microFlow.net Liquid

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Smith Meter® Electronic Flow Computer System

The Smith Meter microFlow.net liquid electronic flow computer system is a microprocessor-based instrument with Ethernet capability. It is designed to monitor and control a single-meter flow stream. The unit can operate either as a stand-alone instrument or be part of system in which it communicates with an automation or supervisory control and data acquisition (SCADA) system.

Features

- Ethernet communications port
- Three multidrop EIA-485 or EIA-232 communications ports
- Continuous monitoring of critical functions
- User-configurable inputs and outputs
- Configurable language and messages
- Event logging and audit trail
- Configurable batch report
- ASTM 1250-04 and American Petroleum Institute (API) Manual of Petroleum Measurement Standards (MPMS) chapter 11.1-2004 compliant

Features

- Ten-point meter factor curve
- Explosion proof
- Display backed-up per International Organization of Legal Metrology (OIML)
- Smith Meter Ultra Series liquid ultrasonic flowmeter communications
- Promass Coriolis meter communications
- Three security levels
- Boolean and algebraic expressions
- Modbus remote terminal unit (RTU)
- Pulse security level B
- Adjustable display contrast
- Automatic temperature correction
- API tables from liquefied petroleum gas (LPG) to crude oil
- Coefficient expansion for chemicals
- Additization of metered products
- Sampler control support
- Sediment and water monitor interface

Standard Features

Temperature Compensation

The temperature compensation feature provides the customer the ability to compensate for variance in temperature from a reference temperature. This feature is used with a resistance temperature detector (RTD) input or a temperature transducer, and, excluding the accuracy of the fluid temperature measurement, will exactly match the proper volume correction factor of ASTM-D-1250-04 and API MPMS chapter 11.1-2004 tables as noted below, over the fluid

temperature range of -58 degree Fahrenheit (°F) to 302 °F (-50 degree Celsius (°C) to 150 °C).

The following API tables can be programmed in the microFlow.net: 5A, 5B, 5D, 6A, 6B, 6C, 6D, 23A, 23B, 23D, 23E, 24, 24A, 24B, 24D, 24E, 53A, 53B, 53D, 53E, 54, 54A, 54B, 54C, 54D, 54E, 59A, 59B, 59D, 59E, 60A, 60B, 60D, 60E, BRIA, BRIP, and BR2P.

Pressure Compensation

Pressure compensation provides the customer the ability to compensate the volume of product delivered at varying pressures per API tables 11.2.1 and 11.2.2, using a 4-20 milliampere (mA) pressure transducer input. This feature also contains real-time control functions for maintaining system pressures at the meter to a minimally-acceptable, user-definable level (pressure transducer not included). Pressure compensation is particularly useful for light products, such as LPG, where the compressibility factor varies greatly with different pressures.

Density Correction

The density correction feature provides customers with the ability to correct the volume of product delivered at varying densities. Density can be obtained through a 4-20 mA input or calculated according to American Gas Association (AGA)-8.

Metered Injectors, Piston Injectors, and Smart Additives

The microFlow.net was designed to provide maximum flexibility when it comes to additive control. The unit is capable of handling metered injectors, piston injectors, and smart additives simultaneously.

The microFlow.net is capable of controlling four additive injector systems which includes one metered injector and three piston injectors or smart additives or zero metered injectors and four piston or smart additives.

The microFlow.net controls the additive solenoids of metered injectors to precisely inject additive into the main product. It monitors the pulses of the additive meter and controls the amount of additive based on the incoming pulses from the additive meter and main product meter.

Additive monitoring provides the capability for the microFlow.net to monitor feedback from the piston injectors of the additive products. The microFlow.net monitors the injector feedback switches for a change of state and counts the errors and alarms if no change is detected within the cycle or a period of time, depending on how the unit is programmed. The microFlow.net totalizes additive volume based on confirmation signals and a programmable volume per cycle. The totalized volume prints on the emulated load ticket printed on the printer output.

For smart additives, the firmware was designed with a primary/subordinate type of communications, with the microFlow.net being the host and the additive injector system being the device. The microFlow.net constantly interrogates the additive injector system for a change in status. The microFlow.net can be operated with communications control over the smart additive injector system or with communication/pulse control. When the microFlow.net has communication control over the additive system, it will constantly monitor the additive system for its status, poll the additive totals, and signal the system when to inject additive, all through the communications line.

The microFlow.net communications package was also designed with a pass-through communications. The microFlow.net communications package has also been designed with a pass-through communications mode. In this mode of operation the supervisory computer communicates with the additive injector system through communication lines run to the microFlow.net and from the microFlow.net to the additive injector systems.

Dual-Pulse Security

Dual-pulse security provides continuous monitoring and error-indication alarms of pulse transmission for the meter according to API MPMS Chapter 5.5, Level B and Institute of Petroleum (IP) Standard IP 252/76, Part XIII, Section 1, Level B.

Sampler Operation

The microFlow.net supports samplers by providing a discrete input/output (I/O) output signal that produces a pulse of programmable width each time a sample is taken. The sampling frequency is configurable by either volume or time. The parameters used to configure the sampler are in the General Purpose directory. The sampler can be enabled and disabled through the keypad in the program mode.

Boolean and Algebraic Processing

The microFlow.net provides customers flexibility to set up inputs and outputs for tasks that are not standard in the unit. Through Boolean processing, relays can be turned on and off through equations and events set up by customers. For example, a relay is required to close when the flowrate is zero. This can be set up using Boolean processing and does not require special software from the manufacturer.

Customers also can use algebraic processing to do simple mathematical calculations not included in the unit. These calculations can then be used in configurable reports or delivery display for the current batch.

Communications

The microFlow.net is equipped with three standard programmable communication ports that can be configured to be either EIA-232 or EIA-485 compatible communication ports, with baud rates up to 38,400 bits per second (bps). In addition to these three communication ports, an Ethernet port is available to support Modbus and Smith minicomputer host protocols.

Shared Printing

Shared printing allows multiple microFlows to generate reports on a single printer. A single microFlow.net can be configured to act as a "print server" (host) and all other microFlows to be "shared printers" (clients). Once the client microFlow.nets are configured as shared printers, they will have their communication, transmit, and receive lines tied together and connected to a single comm port on the print server. When a shared printer microFlow is done with a transaction and print is pressed on its keypad, the report is sent via communications to the host, where it will be printed.

Applications

Applications for the microFlow.net include any size liquid pipeline for single-product, single-meter flow. This self-contained, explosion-proof unit continuously computes, totalizes, and displays indicated volume (IV), gross volume (GV), gross at standard temperature (GST), net standard volume (NSV), and mass. The microFlow.net also offers run-time displays, which provide all (rate, batch, temperature, etc.) critical flow information.

Hardware Options

OIML Display

The microFlow.net is designed with two display options. The standard display option operates until power is lost and then goes blank. The OIML display option is the same display, but when power is lost, the display maintains the data for reading by an operator for up to 15 minutes.

Specifications

Accuracy

- Calculated accuracy is the gross at standard temperature to gross volume ratio, excluding the accuracy of fluid temperature measurement and exactly matches the proper volume correction factor or ASTM-D-1250-04 over fluid temperature range of -58 °F to +302 °F (-50 °C to +150 °C).
- Temperature measurement accuracy is when the fluid temperature is measured to within +/- 0.72 °F (+/-0.4 °C) over the fluid temperature of -328 °F to 572 °F (-200 °C to 300 °C). Fluid temperature is measured to within +/-0.45 °F (+/-0.25 °C) over the fluid temperature range of 32 °F to 572 °F (0 °C to 300 °C).

The microFlow.net's stability is 0.1 degree Fahrenheit (°F) (0.06 degree Celsius (°C)) per year.

Flow totalization is within one pulse of input frequency.

Electrical Inputs

AC Instrument Input Power

Dual voltage input: 115 or 230 volts alternating current power (VAC) via switch, 50/60 hertz (Hz)

Power consumption: Approximately 9W

Power interruption tolerance: Interruption of power greater than 0.05 seconds (typical) will cause an orderly shutdown of the microFlow.net and the control valve will be immediately signaled to close

Digital (Meter Signal) Pulse Inputs

Type: Optically-isolated, solid-state voltage sensors

Quantity: Two

Input voltage range: 5 to 28 volts direct current (VDC) compatible

Pickup Voltage: 5 VDC minimum

Drop-out voltage: 1 VDC maximum

Current at maximum voltage: 20 mA maximum

Input level duration: 83 microseconds (µS) minimum

Digital Control Inputs

Type: Optically-isolated, solid-state voltage sensors

Quantity: Three

Input voltage range: 5 to 28 VDC compatible

Pickup voltage: 5 VDC minimum

Drop-out voltage: 1 VDC maximum

Current at maximum voltage: 20 mA maximum

Input level duration: 120 milliseconds (ms) minimum

Batch reset: Input must be held on high voltage for 300ms to ensure a reset state

Analog Inputs

Type: 20-bit analog-to-digital converters

Function: One resistance temperature device (RTD), one 4-20 mA

Temperature Resistance Temperature Detector (RTD)

Type: Four-wire, 100-ohms platinum RTD with a temperature coefficient at 32 °F to be 0.00214 ohms per ohms °F (0.00385 ohms per ohms/°C)

Temperature range: -148 °F to +572 °F (-100 °C to +300 °C)

Temperature measurement accuracy: ±0.72 °F (±0.4 °C) over the specified range

Current (4-20 mA) Input

Type: Two-wire, 4-20 mA current loop receiver, programmable as to function

Span adjustment: Program adjustable

Input burden: 50 ohms

Accuracy: ±0.025% of range

Resolution: One part in 1,048,576

Voltage drop: Two volts maximum

Sampling rate: One sample per 300 millesecond (ms) minimum

Electrical Outputs

DC Power

12 VDC +/-5%, 180 mA maximum, short-circuit protected.

AC Digital Outputs

Type: Optically isolated, solid-state output, user-programmable as to function

Quantity: Four

Load voltage range: 90 to 280 VAC root mean square (RMS) 48 to 63 Hz

Steady-state load current range: 0.05amp (RMS) minimum to 0.50 amp (RMS) maximum into an inductive load

Leakage current at maximum voltage rating: 2.5 mA maximum at 240 VAC

On-state voltage drop: 2.0 VAC at maximum load

DC Digital Outputs

Type: Optically isolated, solid-state open-collector output, user-programmable as to function

Quantity: Two

Switch blocking voltage: 30 VDC maximum

Load current: 150 mA maximum with 0.6 volt drop; power down - normally open

Pulse Output

Type: Optically isolated, solid-state open-collector output; pulse-output units are program-selectable through the microFlow.net keypad or communications

Switch-blocking voltage (switch off): 30 VDC maximum

Load current (switch on): 10 mA with 0.6 volts drop

Frequency range: 0 to 3,000 Hz

Duty cycle: 50/50 (on/off)

Environmental

Ambient operating temperature: -13 °F to 140 °F (-25 °C to +60 °C)

Humidity: 5 to 95% with condensation

Enclosure: Explosion-proof (NEMA 7, Class I, Groups C and D) and watertight (NEMA 4X), IP 65

Electrical Safety Approvals

North American

UL/CUL Listed 557N 557N UL File E23545

Class I, Division 1, Groups C, D; Class II, Groups E, F, G

Class I, Zone 1, AEx d ib IIB T6

UL Enclosure 4X, CSA Enclosure

Global

Ex db ib IIB T6 Gb Tamb -25 °C + 60 °C IP65

ATEX: DEMKO 04 ATEX 0403315X

IEC: IECEx UL 04.0007X

UL Brazil: 19.0057X

Electromagnetic Compatibility

European Union: EMC Directive 2014/30/EU EN 61326-1 Electrical equipment for measurement, control, and laboratory use.

Communications

Number of ports: Three plus Ethernet

Configuration: EIA-485 Four-wire or two-wire multidrop network with optional termination resistor or EIA-232 three-wire communications link

Data rate: Programmable asynchronous data (baud) rate from 2,400 to 38,400 bps

Data format: Fixed at one start bit, one stop bit, eight data bits, and no parity

Line protocol: Full duplex, no echo character

Data structure: American Standard Code for Information Interchange (ASCII) character oriented, modeled after ISO Standard 1155

Protocol: Smith Meter ASCII longitudinal redundancy check (LRC), Smith Meter ASCII carriage return (CR), Smith Meter ASCII binary

Ethernet: 10/100 Base-T RJ-45 8- or 10-pin unshielded twisted pair (UTP) connector

Modeling Code

ML — XP — MFL — 1

Model Designation

Housing

XP—Explosion Proof/Flame Proof

Hardware Option

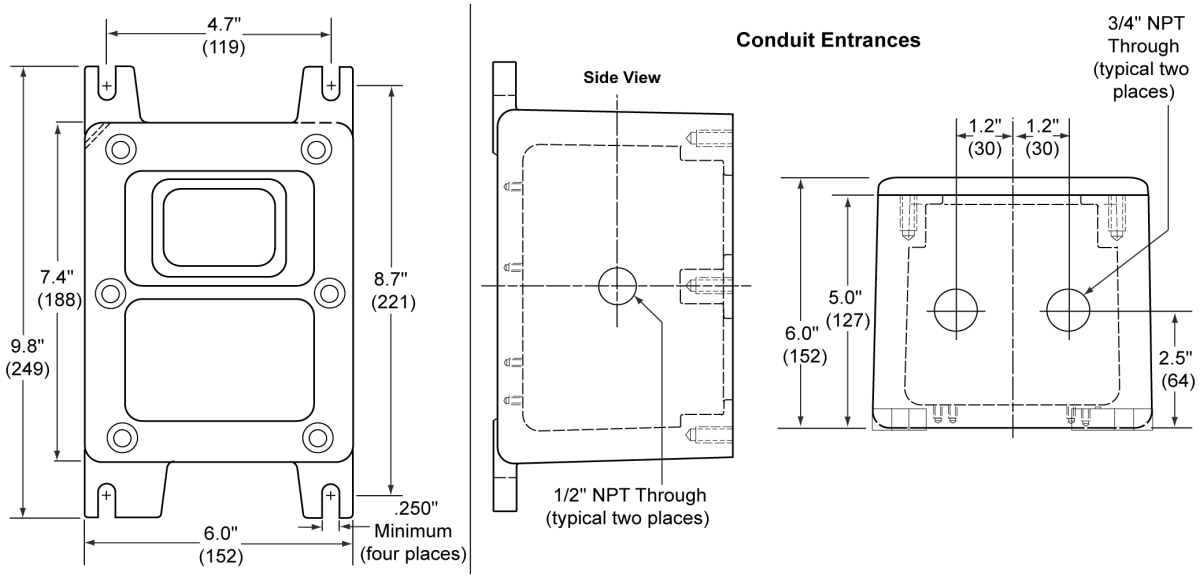
1—STD
2—OIML Display Option
3—STD (UL Brazil)
4—OIML Display Option (UL Brazil)

Firmware

MFL—microFlow.net Liquid

Dimensions

Inches are to the nearest tenth (millimeters (mm) to the nearest whole mm), each independently dimensioned from respective engineering drawings.



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