

ST1 MANIFOLD FC

ST1 Manifold Controller & Flow Computer for Liquid Applications

Features

- Automatically Selects In-Range Meter for Best Accuracy
- Automatic Valve Control/Meter Selection
- Displays Rate/Total Through Manifold
- Supports Pulse Producing Flowmeters Turbine, Positive Displacement, Coriolis, Vortex
- Volume, Corrected Volume or Mass Equation
- Universal Viscosity Curve (UVC) and Strouhal/Roshko Advanced Linearization Methods
- API 2540 Equations for Petroleum Fluids
- User Entry of Fluid Properties (10 Selectable)
- Menu Selectable Hardware & Software Features
- Data Logging of Rate/Total Over Wide Range



- Two Line LCD, OLED or VFD Display
- Isolated Pulse and Analog Outputs Standard
- RS-232 Port Standard, RS-485 Optional
- Windows™ Setup Software
- DDE/OPC Server & HMI Software Available

Manifold Controller

General Description:

The piping layout for a flow measurement manifold is shown in figure-1. Such flowmeter manifolds are used to increase the flow measurement turn down range beyond that which can be satisfied by a single flowmeter. The system is automatic in operation and will use the information being measured most accurately by either Flowmeter-1 (FM-1) or Flowmeter-2 (FM-2).

The flow measurement manifold consists of:

- High flow range flowmeter
- Low flow range flowmeter
- Bypass valve
- Flow Measurement Instrument/Controller (ST1-Manifold-FC)
- Interconnecting piping
- Ancillary temperature measurement devices (as needed)

The principle of operation is that the flow is always measured by the larger flowmeter. If the larger flowmeter indicates a flow rate measurement below its measurement range, a bypass valve is closed diverting all the fluid flow through the smaller flow meter where the measurement is then made. The operator will only see information based on the in-range meter.

In the case where the bypass valve is open, most of the flow is diverted around the smaller flowmeter. The portion of the fluid passing through the flowmeter may cause the meter to coast, but it will not be overranged.

Operation of the ST1-Manifold-FC

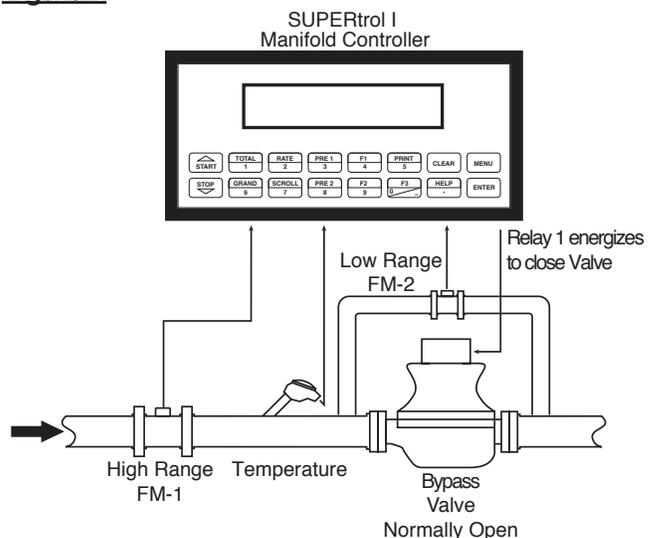
A flowmeter manifold controller is a special flow instrument intended to accept inputs from two flowmeters, one larger and one smaller, and which also controls the bypass valve. The instrument setup contains the calibration information for both flowmeters as well as the manifold flow rate switch setpoint and hysteresis.

The instrument operation may be summarized as follows:

1. Measure the flow rate signal from the high range flowmeter
2. Decides if the flowrate is below the user specified low flow rate for the high range flowmeter:
If yes, close the bypass valve
If no, open the bypass valve
3. If the bypass valve is open display flowrate and totalization based on the high range flowmeter. If the bypass valve is closed, display flowrate and total based on the low range flowmeter
4. Analog Output, Relays, Pulse Output, etc... is based on which flowmeter is active at the time.

This special version of the ST1 has two pulse, flow input channels.

Figure-1



Specifications:

Flow Meters and Computations

Meter Types: Supports pulse producing meters including: vortex, single rotor turbine, magnetic, PD flowmeter, Coriolis

Linearization: 40 point table, UVC table or Strouhal/Roshko

Computations: Volume, Corrected Volume & Mass

Fluid Computations: Density, Temperature, Viscosity

Environmental

Operating Temperature: 0°C to +50°C

Storage Temperature: -40°C to +85°C

Humidity: 0-95% Non-condensing

Materials: U.L. approved

Approvals: CE Compliant, UL/CUL Listed

Display

Type: 2 lines of 20 characters, LCD, OLED or VFD

Character Size: 0.2" nominal

User programmable label descriptors and units of measure

Keypad

Keypad Type: Membrane Keypad with 16 keys

Keypad Rating: Sealed to NEMA 4X / IP65

Enclosure

Size: See Dimensions

Depth behind panel: 6.5" including mating connector

Type: DIN

Materials: Plastic, UL94V-0, Flame retardant

Bezel: Textured per matt finish

Fluid Types

General Purpose, User entry of fluid properties for up to 10 fluids.

Real Time Clock

The ST1-Manifold-FC is equipped with a battery backed real time clock with display of time and date.

Format:

12 or 24 hour time display

Day, Month, Year date display

Excitation Voltage

Menu Selectable: 5, 12 or 24 VDC @ 100 mA (fault protected with self resetting fuse)

Relay Outputs

The relay outputs are menu assignable to (Individually for each relay) Low Rate Alarm, Hi Rate Alarm, Temperature, Density or General purpose warning (security).

Number of relays: 2 (4 optional)

Contact Style: Form C contacts

Contact Ratings: 5 amp, 240 VAC or 30 VDC

Capabilities: Alarm Delay, Setpoint, Hysteresis,

Duration

NOTE: Relay 1 is reserved for manifold control.

Power Input

The factory equipped power option is internally fused. An internal line to line filter capacitor and MOV are provided for added transient suppression.

110 VAC Power: 85 to 127 Vrms, 50/60 Hz

220 VAC Power: 170 to 276 Vrms, 50/60 Hz

DC Power:

12 VDC (10 to 14 VDC)

24 VDC (14 to 28 VDC)

Power Consumption:

AC: 11.0 VA (11W)

DC: 300 mA max.

Flow Inputs:

Pulse Inputs:

Number of Flow Inputs: 2, one for larger and one for smaller flowmeters

Input Impedance: 10 K Ω nominal

Pullup Resistance: 10 K Ω to 5 VDC (menu selectable)

Pull Down Resistance: 10 K Ω to common

Trigger Level: (menu selectable)

High Level Input

Logic On: 3 to 30 VDC

Logic Off: 0 to 1 VDC

Low Level Input (mag pickup)

Sensitivity:

10 mV or 100 mV

Minimum Count Speed:

Menu selectable: 1-99 seconds

Maximum Count Speed:

Menu Selectable: 40Hz, 3000Hz or 20 kHz

Overvoltage Protection: 50 VDC

Control Inputs

Switch Inputs are menu selectable for Reset, Lock, Inhibit, Alarm Acknowledge, Print, or Not Used.

Control Input Specifications

Number of Control Inputs: 3

Input Scan Rate: 10 scans per second

Logic 1: 4 - 30 VDC

Logic 0: 0 - 0.8 VDC

Input Impedance: 100 K Ω

Control Activation:

Positive Edge or Pos. Level based on product definition for switch usage.

Auxiliary / Compensation Inputs

The auxiliary/compensation inputs are menu selectable for manifold temperature, small meter temperature or not used. These inputs are used for the compensated inputs when performing compensated flow calculations. They can also be used as a general purpose input for display and alarming.

Number of inputs: 2

Operation: Ratiometric

Accuracy: 0.02% FS at 20° C (current input)

Basic Measurement Resolution:
16 bit

Update Rate: 1 update/sec minimum

Automatic Fault detection:

Signal Over-range/under-range

Current Loop Broken

Fault mode to user defined default settings

Fault Protection:

Reverse Polarity: No ill effects

Over-Voltage Limit (Voltage Input): 50 VDC

Available Input Ranges

Current (Two): 4-20 mA, 0-20 mA

RTD: (One) 100 Ohm DIN RTD Standard Three Wire

Thermistor (One) - Consult Factory

Isolated Analog Output

The analog output is menu assignable to correspond to the Manifold Rate/Total, Temperature, Computed Density.

Type: Isolated Current Sourcing

Available Ranges: 4-20 mA, 0-20 mA

Resolution: 12 bit

Accuracy: 0.05% FS at 20° C

Update Rate: 1 update/sec minimum

Temperature Drift: Less than 200 ppm/C

Maximum Load: 1000 ohms (at nominal line voltage)

Compliance Effect: Less than .05% Span

60 Hz rejection: 40 dB minimum

Calibration: Operator assisted Learn Mode

Averaging: User entry of damping constant to cause a smooth control action

Isolated Pulse output

The isolated pulse output is menu assignable to Manifold Total.

Pulse Output Form: Photo MOS Relay

Maximum On Current: 100 mA

Maximum Off Voltage: 30 VDC

Saturation Voltage: 1.0 VDC

Maximum Off Current: 0.1 mA

Pulse Duration: 10 mSec or 100 mSec (user selectable)

Pulse output buffer: 256

Fault Protection

Reverse polarity: Shunt Diode

Serial Communication

The serial port can be used for printing, data recording, and/or communication with a computer.

RS-232:

Device ID: 01-99

Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19200

Parity: None, Odd, Even

Handshaking: None, Software, Hardware

Print Setup: Configurable print list and formatting

RS-485: (optional 2nd COM port)

Device ID: 01-247

Baud Rates: 2400, 4800, 9600, 19200

Parity: None, Odd, Even

Protocol: Modbus RTU (Half Duplex)

Setup Diskette Capabilities

Capabilities include: View Live Results Configure unit, Upload and Download to unit, Load and Save to file, Print Setup,

Data Logging Capabilities

Capabilities:

Permits unit to automatically gather data during use.

Data Log List:

User selectable: includes Large/Small Temperatures, Density, Viscosity, Large/Small and Manifold Ratemeters/Totalizers, Grand Totalizer, Time and Date, Fluid, Setpoint 1 & 2, Frequency 1 & 2, K-Factor 1 & 2.

Data Log Event Trigger:

selectable: includes interval, time of day, front key, external contact, end of batch

Data Log Format:

selectable: Printer format, Database CSV format

Data Transmission:

Selectable: Output may be transmitted immediately or held in data log for later polling

Remote Request Capabilities include:

Send data log, clear data log

External Modem Support Capabilities:

Compatibility: Hayes Compatible

Polling Capabilities:

Answers incoming calls, responds to requests for information of action

Call Out Capabilities:

Can initiate call on user selectable event condition, or upon error

Error Handling:

Supports multiple retry, automatic disconnect upon loss of line or remote inactivity

Fig. 1: Standard Dimensions

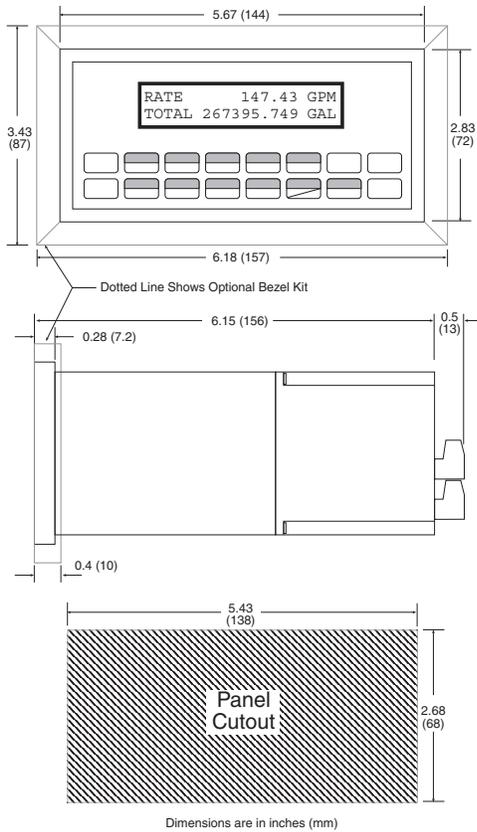
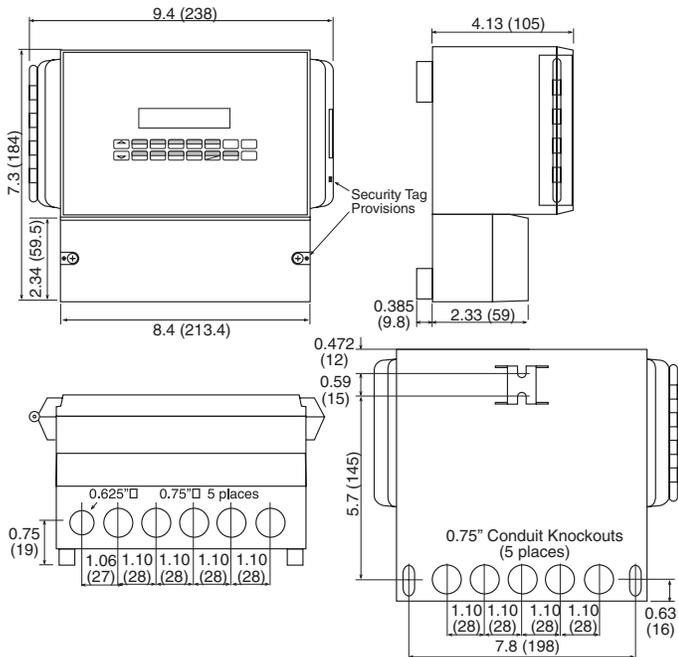


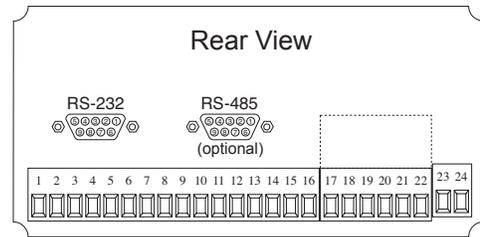
Fig. 2: Wall Mount (“W” mounting option) Dimensions



Terminal Designations

1	DC OUTPUT	FLOW	
2	PULSE IN 1 (Large)	IN	
3	PULSE IN 2 (Small)		
4	COMMON	Vin +	Temp. 2
5	RTD EXCIT +	Thermistor	Temp. 1
6	RTD SENS +	in +	Temp. 1
7	RTD SENS -	in +	Temp. 2
8	CNTR IN 1		
9	CNTR IN 2		
10	CNTR IN 3	SEE USER	
11	COMMON	MANUAL	
12	PULSE OUTPUT +		
13	PULSE OUTPUT -		
14	ANALOG OUTPUT +	4-20 mA	
15	ANALOG OUTPUT -		
16	NC	COM RLY3	NC
17	COM RLY1	26	NO
18	NO	27	NC
19	COM RLY2	28	NO
20	NC	29	NO
21	COM RLY4	30	NO
22	NO		
23	AC LINE	DC +	POWER IN
24	AC LINE	DC -	

Terminal Layout



Ordering Information

Example ST1MANIFOLDFC L 1 A 0 P

Series: _____

Display Type: _____
 L= LCD
 O= OLED
 V= VFD

Input Type: _____
 1= 110 VAC
 2= 220 VAC
 3= 12 VDC (10 to 14 VDC)
 4= 24 VDC (14 to 28 VDC)

Relays: _____
 A= 2 SPDT Relays
 B= 4 SPDT Relays (optional)

Network Card: _____
 0= None (STD)
 2= RS485/Modbus (optional 2nd COM port)

Mounting: _____

P= Panel Mount (see Fig. 1)
N= NEMA 4 Wall Mount (see MS811NEMAST4X)
W= NEMA 12/13 Wall Mount w/ Clear Cover (see Fig.2)
E= Explosion Proof (No Button Access) (see XHVD 7/4)

Options:
 TB= RS485 Terminal Block for Panel Mount Enclosure
 ET= Extended Temperature
 -4°F to 131°F (-20°C to 55°C)
 IM = Internal Modem
 M = Modem Power Option

Accessories:
 OPC/DDE Server for RS232 Port available, see EX5-UCOND-NA00
 OPC/DDE Server for Modbus Suite available, see EX5-MDBUS-NA00
 Modem Available, see MPP-56KN and MPP-2400N
 Serial printer available, see P1000, P295
 Ethernet Port Server available, see IEPS
 Ethernet Port Server Modbus TCP available, see ADAM4572
 RS-422/485 to RS-232 Communication Adapter available, see CA285
 RS232 Extender Cable: P/N=13220-<length in inches>