

## **SECTION 260531**

### **FIELD MOUNTED INSTRUMENTS**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. The WORK of this Section includes the general specification and requirements for the instrumentation and control WORK under this and other applicable Specifications. The WORK also includes providing instrumentation and all related wiring as shown in these Contract Documents.

##### **RELATED WORK SPECIFIED ELSEWHERE**

- A. General Conditions, Section J – Shop Drawing Submittals
- B. Section 15132 – Pressure Gauges
- C. Section 16010 - General Electrical Requirements
- D. Section 17000 - General Instrumentation Control Requirements

#### **PART 2 – MATERIALS**

##### **2.1 LEVEL TRANSMITTER - ULTRASONIC TYPE**

- A. The system shall use ultrasonic ranging to measure the level of liquid and shall consist of a combination sensor/transmitter unit.
- B. Transmitter shall be microprocessor based. Level sensing shall be automatically compensated over the system temperature range of at least 0°C to 50°C and shall incorporate digital algorithmic echo extraction and filtering. Synchronization capability shall be provided. When synchronized, no transmitter shall transmit a signal within a certain time interval of the prior one. Application parameters shall be stored in non-volatile EEPROM. Calibration shall require no reference targets.
- C. Accuracy shall be  $\pm 0.25\%$  or better. Output shall be 4 mA to 20 mA proportional to the range of level sensing. Ultrasonic transmitter shall also have a minimum of three contact outputs (SPDT each) with adjustable set points and dead bands which can be used for pump control and alarming. In the case of momentary signal loss, relays shall maintain their last state. The transducer shall be FM approved for Class I, Division 1 and housed in

a NEMA 4X enclosure. The ultrasonic unit shall be powered by 115 volts a-c.

D. Ultrasonic unit shall be Drexelbrook, Ametek, USonic or equal.

## 2.2 SUBMERSIBLE PRESSURE TRANSDUCER

A. General: The transducer shall sense the liquid level or pressure variation of water and convert these variations into a linear 4-20 ma dc signal. The transducer shall interact with a level indicator which converts the transducer signal into a 4-20 ma analog output signal.

B. Required Features:

1. The liquid level or pressure shall be sensed by a pressure transducer certified by FM, UL and CVSA for installation applicable location.
2. The transducer shall be solid state with no mechanical linkages or moving parts.
3. Pressure Range: 0 to 5 feet
4. Static Accuracy: +/- 1 percent (includes the combined errors due to nonlinearity, hysteresis and non-repeatability on a Best Fit Straight Line basis at 25 C per ISA S51.1).
5. The pressure sensing element shall incorporate a four active arm Wheatstone Bridge strain gage diffused directly into a silicon diaphragm.
6. The sensing element shall exhibit no measurable hysteresis, withstand overpressures up to 200 percent and have a life expectancy of 20 million cycles.
7. The transducer shall operate from a 24 VDC regulated power supply.
8. The transducer shall have on-board signal conditioning and include surge and reverse polarity protection.
9. Wetted materials: Type 316 stainless and/or Viton
10. Transducer Diameter: 1-inch maximum.
11. Factory-attached polyurethane or Tefzel jacketed cable with non-stretch Kevlar stiffeners, braided cable shield and vent tube for

atmospheric reference with moisture barrier. Water tight cable seal shall be via compression type fitting. Anti-snag cone shall be supplied to prevent cable from “hanging-up” on foreign debris.

12. Cable Length: 5 feet
13. User-installable open-faced port end cap shall be supplied for maximum contact with the liquid media and to prevent clogging of the sensor.
14. An aneroid bellows assembly complete with DIN rail mounting assembly shall be provided to prevent condensation from forming in the vent tubing.
15. Provide one stainless steel identification tag with each sensor. Information shall identify the range.
16. Product and Manufacturer:
  - a. Components as manufactured by KPSI:
    - 1) Transducer Model No. 700 with anti-fouling nose cap and protective screen
    - 2) Anti-snag Cone Model No. 42-01-64134.
    - 3) Series 815 Aneroid Bellows
  - b. Or equal.

C. PROCESS INDICATOR (For Use with submersible Pressure Transducer)

1. Type: Indicator shall be a microprocessor-based, seven-segment red LED display, capable of five-digit readout, programmable to four decimal places.
2. Required Design and Construction Features:
  - a. Front panel red LED type display.
  - b. 4-20 ma dc.
  - c. Inputs:
    - 1) Accuracy: 0.1 percent of full scale.

- 2) Normal Mode Rejection: 55 dB at 60 Hz.
- 3) Common mode Rejection: 120 dB at 60 Hz.
3. Supply integral 24 VDC power supply for transducer applications.
4. Product and Manufacturer:
  - a. Model 760 as manufactured by Chessell Corporation
  - b. Or equal.

## 2.4 PRESSURE TRANSMITTER

- A. The pressure transmitter shall be of the microprocessor-based type 2-wire system. The transmitter shall operate from a 24-volt d-c source. The output signal shall be 4-mA to 20-mA d-c. The transmitter shall be housed in a NEMA 4 enclosure.
- B. Configuration data shall be stored in nonvolatile EEPROM memory in the transmitter electronics module. This data shall be retained in the transmitter when power is interrupted, so the transmitter shall be functional immediately upon power up. The transmitter shall perform continuous self-tests. In the event of a problem, the transmitter shall activate the user-selected analog output warning. A HART Communicator or other HART-based communications device can then interrogate the transmitter to determine the problem. The transmitter shall output specific information to the communicator identifying the problem for fast and easy corrective action.
- C. The pressure transmitter shall provide an electronic signal proportional to the calibrated pressure range. The pressure-sensing element shall be silicone oil filled with a process media operating temperature range of -40°F to 250°F. An integral stainless steel block/bleed manifold (pre-assembled to the transmitter and leak checked) shall be provided for each transmitter. The manifold shall have a block and a vent/test valves.
- D. Provide the pressure transmitter with the following features:
  1. Independent external zero and span adjustments.
  2. Over range protection.
  3. Vent/drain valve.

4. Integral output signal indicator, calibrated in engineering units.
- E. Accuracy of the pressure transmitter shall be  $\pm 0.2\%$  of calibrated span.
- F. The pressure transmitter shall be manufactured by Drexelbrook, Ametek, or equal.

## 2.5 MAGNETIC FLOW METERS

- A. Magnetic Flow Measuring Systems: Magnetic flow meter systems shall be of the low frequency electromagnetic induction type and produce a DC pulse or analog signal directly proportional to, and linear with, the liquid flow rate. Complete zero stability shall be an inherent characteristic of the flow meter system. Each magnetic flow metering system shall include a metering tube, signal cable, transmitter and flow meter grounding rings. The metering tube shall have the following attributes:
  1. Constructed of 316 stainless steel with flanged connections
  2. Utilize a minimum of two bullet-nosed, self-cleaning electrodes
  3. Liner in conformance with the manufacturer's recommendation for the meters intended service
  4. Electrodes constructed of materials which are in conformance with the manufacturer's recommendations for the meters intended service
  5. Meter housing rated for NEMA 6 submergence conditions
  6. Meter coating consisting of epoxy painted finish
  7. Two grounding rings which are in conformance with the manufacturer's bore and material recommendations for the meters intended service. Grounding rings shall be designed to protect and shield from process abrasion the liners edge interface at the meters end.
- B. The microprocessor-based signal converter/transmitter shall have the following attributes:
  1. Utilize DC pulse technique to drive flux-producing coils

2. Convert DC pulse signal from the tube to a standardized 4-20 mA signal to a minimum of 700 ohms
3. Six digit LCD display for flow rate, percent of span, and totalizer
4. An operator interface consisting of keypads which respond to English text entry
5. Integral zero return to provide a consistent zero output signal in response to an external dry contact closure
6. Integral low flow cutoff and zero return
7. Automatic range change
8. Capable of measuring flow in both directions
9. Programmable parameters including meter size, full scale Q, magnetic field frequency, primarily constant, time constant
10. Date retention for a minimum of five years without auxiliary power (main or battery)
11. Self-diagnostics and automatic data checking
12. Protected terminals and fuses in a separate compartment which isolates field connection from electronics
13. Produced a scaleable frequency output, 0 to 100 Hz, transistor switch closure up to 5.75 W externally powered, 5 to 24 VDC
14. Can tolerate ambient temperature operating limits of -20 to 140 degrees F (-29 to 60 degrees C)

B. Each flow metering system shall be hydraulically calibrated at a facility which is traceable to the National Institute of Standards and Technology. The calibrations procedure shall conform to the requirements of MIL-STD-45662A. A real-time computer generated printout of the actual calibration data indicating apparent and actual flows at 20%, 40%, 60%, 80% and 100% of the calibrated range shall be submitted to the Project Manager at least thirty (30) days prior to shipment of the meters to the project site. The flow metering system shall conform to the following technical specifications: time constant = 0.5 to 1000 seconds; Galvanic or optic isolation: Accuracy: 0.25% of flow rate from 10 to 100% full scale for velocities over 3 FPS; Repeatability: 0.25% full scale; Power consumption: 30 watts or less; Power Requirements: 120 VAC, 10% (24 VDC).

## 2.6 FLOAT LEVEL SWITCHES

- A. The float level switch shall have a microswitch inside a bulb-shaped float for detecting fluid level change and generates a Start/Stop, Open/Close, or alarm actuation signal. The float material shall be polypropylene, the maximum liquid temperature shall be 159 degrees F and the float includes a mounting weight. The contact rating of the microswitch shall be 8Amps minimum.
- B. Float switches shall be Flygt, Dwyer Mercoïd or equal.

## 2.7 HYDROGEN SULFIDE GAS DETECTOR/ CONTROLLER

- A. The hydrogen sulfide gas detector/ controller shall have a supervised detector system complete with fan and alarm relay, 2-3 year sensor, replaceable sensor, end of life indication, digital readout LED display, internal buzzer, two (2) onboard relays and 4-20mA analog current output.
- B. Power requirement 100 to 240VAC. Operating temperature range 0 – 125 degrees F.
- C. Shall be ETL listed to UL 61010-1
- D. Sensor range: 0 to 50 ppm, resolution 1 ppm.
- E. H<sub>2</sub>S Gas/ controller shall be Macurco #TX-12-HS or equal.

## 2.8 PROCESS DIGITAL INDICATOR

- A. The process digital indicator shall be a solid-state electronic four-digit panel meter utilizing a LED display, with a range of 0 to 9,999 in engineering units. The indicator shall operate on a 115-volt, 60-Hz power source, with a maximum power consumption of 5 watts. Standard input signal range shall be 4 mA to 20-ma d-c. The indicator shall be capable of being configured and scaled in the field. Zero and span adjustments shall be accessible without removal of the unit. The process digital indicator shall be a 205-P manufactured by Newport Electronics, Inc., Santa Ana, California; or equal.

## 2.9 TUBING, VALVES, FITTINGS, AND MANIFOLDS

- A. Instrument tubing connections between process lines and instruments shall be 1/2 inch in diameter Teflon.
- B. Fittings shall be 316 stainless-steel compression type. Fittings shall be Swagelok, Parker CPI, or equal.
- C. Valves shall be full port ball valves with 316 stainless-steel body and Teflon seats and packing. Valves shall be Parker CPI, Whitey, or equal.

## 2.10 ISOLATORS

- A. Isolators shall be Acromag Series 1700, equivalent by AGM, or approved equal with powered 2-wire output.

## **PART 3 – EXECUTION**

### 3.1 INSTALLATION:

- A. Installation, testing, calibration, validation, start-up, and instruction shall be in accordance with the requirements set forth in Section 26530, Process Instrumentation and Controls – General Requirements.
- B. Calibrate all level instruments to match process conditions. Obtain process data from Owner's Representative.
- C. Locate and install all float level switches so that they will actuate at the correct level. Obtain actuation levels from Owner's Representative.

END OF SECTION



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