HFC-100

Economical Heat Flow Computer

Features

- Heating and Cooling for Liquid (BTU) Calculations
- Pulse Inputs for Flowmeter; RTD Temperature Inputs
- Battery or 24-Volt or Loop Powered
- Pulse Output for Energy Value
- RS-485 Modbus RTU Option
- Liquid Crystal Display
- Monthly Data Storage of Heat Total and Cooling Total

DESCRIPTION

The HFC-100 is a economical energy flow computer intended for applications in energy transfer and heating/ cooling systems where the energy used is required to be measured. The energy used is measured based on the difference in temperature between a supply and return line and the quantity of fluid passing through the systems.

The volume of fluid is measured by means of a pulse generating flow meter sensor. The supply temperature is measured by means of a precision RTD sensor. A precision RTD sensor also measures the return temperature. The HFC makes the required calculations to determine the energy passing through the system and provides for totalization of the energy flow. Separate heat and cooling totalizers are provided.

The total energy as well as the individual measurements are displayed on a two line numeric display in the desired units of measure.

The unit is compatible with many flow meter types including turbine, paddle wheel, positive displacement types (including nutating disk water meters), and magnetic flow meters. Depending on the signal type available from the flow meter it will be wired to one of three available pulse input terminal pairs on the HFC-100.

Pulse input signals supported include magnetic pickup, contact closure and externally powered pulse input.
The unit can be configured to either manually or automatically sequence displays of volume flow rate, supply temperature, return temperature, energy flow rate on the top line of the display while displaying the energy totals on the bottom line of the display. Descriptors show which item is being displayed on the top line.

A scaled pulse output is provided for transmission of the total energy used to the building automation system. An optional 4-20mA analog output may be provided for the transmission of the rate of energy transfer passing through the system.

Communication options include RS485 Modbus RTU for on-site digital communications or RS232 or Telephone Modem connections.

The on-board data-logger automatically stores the monthly heating and cooling energy summary usage for later access.

A special calibration mode is provided for calibrating the two temperature inputs and the optional analog output

The unit is suitable for use with either the internally stored properties of water or with the user entered properties for other heat transfer fluids. User properties include a density table and a specific heat table.

Access to the programming mode and the resetting of totalizers is blocked by means of password and internal programming enable jumper. Their are provisions for sealing the cover.

APPLICATIONS

- Heating Only Application
- Cooling Only Application
- Combined Heating and Cooling Applications
- Heat Recovery Applications
- Condensate Recovery Applications
- Efficiency Measuring/Verification
- Solar and Geothermal Systems

INFORMATIONAL DISPLAYS

- Volume Flow rate
- Supply Temperature
- Return Temperature
- Difference Temperature
- Mass Flow rate
- Energy (Heat) Flow rate
- Volume Total
- Mass Total
- Energy (Heat)Total
- Energy (Cooling)Total

SPECIFICATIONS

POWER:

BATTERY POWERED
Supplied with 1 C size Lithium battery

EXTERNAL POWER INPUT
Voltage: 8.5 to 30 VDC
Current: Less than 5 mA
Supplied with 1 C size lithium battery
Protection: Reverse Polarity Protection on DC Power Input

BATTERY LIFE EXPECTANCY:

Expected Years of Operation for HFC-100 of various powering options at equipment duty cycles

MODEL	RUN TIME			
	Idle	2hrs/day	8hrs/day	24hrs/day
Battery	10 yrs	10 yrs	10 yrs	8.4 yrs
Loop	Indefinite operation when externally powered			

NOTE: Battery shelf life is rated at 10 years by manufacturer
Life expectancy based on rated battery capacity at 20°C
The above table is shown with pulse output inactive. Use of pulse output shortens battery life. Example: A pulse output of 0.06 sec. duration, once per second, would derate the battery life by 20%.

DISPLAY:

Rate Display: (selectable decimal)
5 Digits (99999), 0.35" High, Display updates once per second with battery power, 8X per second with DC power
Rate Descriptors: /SEC, /MIN, /HR, /DAY
Min. Input Frequency: 0.01 Hz to 10 Hz (selectable delay of 0.1 to 99.9 seconds)*
Selectable Rate Display Damping

Totalizer Display: (selectable decimal)
8 Digits (99999999), 0.2" High
Totalizer Descriptors: Decal Provided

Display is viewable from -22°F (-30°C) to + 158°F (70°C)
Warning Displays: Low battery warning

ACCURACY:
0.25% Reading, ±1 count
Temperature Drift: 50 ppm/°C Worst Case

ENVIRONMENTAL:

OPERATOR TEMPERATURE
Maximum Temperature: 0 to 50 degrees C

HUMIDITY
0 - 90% Noncondensing

MOUNTING STYLE:

NEMA4X keypad mounted outside opaque cover, with 1" union connection for turbine flowmeter.

FLOW INPUT:

MAGNETIC PICKUP INPUT
Frequency Range: 0 to 3500 Hz
Trigger Sensitivity: 10 mV p-p
Over Voltage Protected: ± 30 VDC

OPTO-ISOLATED DC PULSE INPUT
High (logic 1): 4-30 VDC
Low (logic 0): Less Than 1 VDC
Minimum Current: .5 mA
Hysteresis: 0.4 VDC
Frequency Range: 0 to 10 kHz
Min. Pulse Width: 0.1 msec

CONTACT CLOSURE INPUT
(momentary contact closure to common)
Internal Pullup Resistor: 100 KΩ to +3.6 VDC
High (logic 1): Open or 4-30 VDC
Low (logic 0): Less Than .5 VDC
Internal Switch Debounce Filter: 0 to 40 Hz

K-FACTOR
Range: 0.001 to 99999999
Decimal Point Locations: XXXX.XXXX to XXXXXXXX

TEMPERATURE INPUT

Type: Platinum Three Wire RTDs with lead Compensation
Temperature Range: 23°F to 356°F
Accuracy (each input): +/- 0.1 degrees
Display Resolution: 0.01 degrees
Temperature Sampling Rate: 15 seconds (60 seconds optional)

RESET INPUT: (momentary contact closure to common)
Internal Pullup Resistor: 100 KΩ to +3.6 VDC
High (logic 1): Open or 4-30 VDC
Low (logic 0): Less Than .5 VDC
Minimum On : 25 msec

PULSE OUTPUT:

The pulse output advances with the least significant digit of the totalizer or decimal multiples there of (see Pulse scale divider).

Type: Isolated photomos relay

Max. voltage (off state): 30 VDC

Current (on state): 100 mA

Pulse Duration: Selectable 0.5, 0.25, 0.125, 0.0625 seconds

Pulse Scale divider (Pulscale): User selectable, ÷1, ÷10, ÷100 or OFF

ANALOG OUTPUT OPTION:

Type: 4-20 mA follows heat flow rate display, Two wire hookup

Accuracy: 0.025% Full Scale at 20° C

Temperature Drift:

50 ppm/°C Typical

Reverse Polarity Protected

Update Rate: 8 times/second

NOTE: The HFC-100 uses the 4-20 mA loop power as its primary power source when this option is used. The battery is still required for standby battery operation.

DATA STORAGE:

Setup Information: Stored in flash memory

Totalizer: Stored in battery backed RAM but can be saved to flash memory by operator for recall after battery change out. Monthly Data Storage of Heat/Cooloing Totals.

RS-485 MODBUS and DATA LOGGER OPTION (S2):

The optional RS-485 card utilizes Modbus RTU protocol to access a variety of process parameters. The Data Logger stores the totalizer to flash memory once every month. The data logger can hold 13 months of heating and cooling totals, the oldest total in the logger is dropped. Requires external DC power: 6-28VDC (input is reverse polarity protected)

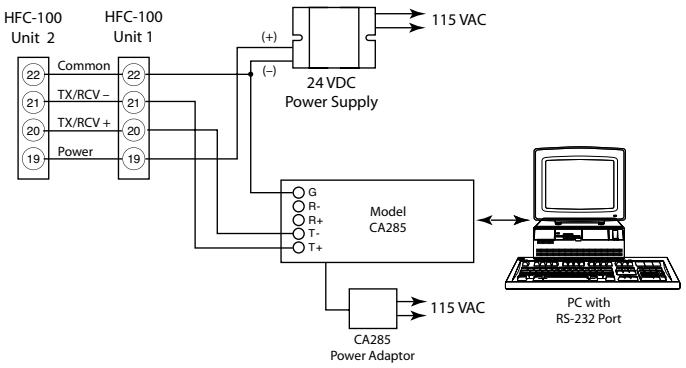
Current Draw:

Receiving: 2 mA

Transmitting: 125 mA (instantaneous peak)

Baud Rate (selectable):

110, 300, 600, 1200, 2400, 4800, 9600



WIRING CONNECTIONS

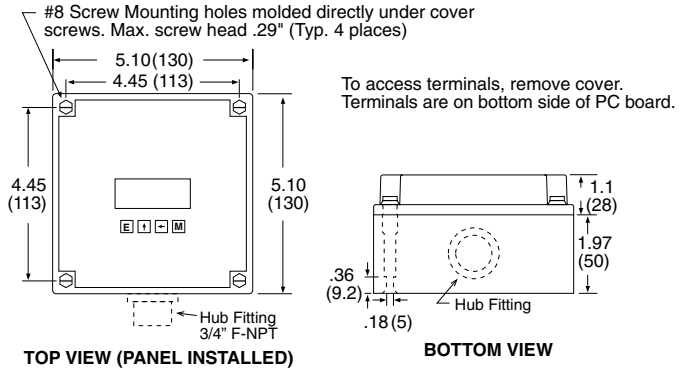
Terminal Block 1A, 1B

1 Mag Pickup Pulse Input
2 Mag Pickup Pulse Input
3 Signal Common
4 Reset Input
5 Contact Closure Pulse Input
6 Signal Common
7 Opto-Isolated Pulse Output -
8 Opto-Isolated Pulse Output +
9 Opto-Isolate Pulse Input -
10 Opto-Isolated Pulse Input +
11 Optional 4-20m Out -
12 Optional 4-20mA Out +
13 Cold RTD Excitation +
14 Cold RTD Sense +
15 Cold RTD Excitation -
16 Hot RTD Excitation +
17 Hot RTD Sense +
18 Hot RTD Excitation -

Terminal Block 2 RS485 Communications

19 • Power
20 • TX/RCV +
21 • TX/RCV –
22 • 120k Ω terminating resistor
23 • No Connection
24 • Common

DIMENSIONS:



Ordering Information

EXAMPLE: HFC-100 5 B S2

Series:

Power Supply:

A = Dual Battery
B = Single Battery
C = 4-20mA Output Option (loop powered)

RTD Resistance

1 = 100 ohm RTD
5 = 500 ohm RTD
10 = 1000 ohm RTD

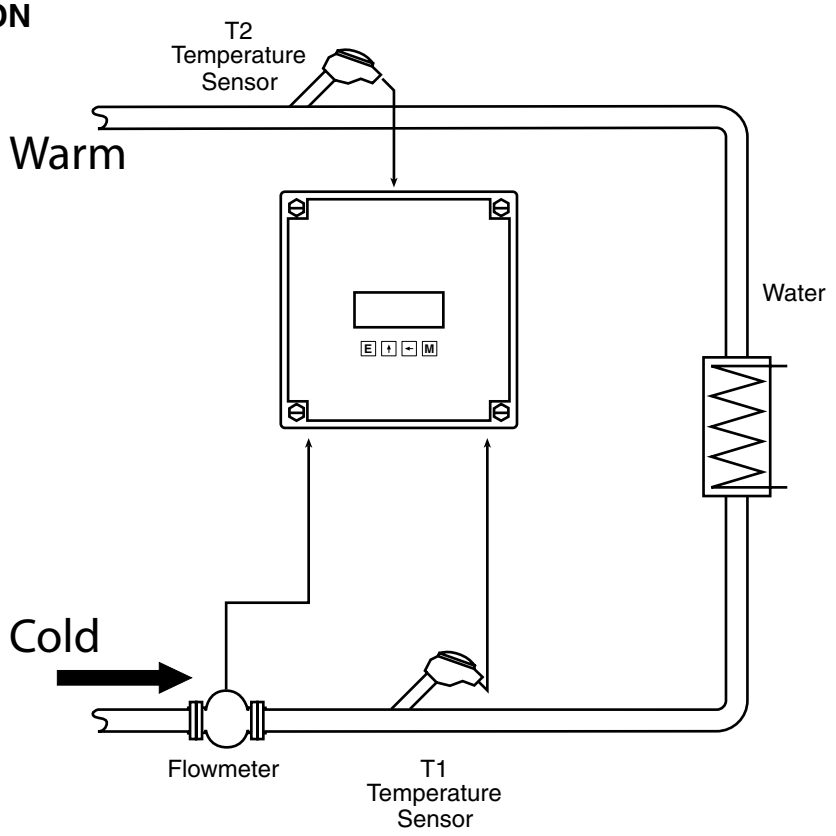
Options

S2 = Serial Communication: RS-485 Modbus RTU

Accessories

Matched RTD Sensors
Water Meters
LAN Gateways
DDE/OPC Servers
Remote Metering Software

TYPICAL APPLICATION
Liquid Delta Heat



Measurements:
Actual volume flow is measured by the flow element (Pulse Producing Flowmeter). Temperature of the supply and return lines are measured by the temperature sensors.

Calculations:
- The density, mass flow and delta heat are calculated using values of the heat carrying liquid stored in the flow computer.

Output Results:
- Display Results
  Heat/Cooling Rate or Volume Flow Rate, Heat Total, Cooling Total, Temperature1, Temperature2, Delta Temperature, Density,
- Analog Output
  Heat, Cooling or Volume Flow Rate, or Delta Temperature
- Pulse Output
  Heat, Cooling or Volume Total

Applications:
Calculate the energy which is extracted by a heat exchanger from heat carrying liquids.

Calculations

Water

$$\text{Heat} = \text{Volume Flow} \bullet \rho(T1) \bullet [h(T_2) - h(T_1)]$$

Other heat carrying liquids

$$\text{Heat} = C \bullet \text{volume flow} \bullet (1-\alpha \bullet (T_1-T_{ref}))^2 \bullet \rho_{ref} \bullet (T_2 - T_1)$$

WHERE: Delta T > Low Delta T Cutoff

α = Thermal expansion coefficient • 10^{-6}
C = Mean specific heat
$\rho(T1)$ = Density of water at temperature T_1
h(T1) = Specific enthalpy of water at temperature T_1
h(T2) = Specific enthalpy of water at temperature T_2
ρ_{ref} = Reference density
T_{ref} = Reference temperature

Kessler-Ellis Products
10 Industrial Way East
Eatontown, NJ 07724
Phone: (732) 935-1320 • (800) 631-2165
Fax: (732) 935-9344