Rad for centralized monitoring and data acquisition. You may specify updates between once per second and once per minute based on how frequently the process is monitored and how often the data is transmitted.

Temperature Gauge Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.KS-RT-bN-xxx</td>
<td>-328 to +392°F (LO)</td>
</tr>
<tr>
<td>1000 PT RTD DIN</td>
<td>-328 to +900°F (HI)</td>
</tr>
<tr>
<td>Curve (a=00385)</td>
<td></td>
</tr>
<tr>
<td>AKS-GP-I0000</td>
<td>10,000 PSIG</td>
</tr>
</tbody>
</table>

Specifications:

Integrated Application Packages
- Production Well Test Package
- Well Site Monitoring Package
- Artificial Lift Optimization Package

Accuracy
- ±0.1% of full-scale reading plus 1.8°F (1°C) for thermocouple cold-junction effect at reference conditions.
- RTD: ±0.002% of reading per °C for ambient temperature effect
- Thermocouple: ±0.01% of reading per °C for ambient temperature effect
- RED and thermocouple linearization to ±0.05°C
- Custom linearization with 22-point curve

Stability
- Stability deviation per year is less than 0.025%

Operating Ambient Environment
- Operating: -40°F to +185°F (-40°C to +85°C)
- Humidity limits: 0 to 95% non-condensing

Power Characteristics
- Self-contained power
- ‘C’ size 3.6 V lithium battery
- Up to five-year battery life (depends on sample rate and RF update rate (field replaceable)
**RF Characteristics**
- 902 MHz - 928 MHz Frequency Hopping Spread Spectrum (FHSS) FCC certified ISM license-free band
- Up to 3000' range from Base Radio with clear line of sight; 500' to 1000' typical range with obstructions

**Self-Diagnostics**
- Low battery alarm—indicates the need to replace the battery (approximately one-month warning)
- Extensive self-diagnostics

**Local Configuration**
- Integrated LCD display with membrane switch buttons
- Configure sampling and RF parameters locally using membrane switches
Wireless Turbine Flowmeter Gauge

Description

The wireless turbine meter interface is a key component of the AKS FieldPORT™ wireless monitoring systems. The wireless Turbine ohmmeter provides wireless access to a proven flow measurement technology that can be applied to a wide variety of liquid and gas applications. The Turbine Flowmeter Field Unit is available with or without the turbine meter itself and with a selection of intrinsically safe pickups compatible with flow elements from virtually every major manufacturer. The greatly extends the applications and measurement ranges available.

Each field unit is self-powered and contains a magnetic pickup, signal conditioning circuitry, and an RF transceiver.

Pulse data from the pickup is monitored, converted to a rate and total in user defined units. This information is transmitted to the Base Radio for centralized monitoring and data collection. Updates between once per second and once per minute may be specified.

The RF base station and Field units update in the 902 MHz to 928 Mhz license free band making the installation and maintenance easy and worry free

Turbine Meter Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKS-TFM</td>
<td>Meter Dependent</td>
</tr>
</tbody>
</table>

Specifications:

Integrated Application Packages
- Production Well Test Package
- Well Site Monitoring Package
- Artificial Lift Optimization Package

Accuracy
- 1% of sensor range including combined effects of linearity, hysteresis, repeatability and temperature.
- Rate accuracy dependent fluids and meter body and calibration.

Range and Resolution
- The TFM Field Unit can be with virtually any size turbine meter.
- Standard turbine sizes are 3/8 inch to 12 inches
- Liquid flow rates ranging from 0.25 GPM to 12,000 GPM.
- Gas ranges are available from 0.1 to 12000 ACFM for standard products.
- Extended ranges are materials compatibilities are available.
- Turn-down of 10:1 is standard. 40:1 or better is available with special low-drag pick-up coil.
- Both rate and total are provided.

Stability
- Combined zero and span stability: less than ±0.1 % of sensor URL per year at 7°C.

Operating Ambient Environment
- Operating: -40°F to +185°F (-40°C to +85°C)
• Process: -40°F to + 250°F (-40°C to 121°C) process temperature, steady state sensor
• Humidity limits: 0 to 95%, non-condensing

Power Characteristics
• Self-contained power
• ‘C’ size 3.6 V lithium battery
• Up to five-year battery life (depends on sample rate and RF update rate (field replaceable)

RF Characteristics
• 902 MHz - 928 MHz Frequency Hopping Spread Spectrum (FHSS) FCC certified ISM license-free band
• Up to 3000' range from Base Radio with clear line of sight; 500' to 1000' typical range with obstructions