

## Phoenix CTS

### Cable-to-surface artificial lift downhole monitoring system

#### APPLICATIONS

- Monitoring of
  - beam/rod pumps
  - progressing cavity pumps
  - gas lift systems and completion performance
- Identification and diagnosis of wells with potential startup or instability problems
- Identification of changing productivity and sandface conditions
- Improvement of reservoir drainage and depletion monitoring
- Optimization of gas injection rate
- ESP with ground fault or low cable insulation

#### BENEFITS

- Extends lift system run life
- Lowers lift system operating costs
- Reduces early lift system failures
- Increases production and ultimate recovery
- Extends monitoring of all ESP wells with low insulation or ground fault conditions

#### FEATURES

- Adaptability to any artificial lift system or application
- Accurate, continuous monitoring of reservoir conditions and key well parameters
- Compatibility with SCADA systems using Modbus® protocol
- Programmable trip and alarm relays for all monitored parameters
- Analog outputs and inputs for interfacing with older SCADA systems
- Onsite storage of historical data

The Phoenix CTS\* cable-to-surface artificial lift downhole monitoring system acquires pressure, temperature, and vibration measurements for in-depth identification, diagnostics, and analysis of equipment operating problems and changes in reservoir conditions. Monitoring is continuous and in real time, leading to more effective intervention strategies, better equipment protection, improved well integrity, and optimized production and recovery.

The system is used with beam/rod pumps, progressing cavity pumps, and gas lift systems.

#### Data collection and transmission

Multiple sensors mounted on the production tubing either above or below the artificial lift equipment collect and transmit data to the surface via an independent encapsulated clad instrument cable. The parameters monitored include tubing, annulus, and other pressures; tubing and annulus temperatures; three-axis vibration; and current leakage.

Advanced transducer technology, state-of-the-art microelectronic components, and digital telemetry ensure that data are highly reliable and accurate.

#### Configuration options

Field-programmable trips and alarms can be set for individual parameters to monitor both the artificial lift system and the well. This configuration flexibility allows operators to adjust to specific reservoir, well, and operating conditions, to select appropriate monitoring levels, and to minimize false alarms.

#### Alarms for all measured parameters

Alarms can be set for each measured parameter. This flexibility lets users select the level of monitoring appropriate for each artificial lift system.

#### Monitoring and control compatibilities

The Phoenix CTS monitoring system is fully compatible with other monitoring and control technologies. The Instruct\* all-in-one acquisition and control unit can be connected to the Phoenix CTS system to provide remote access and control from a single data acquisition and communication platform. The unit uses data retrieval software to combine downhole and surface data.



They provide plain language and multilingual prompts and have local and remote settings. Their capability of storing up to 500 events facilitates data logging and trending.

The downhole and surface data can be further integrated with the Lift IQ\* production life cycle management service for round-the-clock surveillance of all monitored parameters via satellite. The service enables engineers to monitor and analyze data from multiple wells across several fields simultaneously in real time to prevent or resolve equipment downtime, misuse, and failure.

The system is SCADA ready and has a Modbus protocol terminal with RS232 and RS485 ports for continuous data output.

# Phoenix CTS

## Phoenix CTS System Specifications

Parameter	Range	Accuracy	Resolution	Rate
Pressure, single-pressure gauge, psi [kPa]	0–5,800 [0–39,990]	±5 [±34]	0.1 [0.7]	4 s
Tubing pressure, dual-pressure gauge, psi [kPa]	0–5,800 [0–39,990]	±5 [±34]	0.1 [0.7]	4 s
Annulus pressure, dual-pressure gauge, psi [kPa]	0–2,900 [0–19,995]	±5 [±34]	0.1 [0.7]	4 s
Temperature, degF [degC]	32–302 [0–150]	1.33% at full scale	0.18 [0.1]	4 s
Vibration, g	0–30	3.33% at full scale	0.1	Variable
Current leakage, mA	0–25	0.2% at full scale	0.001	Variable

## Phoenix CTS System 6000 Specifications

Parameter	Range	Accuracy	Resolution	Rate
Pressure, single-pressure gauge, psi [kPa]	0–6,000 [0–41,368]	±5 [±34]	0.1 [0.7]	4 s
Tubing pressure, dual-pressure gauge, psi [kPa]	0–6,000 [0–41,368]	±5 [±34]	0.1 [0.7]	4 s
Annulus pressure, dual-pressure gauge, psi [kPa]	0–6,000 [0–41,368]	±5 [±34]	0.1 [0.7]	4 s
Intake temperature, degF [degC]	32–302 [0–150]	1.33% at full scale	0.18 [0.1]	4 s
Vibration, g	0–30	3.33% at full scale	0.1	Variable
Current leakage, mA	0–25	0.2% at full scale	0.001	Variable

## Gauge Specifications

Phoenix System	Phoenix CTS System	Phoenix CTS System 6000	Phoenix CTS XT-150
Length, in [cm]	13.18 [33.48]	13.17 [33.45]	22.430 [57]
OD, in [cm]	1.125 [2.8575]	1.125 [2.8575]	4.8 [12.2]
Material	13% chrome steel	13% chrome steel	13% chrome steel
Temperature rating, degF [degC]	302 [150]	302 [150]	302 [150]
Pressure rating, psi [kPa]	5,800 [39,990]	7,500 [51,710]	5,800 [51,710]
Tested insulation rating, V DC	1,000	1,000	1,000

## Phoenix CTS System Parameters Measured

Parameter	Beam/Rod Pump	Progressing Cavity Pump	Gas Lift System	ESP
Annulus pressure	na <sup>†</sup>	na	✓	na
Tubing pressure	na	na	✓	na
Intake pressure	✓	✓	na	✓
Discharge pressure	na	✓	na	✓
Tubing and annulus temperature	✓	✓	✓	✓
Vibration (three-axis)	✓	✓	✓	✓
Current leakage	✓	✓	✓	✓
Motor temperature	na	na	na	✓

<sup>†</sup> Not applicable

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