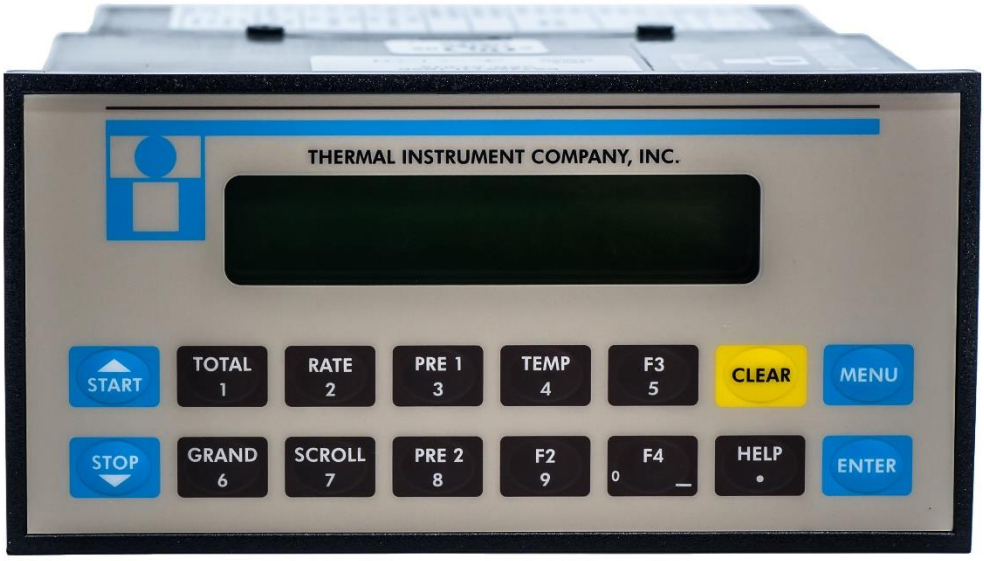
Thermal Instrument COMPANY

Flow meters and Flow Switches…. Over 60 years of experience!



9200B

FLOW COMPUTER

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Unit Description

1. Description

1.1 Unit Description:

The 9200B is a special purpose flow computer intended for use with Thermal Mass Flowmeters. The units of measure for flow rate and total can be entered by the user. An auxiliary, internal, high current, DC power supply is provided to power the Thermal Mass Flowmeters.

The 9200B accepts analog input from Thermal Mass Flowmeter and provides linearization of the sensor and scaling to the flow rate and total indicators. A variety of pulse output, analog outputs, control inputs, relay alarms, and RS-232 outputs are provided standard. RS-485 Modbus RTU is also an ordering option.

Enclosures are available suitable for panel, wall (Nema 4), benchtop, and explosion proof enclosure (Class 1 Div 1 Groups C+D) mounting schemes.

Unit Features

1.2 Unit Features:

The 9200B Flow Computer offers the following features:

- Thermal Mass Flowmeter Input
- Provides Isolated 24 VDC Output at 600 mA to Power Thermal Mass Flowmeter
- Two Line LCD Display
- Multiple Instrument Functions
- Menu Selectable Hardware & Software Features
- Isolated Outputs Standard
- Versatile RS-232 Port Standard
- DIN Enclosure with Two Piece Connector
- Optional Networking Cards
- Advanced Batching Features
- Also Suitable for Use with Volumetric Flowmeter Types

1.3 Specifications:

Flow Meters and Computations
Meter Types: Thermal Mass flowmeters plus all linear pulse and square law meters supported including: vortex, turbine, magnetic, PD, target, orifice, venturi and many others
Linearization: Square root, 16-point table or UVC table
Computations: Volume, Corrected Volume & Mass
Fluid Computations: Temperature, Density, Viscosity and API 2540 for petroleum.

Environmental
Operating Temperature: 0°C to +50°C
Storage Temperature: -40°C to +85 C
Humidity: 0-95% Non-condensing
Materials: U.L. approved

Listing
UUCUL Listed (File No. E192404), CE Compliant

Display
Type: 2 lines of 20 characters, Backlit LCD
Character Size: 0.3" nominal
User programmable label descriptors and units of measure

Keypad
Keypad Type: Membrane Keypad with 16 keys

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

Real Time Clock
The 9200B 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

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

110 VAC Power: 85-127 Vrms, 50 / 60Hz (11.0 VA)
220 VAC Power: 170-276 Vrms, 50 / 60Hz (11.0 VA)

Flow Inputs:
Analog Input:
Accuracy: 0.02% FS at 20° C
Ranges
Voltage: 0-40 VDC, 0-20 VDC, 4-20 VDC
Current: 4-20 mA, 0-20 mA
Basic Measurement Resolution: 16-bit
Update Rate: 4 updates / sec
Automatic Fault detection: Signal over / under-range, Current Loop Broken
Calibration: Software Calibration (no trimmers) and Auto-zero Continuously
Extended calibration:
Learns Zero and Full Scale of each range using special test mode.
Fault Protection:
Reverse Polarity: No ill effects
Over-Voltage Limit: 50 VDC Over voltage protection
Over-Current Protection: Internally current limited protected to 24VDC

Pulse Inputs:
Number of Flow Inputs: one with or without quadrature
Input Impedance: 10 KΩ nominal
Pullup Resistance: 10 KΩ to 5 VDC (menu selectable)
Pull Down Resistance: 10 KΩ 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 down to 0.01 Hz
Maximum Count Speed:
Menu Selectable: 40Hz, 3000Hz or 20 kHz
Overvoltage Protection: 50 VDC

Auxiliary / Compensation Input
The auxiliary / compensation input is menu selectable for temperature, density or not used. This input is used for the compensated input when performing compensated flow calculations. It can also be used as a general-purpose input for display and alarming.

Operation: Ratiometric
Accuracy: 0.01% FS at 20° C
Basic Measurement Resolution:
16-bit
Update Rate: 1 update / sec
minimum Automatic Fault detection:
Signal Over-range / under-range
Current Loop Broken
RTD short
RTD open
Fault mode to user defined default settings

Fault Protection:
Reverse Polarity: No ill effects
Over-Voltage Limit (Voltage Input): 50 VDC

Available Input Ranges
Voltage: 0-10 VDC, 0-5 VDC, 1-5 VDC
Current: 4-20 mA, 0-20 mA
Resistance: 100 Ohms DIN RTD

100 Ohm DIN RTD
(DIN 43-760, BS 1904):
Three Wire Lead Compensation
Internal RTD linearization learns ice point resistance
1 mA Excitation current with reverse polarity protection
Temperature Resolution: 0.01 C

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

Control Input Specifications
Input Scan Rate: 10 scans per second
Logic 1: 4-30 VDC
Logic 0: 0-0.8 VDC
Input Impedance: 100 KΩ
Control Activation:
Positive Edge or Pos. Level based on product definition for switch usage.

Excitation Voltage
Menu Selectable: 5, 12, 24 VDC @ 100 mA (fault protected)

Auxiliary DC Supply with High Current Capability
24 VDC 420 mA (600 mA Peak)

Relay Outputs
The relay outputs are menu assignable to (Individually for each relay) Low Rate Alarm, Hi Rate Alarm, Prewarn Alarm, Preset Alarm or General-purpose warning (security), low temperature / high temperature.
Number of relays: 2 (4 optional)
Contact Style: Form C contacts
Contact Ratings: 5-amp, 240 VAC or 30 VDC

Serial Communication
The serial port can be used for printing, datalogging, modem connection and 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.
Print Out: Custom form length, print headers, print list.
Print Initialization: Print on end of batch, key depression, interval, time of day or remote request.
RS-485:
Device ID: 01-247
Baud Rates: 2400, 4800, 9600, 19200
Parity: None, Odd, Even
Protocol: Modbus RTU (Half Duplex)

Data Logging
The data logger captures print list information to internal storage for approximately 1000 transactions. This information can be used for later uploading or printing. Storage format is selectable for Comma- Carriage Return or Printer formats.

Isolated Analog Output
The analog output is menu assignable to correspond to the Uncompensated Volume Rate, Corrected Volume Rate, Mass Rate, Temperature, Density, Volume Total, Corrected Volume Total or Mass Total. 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 Uncompensated Volume Total, Compensated Volume Total or Mass Total
Pulse Output Form: Open Collector
Maximum On Current: 25 mA
Maximum Off Voltage: 30 VDC
Saturation Voltage: 1.0 VDC
Maximum Off Current: 0.1 mA
Pulse Duration: 1OmSec or 100mSec
Pulse output buffer: 256
Fault Protection
Reverse polarity: Shunt Diode

Operating Mode
The Flow Computer can be thought of as making a series of measurements of flow, temperature/density sensors and then performing calculations to arrive at a result(s) which is then updated periodically on the display. The analog output, the pulse output, and the alarm relays are also updated. The cycle then repeats itself.

Step 1: *Update the measurements of input signals*-
Raw Input Measurements are made at each input using equations based on input signal type selected. The system notes the "out of range" input signal as an alarm condition.

Step 2: *Compute the Flowing Fluid Parameters*-
The temperature, viscosity, and density equations are computed as needed based on the flow equation and input usage selected by the user.

Step 3: *Compute the Volumetric Flow*-
Uncompensated flow is the term given to the flow in volume units. The value is computed based on the flowmeter input type selected and augmented by any performance enhancing linearization that has been specified by the user.

Step 4: *Compute the Corrected Volume Flow at Reference Conditions*- In the case of a corrected volume flow calculation, the corrected volume flow is computed as required by the selected compensation equation.

Step 5: *Compute the Mass Flow*-
All required information is now available to compute the mass flow rate as volume flow times density.

Step 6: *Check Flow Alarms*-
The flow alarm functions have been assigned to one of the above flow rates during the setup of the instrument. A comparison is now made by comparing the current flow rates against the specified hi and low limits.

Step 7: *Compute the Analog Output*-
This designated flow rate value is now used to compute the analog output.

Step 8: *Compute the Flow Totals by Summation*-
A flow total increment is computed for each flow rate. This increment is computed by multiplying the respective flow rate by a time base scaler and then summing. The totalizer format also includes provisions for total rollover.

Step 9: *Total Preset Comparisons*-
The total associated with a preset function is then compared against the corresponding preset value and any required control actions taken.

Step 10: *Pulse Output Service*-
The pulse output is next updated by scaling the total increment which has just been determined by the pulse output scaler and summing it to any residual pulse output amount.

Step 11: *Update Display and Printer Output*-
The instrument finally runs a task to update the various table entries associated with the front panel display and serial outputs.