



ROOTS® EC-2 Industrial Flow Computer

S: EC-2
June, 1998



Description:

The ROOTS® EC-2 is a microprocessor based instrument designed to measure compensated flow in an industrial environment. Three analog inputs for temperature, pressure and flow are provided to measure the parameters needed to calculate the actual compensated mass, volume or heat flow.

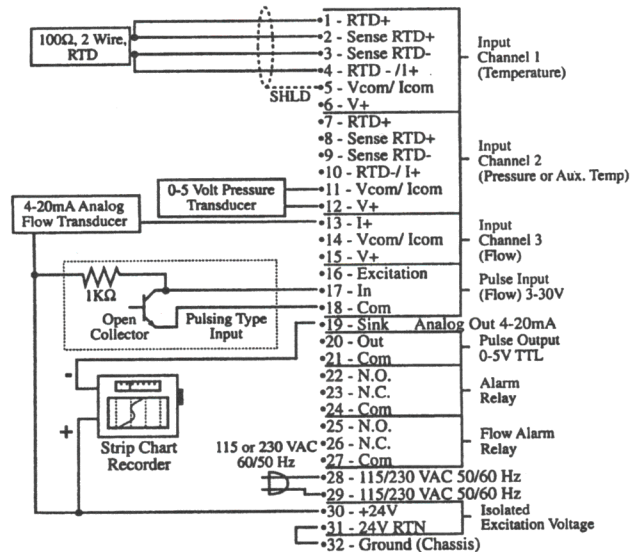
Special signal conditioning circuitry is included to allow direct connection of platinum resistance temperature detectors (RTD'S). A high speed digital input is provided to interface with pulse output type flowmeters. As an alternative, voltage inputs or current loops can be used for the above.

All instrument interface is with a 32 point screw terminal strip on the rear of the instrument.

Features

- Compensates Steam, Gases and Liquids for Temperature and Pressure to Yield Corrected Volume, Mass and Heat Flow.
- Two Line by 20 Character Super Twist Back-Lit LCD Display
- Square Root Extraction of DP Inputs
- 16 Point Linearization
- Displays Compensated Rate and Total Flow
- Takes a Direct 100 Ohms Platinum RTD
- Flow Rate, Temperature and Pressure Alarms
- 4-20 mA and Pulse Output Based on Compensated Flow
- Non-volatile Memory
- 24 Volt Excitation Provided
- Front Panel NEMA 4X/IP 65 Rated

TYPICAL HOOKUP:



Operation:

Through the 16 button, NEMA 4X/IP 65, front keypad, the operator enters all parameters necessary to configure the mass flow computer. One ROOTS® EC-2 will handle all of your mass flow requirements.

The type of flow equations desired (steam tables, ideal gas law or liquids) must be selected first. For steam flow and heat measurement, the 1967 ASME steam tables for both saturated and superheated steam are stored in memory. For gases, the ideal gas law is used. For liquids and heat calculations, factors are entered through the front keypad. Additionally, the following hardware parameters must be entered to configure the EC-2 input signal types (from the flow, temperature and pressure transmitters) along with their corresponding ranges or K factors; alarm set points may be entered; the output range for the 4-20 mA signal and the pulse output scaling factor. The operator can select, in any order, up to 16 parameters to display on the read out. If it is so desired, the operator then can lockout the unit from changes by entering a five digit lockout code.

Optional RS232 serial communications for ease of programming and timely printouts of flow results and/or parameters is available. If RS232 two way communications and the keypad are being used simultaneously, the serial port takes precedence.



Specifications:

Overall Accuracy: .25%
Operating Temperature: 32 to 122 F (0 to 50° C)
Storage Temperature: -10 to 160 F (-23 to 71° C)
Humidity: 0 to 90% Noncondensing
Front Bezel: NEMA 4X/IP 65
Case: ABS Plastic
Approvals: CE Approved, UL/CSA Pending

Power:

Nominal Line Voltage: 100, 110, 220 or 240 VAC (50/60 Hz)
24 VDC $\pm 20\%$ or 12 VDC $+20\%/-10\%$
Power Consumption: 10 Watts max

Input Specifications:

The following applies to all inputs. Inputs are referenced to signal ground. All ground terminals are connected internally.
Note: All inputs are single-ended with one leg grounded. The exception is the RTD input which is differential but is referenced to ground.

Transient protection: 100V 5 nsec

Analog Inputs:

Input Impedance: 100 Ohms
Range: 0-20mA, 4-20mA
Maximum sustained input voltage: 5 VDC (Fault Condition)
Resolution: $\pm .024\%$ FS

Voltage Inputs:

Input Impedance: 115 kOhms
Range: 0-5V, 0-10V
Resolution: $\pm .024\%$ FS

Temperature Inputs:

Compatible RTD type: 100 Ohms Platinum (a = .00385; DIN 43-760 Calibration)
Lead Wire Compensation: 4 Wire
Configuration: 2, 3 or 4 wire
Excitation Current: 2 mA typical
Max Fault Current: 15 mA
Max Volt on sense inputs: 50 VDC
Rejection of 50 or 60Hz signal: 40dB minimum (Automatically based on line frequency)
Raw Accuracy: $\pm .5$ C

Digital Flow Input: Range: 3-30 VDC Pulse
Max Input Frequency: 40kHz max
Min pulse width: 10 μ sec (with 40kHz filter)
Thresholds: OFF is less than 2.0V; ON is greater than 2.5V
Input Impedance: 40kOhms to ground.
Minimum Frequency to Maintain Rate Display: 5 Hz

Output Specifications:

Analog Output:
Range: 4-20mA DC, sink only.
Compliance Voltage Range: 3.0 - 24 VDC
Load Type: Non Inductive
Accuracy: $\pm .5\%$ FS
Update Rate: 1Hz

Relay Outputs:

One relay is a flow alarm output and a second is for other alarm conditions. Each has the following electrical specifications:
Type: Dry Contact, Form C
Contact Rating: 10A @ 115/230 VAC/28 VDC

Auxiliary Power Output: (AC powered units only)

Voltage: 24 VDC regulated and filtered
Isolation: 230 VAC max
Current: 0 to 100mA
Protection: Short Circuit Proof

Digital Flow Pulse Output:

This output is intended to drive a counter with a minimum input impedance of 1000 Ohms. It is compatible with TTL and 5V CMOS logic inputs. It is slow rate limited to help prevent RFI.

Output High Voltage:

No load: 4.5 Volts min
• 4.0 mA source: 4.0 Volts min

Output Low Voltage:

• No Load: 0.2 Volts max
• 4.0 mA sink: 1.0 Volts max

Output waveform: Symmetric square wave above 1Hz

• 100msec pulse below 1Hz
• Frequency Range: 0 to 50kHz
• Max Slew Rate: 27 Volts/ μ sec
• Sustained Fault Voltage for no permanent damage: 7 Volts
• Transient Protection: 1500V @ 50 μ sec

RS232 Communications:

Connector: 25 Pin Sub-D
Input Impedance: 3000 Ohms to 7000 Ohms
Compliance Voltage:
Output: -25 to -5 (Mark);
5 to 25 (Space); Volts
Input: -25 to -3 (Mark);
3 to 25 (Space); Volts

Protection: Short circuit proof.
Protocol: 8 bits, 1 Stop bit
Parity: None (Not monitored)
Available Baud Rates: 300, 1200, or 9600

Data Display & Keypad:

Internal 2 line by 20 character dot matrix, Backlit LCD display. Sealed, 16 key panel featuring numeric keys 0 - 9, plus the following keys:

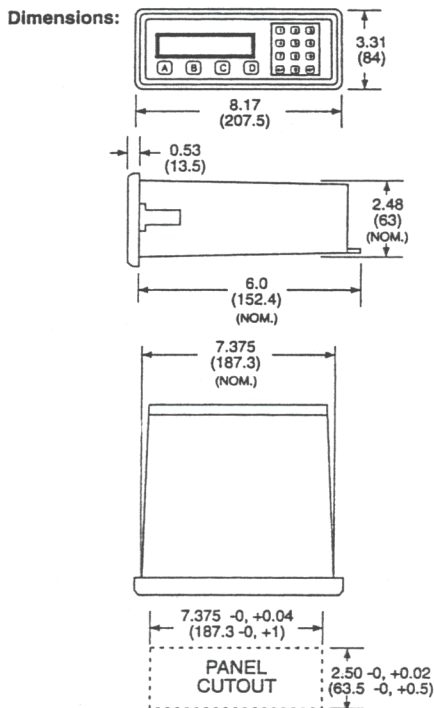
A - Advance through menus
B - Back up through menus
C - Cancel current menu selection
D - Decimal point key
ENT - General purpose enter or recall data key
CLR - Data clear key

Ordering Information:

Specify ROOTS® EC-2 with
a) 4-20 mA p/n 053217-001
b) 4-20mA & RS232 p/n 053217-002

Additional Parts:

a) Enclosure (1 cutout) p/n 013063-003
b) enclosure (2 cutouts) p/n013063-004



Dimensions shown
are inches
(millimeters)

POWER EQUIPMENT CO.

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