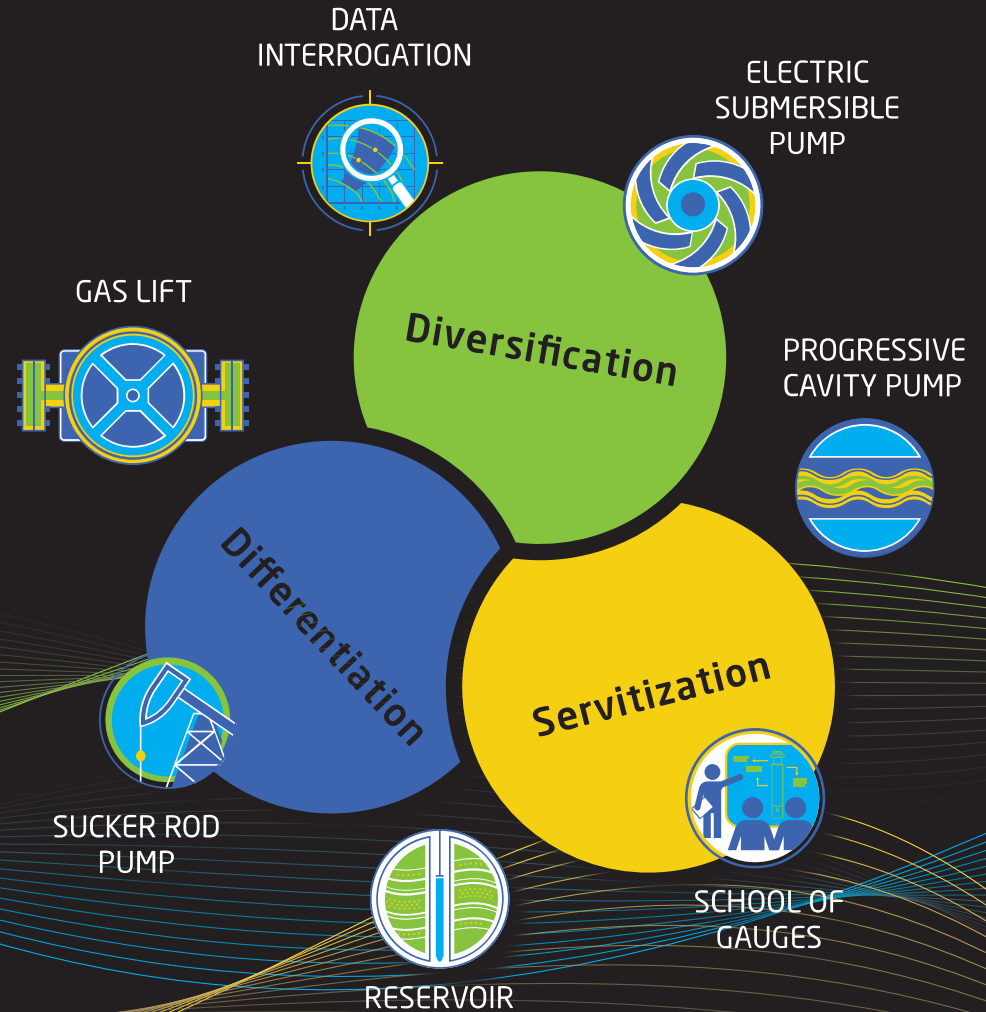




Beyond The Gauge



GRC Solutions

Since 1925, Sercel-GRC has been applying geophysical methods to oil exploration. Established by Amerada® Petroleum Corporation as Geophysical Research Corporation, the Amerada® Gauge, a mechanical tool developed to measure downhole pressure and temperature, enabled reservoir engineers and geophysicists to determine wellbore and reservoir capacity and performance. Over 130,000 gauges later and Sercel-GRC continues to provide the vital information which ensures health to your downhole assets.

ARTIFICIAL LIFT

Reservoir & Well Testing

Real Time Monitoring

ESP

Gas Lift, PCP, SRP

Spy Pro Series

Piezo Series

Surface Acquisition Units

Surface Acquisition Units

Memory Tubing Conveyed

Gas Lift, Jet Pump, Plunger Lift

GL Side Pocket

Piezo Series

MetroWin Software

RESERVOIR

Drilling, Fracking, Coiled Tubing & Well Testing

Real Time Monitoring

Tubing Conveyed and Thru Tubing:
Reservoir, Build-Up, Drawdown, Interference

Piezo Series

Surface Acquisition Units

Memory

Tubing Conveyed: DTS, Drilling, Gravel Pack
Coiled Tubing: Injections, Foam Lift, Acidizing
Slick Line: Gradient, Build-Up, Drawdown, Interference

Piezo Series

Quartz Series

High P&T

MetroWin Software



ELECTRIC
SUBMERSIBLE
PUMP



DATA
INTERROGATION



SCHOOL OF
GAUGES

Spy Pro ESP Systems

Monitor/Protect

The Spy Pro ESP monitors and protects your well from:

- decreasing the fluid level at the pump intake (Pi)
- increasing motor temperature (Tm)
- increasing mechanical imbalance (V, xy)
- increasing current leakage (A);
- decreasing pump lifting efficiency (Pd)
- increasing gas locking and sand slugging (Pd, Vz)
- increasing motor WYE point voltage imbalance (V, wye).

Features

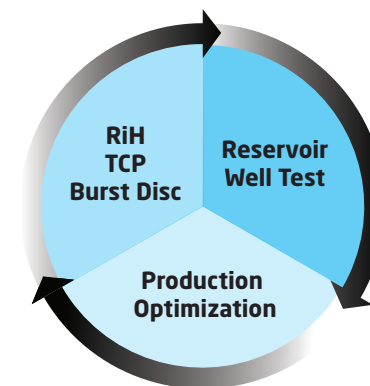
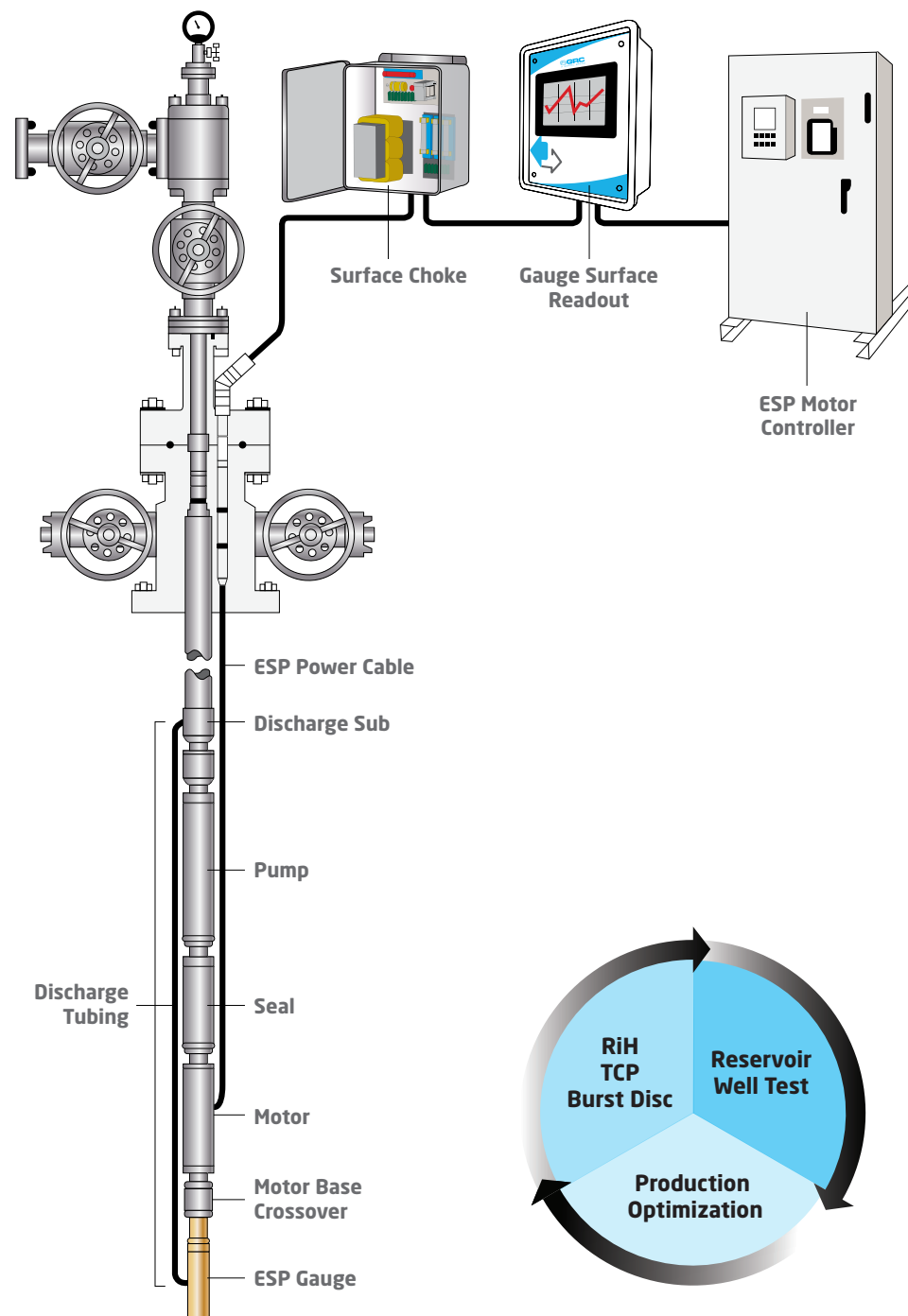
The new electronic features of the GRC Spy Pro ESP System include:

- Measure - an ESP motor WYE point imbalance true downhole measurement, which allows for the understanding of trends pertaining to the electrical health of your ESP.
- Monitor - users can easily determine if the gauge has failed, cannot communicate to the surface due to high imbalance, or is grounded.
- Perform - gauge wiring to the motor is fuse protected to avoid affecting the motor performance. The motor winding temperature can be read with RTD and thermocouple options.

Customizable

The Spy Pro ESP System includes channels of customizable fit-for-purpose data: uCommand, High Speeds and Intake Pressure.

- Under VSD energized conditions or RiH, uCommand enables tailored channels of data to be collected, transmitted, and stored at the surface.
- High speeds of data extend the use of the gauge in reservoir and well testing applications, and improves root cause analysis while still in the hole.
- Intake pressure can be read internally from the motor oil, enabling auditing of the integrity of the seals, while remaining contact less with harsh well fluids.





ELECTRIC
SUBMERSIBLE
PUMP



DATA
INTERROGATION



SCHOOL OF
GAUGES

Spy Pro ESP Systems

- RTD or TC Motor Temp
- Internal Pressure Transducer
- WYE Point Voltage Imbalance
- WYE Point Fuse Protector
- Welded & Sealed
- Shorter & Lighter
- 10K psia Pressure
- uCommand
- 177 °C Temperature
- 3.75" Slim OD

Unique Mechanical Concept

Sercel-GRC's Spy Pro ESP Systems offer a unique mechanical concept. Its precision welded (sealed) design eliminates the need of re-dressing and contamination. In addition, its shorter, slimline design improves deployment in dogleg severity and rigless applications.

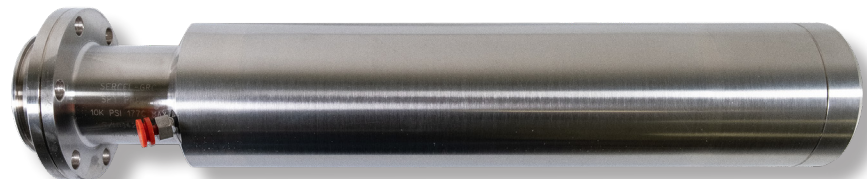
Financial Benefits

- Reduces well intervention, risk, liabilities and costs for all parties involved.
- Optimizes pump performance, run life and oil production.
- Protect your people, the pump and reservoir.
- Eliminates pump shutdown with sensor troubleshooting.



Lease Proof

- < OPEX
- < Penalties
- > Higher Run Life
- > Increase ROI





ELECTRIC
SUBMERSIBLE
PUMP



DATA
INTERROGATION



SCHOOL OF
GAUGES

Spy Pro ESP Systems

Downhole



Surface SAU & Choke



ESP-Variable Speed Drive



SPECIFICATIONS

| | |
|-----------------------------------|---|
| Material | Carbon Steel 1026 or 17-4PH Stainless Steel per NACE MR0175 |
| Temperature Rating | 125,150 or 177 °C |
| Max Working Pressure | 5,000 or 10,000 psi |
| Make-up Length & Weight | 17.86 in. & 34 lb |
| Outside Diameter | 3.75 in. |
| Motor Base Connection | 375 or 456 Series Flange Universal Motor Base |
| Sensor Type | Piezoresistive |
| Tested Insulation Rating | 5,000 VDC |
| High-voltage Coupling Requirement | Surface Choke |
| Surface Data Acquisition | SPS-1500P RiH, SPS-1500 Interface or Data Pro Stand Alone |

MONITORING OPTIONS

| | Spy Pro 10 | Spy Pro 11 | | Units | Range | Resolution | Accuracy | Data Range |
|--|------------|------------|-----------|-------|----------|------------|----------|-------------------|
| Primary Parameters for Essential Pump and Surveillance and Protection | | | | | | | | |
| Pump Intake Pressure | ● | ● | | psia | 0-10,000 | 0.1 | +0.1%FS | 40s (2.5s option) |
| Pump Discharge Pressure | | ● | | psia | 0-10,000 | 0.1 | +0.1%FS | 40s (2.5s option) |
| Intake Temperature | ● | ● | | °C | 0-177 | 0.1 | 1 | 40s (2.5s option) |
| Motor Winding Temperature | ● | ● | RTD or TC | °C | 0-260 | 0.1 | 1 | 40s (2.5s option) |
| Vibration - x Axis | ● | ● | | g | 0-16 | 0.01 | 1% | 40s (2.5s option) |
| Vibration - y Axis | ● | ● | | g | 0-16 | 0.01 | 1% | 40s (2.5s option) |
| Vibration - z Axis | ● | ● | | g | 0-16 | 0.01 | 1% | 40s (2.5s option) |
| Predictive Parameters for Application and User Needs | | | | | | | | |
| Current Leakage | ● | ● | | mA | 0-50 | 0.001 | 0.05% | 40s (2.5s option) |
| Line Voltage | ● | ● | | v | 0-80 | 0.1 | 1% | 40s (2.5s option) |
| Motor WYE Point Voltage Imbalance | ● | ● | | v | 0-400 | 0.1 | 1% | 40s (2.5s option) |
| Data Customization for Application and User Needs | | | | | | | | |
| uCommand | ● | ● | | | | | | |

● Spy Pro Series Market Differenciating Features



GAS LIFT



SUCKER ROD PUMP



PROGRESSIVE CAVITY PUMP



DATA INTERROGATION



SCHOOL OF GAUGES

Permanent Downhole Gauge Systems

Digital FSK Smart Gauge - Welded & Sealed



Unique Mechanical Concept

Sercel-GRC's Permanent Downhole Gauge (PDHG) Systems present a precision welded (sealed) design that eliminates the need of re-dressing and contamination. In addition, its dual cable head design provides cable strain relief for superior sealing, using metal-to-metal primary seal, with dual O-ring backup for increased reliability. The carrier nose reduces time and risk of gauge installation.

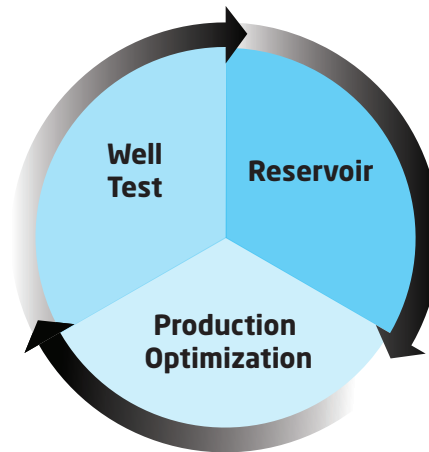
Features

The new electronic features of the Smart PDHG include:

- Calibration coefficients loaded in-factory, making it a Plug & Play to any GRC surface acquisition unit - without the need of laptops, calibration coefficients or special tools.
- Frequency Shift Key (FSK) enables communication of up to 6 PDHGs (P&T) to a single use GRC surface acquisition unit.
- ASIC technology allows for increased reliability and a reduced number of components.

Capabilities

The GRC Permanent Downhole Gauge System extends various monitoring capabilities, including dual pressure on a single assembly; rigless, thru tubing install; reservoir and well testing; and production optimization.



Fit for Purpose

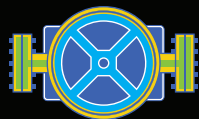
Fit for purpose, the PDHG analyses discharge pressure, which allows monitoring pump efficiency when the gauge is installed above the pump. Annulus and tubing pressure can also both be measured with a single gauge for gas lift applications. Its vibration X and Y axis allows for downhole monitoring of mechanical imbalance.

Financial Benefits

- Reduces well intervention, risk, liabilities and costs for all parties involved, which, in turn, reduces your total operational cost.
- Optimizes pump performance, run life and oil production.
- Protect your people, the pump and reservoir.
- Eliminates pump shutdown due to sensor troubleshooting.

AMERADA

digital interrogation



GAS LIFT



SUCKER ROD PUMP



PROGRESSIVE CAVITY PUMP



DATA INTERROGATION

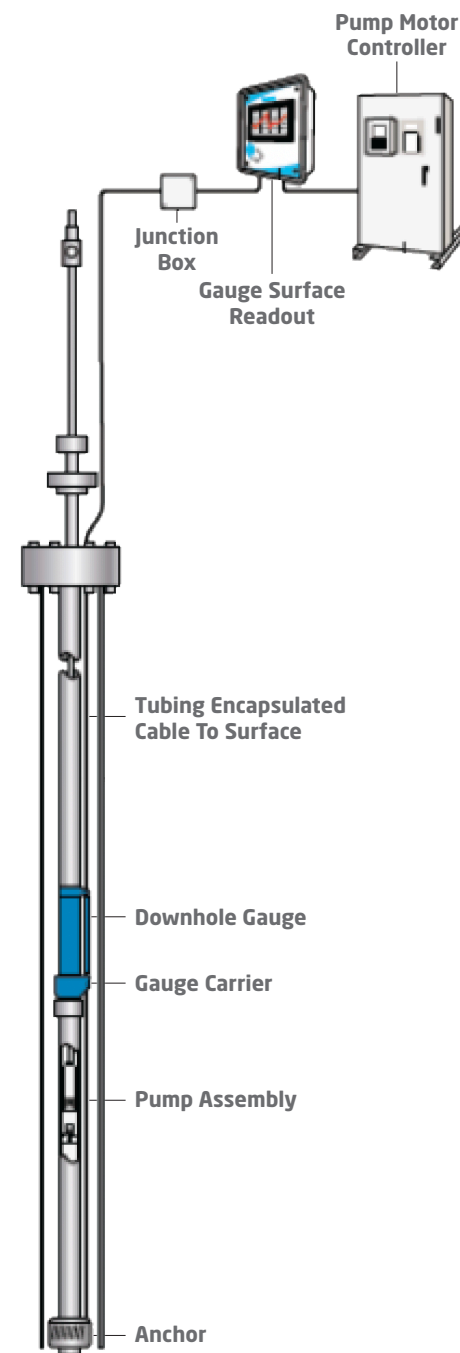
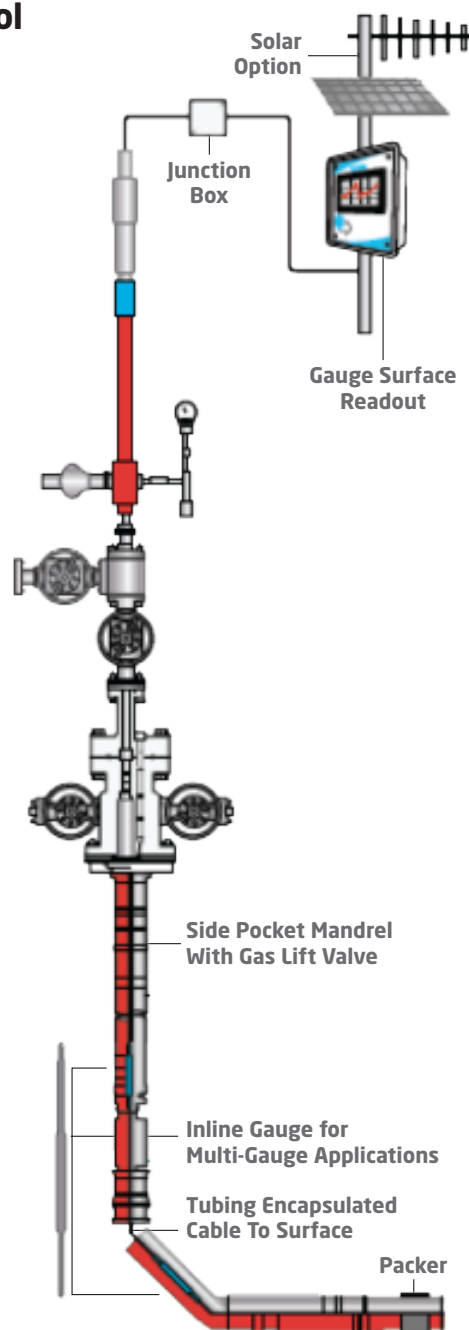
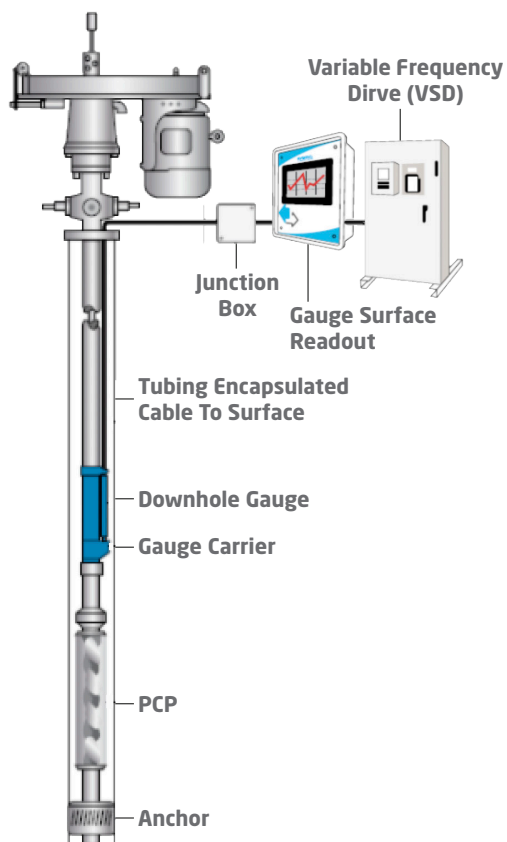


SCHOOL OF GAUGES

Permanent Downhole Gauge Systems

Monitor, Protect and/or Cruise Control

- Pump Off
- Over Temperature
- Wear and Tear
- Rod Breakage
- Rotor
- Elastomer Damage
- Gas Lift Re-injection
- Bubble-Point & Auto Choke Optimization
- Valve Operation





GAS LIFT



SUCKER ROD PUMP



PROGRESSIVE CAVITY PUMP



DATA INTERROGATION



SCHOOL OF GAUGES

Permanent Downhole Gauge Systems

SPECIFICATIONS

| | |
|--------------------------|---|
| Material | 17-4PH Stainless Steel per NACE MR0175 |
| Temperature Rating | 150 °C |
| Max Working Pressure | 5,000 or 10,000 psi |
| Make-up Length | 27.5 in. w/dual cablehead (single-pressure gauge) |
| Outside Diameter | 1 in. or 1.125 in. (P-5500 only) |
| Sensor Type | Piezoresistive |
| Surface Data Acquisition | FIC-1500 or Data Pro |



PQ-SERIES PDHG MEASUREMENT

P-4000

P-4500

P-5500

Units

Range

Resolution

Accuracy

Data Range

Primary Parameters for Essential Pump and Surveillance and Protection

| | | | | | | | | |
|---|---|---|---|-----|----------|-------|--------|----|
| Pressure, single-pressure gauge Annulus or Tubing | ○ | ○ | | psi | 0-10,000 | 0.1 | 0.05% | 1s |
| Pressure, dual-pressure gauge Annulus and Tubing | | | ○ | psi | 0-10,000 | 0.1 | 0.05% | 1s |
| Intake Temperature | ○ | ○ | ○ | °C | 0-150 | 0.01 | 0.3 °C | 1s |
| Vibration - x axis | | ○ | ○ | g | 0-20 | 0.055 | 1.0% | 1s |
| Vibration - y axis | | ○ | ○ | g | 0-20 | 0.055 | 1.0% | 1s |

PQ-SERIES PDHG SYSTEM MEASUREMENT

Rod Pump

PCP

Gas Lift

| | | | |
|--------------------------------|----|----|----|
| Annulus Pressure | na | na | ○ |
| Tubing Pressure | na | na | ○ |
| Intake Pressure | ○ | ○ | na |
| Discharge Pressure | na | ○ | na |
| Tubing and Annulus Temperature | ○ | ○ | ○ |
| Vibration (two-axis) | ○ | ○ | ○ |



GAS LIFT



| | |
|--------------------------|--|
| Power Requirements | 100 to 240VAC (12 – 24VDC) |
| UL Temperature | -20 °C to +60 °C |
| Display | 7" Touch Screen LCD (Res. 800 x 480 px) |
| Enclosure | NEMA 4x Rated |
| Analog Inputs | 3 x 0-15VDC or 0-64mA |
| Analog Outputs | 2 x 4-20mA (15-bit resolution) |
| Alarm | 2 x Latching SPDT dry contacts |
| USB Ports | 1 |
| Relay Outputs | 5A @ 250VDC / 30VDC |
| Ethernet Ports | 2 (Modbus, TCP/IP or SFTP) |
| Modbus Ports | 1 x RS-485 (non-isolated) 2 x RS-232 (non-isolated) 1 x RS-485 or RS-232 (isolated) |
| Storage Capacity | 5GB Internal |



GAS LIFT



RESERVOIR



SCHOOL OF GAUGES

Memory Gauges

Sercel-GRC's Memory Gauge has an external communication port that positively leverages its ease of use, and it boasts a smart battery pack. Paired to GRC MetroWin or MetroTrack software, it extends the data management capabilities of a typical memory gauge, leading to technology breakthroughs: direct access to gauge statistics; customizable reports; instant access to gauge status; and easy data importing from the MetroWin software.

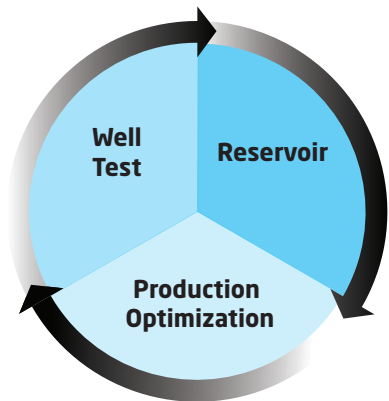
Capabilities/Fit for Purpose

Monitoring capabilities of the Memory Gauge include:

- 225 °C
- 30,000 psi
- Reservoir and well testing
- Production Optimization
- Data Integrity is Guaranteed and Fit for Purpose

Financial Benefits

- Reduces risk, liabilities and costs for all parties involved, which, in turn, reduces your total operational cost.
- Increases run life.
- Protects your people and the reservoir.



FEATURES

| | Piezoresistive PRM5/iGauge5 | Quartz Crystal CGM5/iQuartz5 |
|--------------------|--------------------------------|---------------------------------|
| Gradient Survey | ● | ● |
| TCP | ● | ● |
| Sand Control | ● | ● |
| Build Up (short) | ● | ● |
| Build Up (long) | ● | ● |
| High Pressure | ● | ● |
| High Temperature | ● | ● |
| Pulse/Interference | ● | ● |
| DSt | ● | ● |



GAS LIFT



RESERVOIR



SCHOOL OF
GAUGES

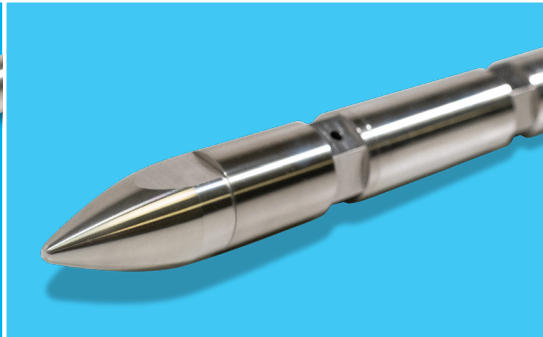
Memory Gauges

The Sercel-GRC's Memory Gauge is offered as a Gas Lift Side Pocket Mandrel; Piezo Series; and Quartz Series - all MetroWin Software, made to last.



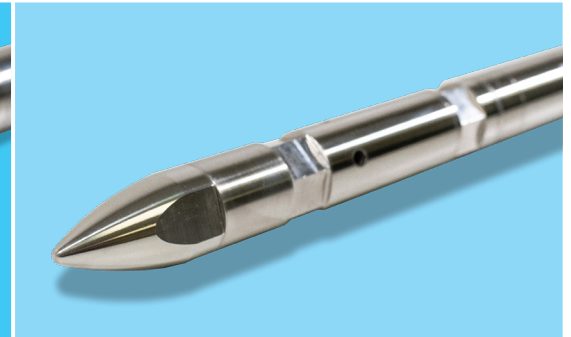
Gas Lift Side Pocket Mandrel

- 150 °C
- 5K, 15K psia
- 17-4 PH
- OD 1, 1.5"
- Tubing Annulus



Piezo Series

- 150, 177, 200, 225 °C
- 1.5K, 5K, 10K, 15K psia
- 17-4 PH, 718 Inconel
- OD 3/4, 1-1/4"
- 2.8MM, 4.2MM Data Points
- Smart Battery



Quartz Series

- 150, 177, 200, 225 °C
- 5K, 10K, 15K, 20K psia
- 1718 Inconel
- OD 1-1/4, 1-1/4"
- 4.2MM Data Points
- Smart Battery

MetroWin Software

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