

# System-40 BTU Measurement System

Chilled Water • Hot Water • Domestic Water



*ONICON's System-40 Series is a family of inline Btu meters that provide accurate, reliable energy, flow and temperature measurement for a variety of applications. System-40 Series meters range in size from 1/2" to 2 1/2" in diameter.*



## DESCRIPTION

System-40 Series BTU Meters provide highly accurate thermal energy measurement in water and water/glycol heating and cooling systems. Each meter includes an integral inline flow sensor and a pair of precision matched temperature sensors. The compact design also features an easy to operate user interface and is available in a number of different configurations.

## FEATURES

- **Reliable, No-Moving-Parts Design** - Wetted ultrasonic transducers sense the flow rate by measuring the differential transit time. Transducer orientation allows for a direct ultrasonic beam path. This significantly enhances both signal strength and long term reliability.
- **Highly Accurate Over a Wide Flow Range** - The flow sensor is accurate within  $\pm 1\%$  of reading over the normal (25:1 turndown) operating range and within  $\pm 2\%$  of reading over an extended (100:1 turndown) range.
- **Suitable for Water and Water/Glycol Solutions** - System-40's are field programmable for both water and water/glycol solutions to ensure accurate flow and energy measurement.
- **Matched Platinum 1000 $\Omega$  RTD Temperature Sensors** - Sensors are paired in a matching process that ensures a differential measurement uncertainty of better than  $\pm 0.18^\circ$  F.
- **User Friendly Calculator with Backlit Display** - The bright, easy-to-read, backlit display uses "smart button technology" to simplify page navigation and programming. This eliminates the need for special configuration tools.
- **Detachable Calculator** - The calculator for the System-40 is easily detached from the flow sensor. This allows for remote mount installation up to 5 ft from the sensor body.
- **Built-in Interval Data Logger** - Energy and volume totals are date/time stamped and logged within the meter along with other analytical data. This data is available via BACnet<sup>®</sup> or MODBUS<sup>®</sup>.

<sup>1</sup> - National Institute of Standards and Technology

## APPLICATIONS

Monitoring chilled water, hot water and condenser water AHU and CRAC units for:

- Commercial office tenant billing
- Residential apartment and condominium tenant billing

Monitoring renewable energy resources for:

- Solar thermal applications
- Ground source heat pumps
- Geothermal heating systems

## CALIBRATION

Each flow sensor is wet calibrated. Temperature sensors are then matched for differential accuracy. Functional system verification testing is performed on each complete meter. Absolute accuracy for calibration and testing is directly traceable to N.I.S.T.<sup>1</sup> and other national standards. A certificate of calibration is provided.



Meters with 1" and smaller process connections are provided with direct insertion temperature sensors. Thermowells are optional for these meters.

## CONFIGURATION OPTIONS

The System-40 is a flexible platform that is available with three factory configurable 2-wire signal connection ports and one RS485 interface.

- **Auxiliary Pulse Inputs** – All three 2-wire ports can be used as inputs for totalizing pulses from external devices such as water, gas or electric meters. Totals are displayed and transmitted to the network.
- **Programmable Pulse Outputs** – All three 2-wire ports can be used as contact closure outputs for totalization, alarm status, mode indication or coil indication (MODBUS® RTU only).
- **Analog Output** – One 2-wire port can be provided as an analog output to provide energy rate, flow rate or temperature data.
- **RS485 Serial Communications** – RS485 can be provided with BACnet® MS/TP or MODBUS® RTU to report energy, volume, temperature and operating status data to the network.

BACnet / MODBUS Data	
Name	Description
Energy	Rate / Total / Y-T-D Total / Prev. Yr. Total / User Resettable Total
Volume	Rate / Total / Y-T-D Total / Prev. Yr. Total / User Resettable Total
Temperature	Supply Temp / Return Temp / Delta Temp
Diagnostics	Meter Status / Signal Strength / Signal Quality / Speed of Sound
Trend Data	Energy Total / Volume Total / Peak Energy / Average Delta Temp / Meter Status



Meter couplings are provided for meters up to 2" in diameter. 2½" meters are provided with flanged process connections.

Meter Models with Flow Ranges in GPM							
Meter Size	Process Connection Type	Typical Design Flow	1% of Rate Range	2% of Rate Range	Min Flow	C <sub>v</sub>	Length with Couplings or Flanges
(Nominal Size)		(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(in)
½"	Male NPT	6.6	0.6 - 15	0.15 - 15	0.03	6.08	11.2
¾"	Male NPT	6.6	0.6 - 15	0.15 - 15	0.03	6.08	11.7
¾" (high flow)	Male NPT	11	1 - 25	0.25 - 25	0.05	8.81	11.7
1"	Male NPT	11	1 - 25	0.25 - 25	0.05	8.81	12.3
1" (high flow)	Male NPT	15.4	1.4 - 35	0.35 - 35	0.07	12.17	15
1¼"	Male NPT	26.4	3 - 60	0.6 - 60	0.12	20.26	15.25
1½"	Male NPT	44	5 - 100	1 - 100	0.2	33.85	17
2"	Male NPT	66	8 - 150	1.5 - 150	0.3	101.2	17.6
2½"	Class 150 Flange	110	12 - 225	2.5 - 250	0.5	156.2	11.81



Thermowells

Meters with 1¼" and larger process connections are provided with temperature sensors that are installed in thermowells.



## GENERAL SPECIFICATIONS\*

### ACCURACY

#### FLOW

- ± 1% of reading over 25:1 turndown
- ± 2% of reading over 100:1 turndown
- Overall turndown exceeds 500:1
- Repeatability:  $\leq \pm 0.2\%$
- Meets EN1434 Class 1 accuracy requirements

#### TEMPERATURE

- Field serviceable MID certified matched pair of 2-wire 1000 $\Omega$  platinum RTDs
- Calibrated to a differential measurement uncertainty of  $\pm 0.18^\circ\text{F}$
- Meets EN1434/C900.1 accuracy requirements for 3K sensors

#### CALCULATOR

- Computation error:  $\leq 0.09\%$  @  $30^\circ\text{F } \Delta t$
- Meets EN1434 Class 1 requirements with 3K minimum  $\Delta t$

### MECHANICAL

#### METER SIZES (Nominal Diameter)

- 1/2", 3/4", 1", 1 1/4", 1 1/2", 2" and 2 1/2"

#### PIPING SYSTEM CONNECTIONS

- Male NPT threads
- 2 1/2" meter provided with ANSI Class 150 raised face flanges

#### MAXIMUM OPERATING PRESSURE

- 400 PSI

#### PRESSURE DROP

- Less than 1 PSI at 4 ft/sec, decreasing at lower velocities

#### FLUID TEMPERATURE RANGE

- 32° F to 250° F

#### MATERIALS

- Wetted components: Lead-free brass, PEEK
- Enclosure: Polycarbonate

### ENVIRONMENTAL

- Meets EN1434/C900.1 Class A Requirements
- Operating Temperature Range:  $-13^\circ$  to  $131^\circ\text{F}$
- Storage Temperature Range:  $-14^\circ$  to  $158^\circ\text{F}$
- Enclosure Rating: IP65

### ELECTRICAL

#### POWER SUPPLY REQUIREMENTS

- 12-28 VAC, 50/60 Hz, 5 VA maximum
- 12-28 VDC, 5 W maximum

#### PULSE INPUTS, OUTPUTS, and ANALOG OUTPUT

The three 2-wire signal ports can be configured as pulse inputs or outputs. One of the ports can be configured as an analog output.

- Isolated totalizing pulse inputs** for use with sinking open collector or dry contact outputs
- Input rating: 30 VDC, 10 mA maximum
- Pulse duration: 50 msec minimum

- Isolated totalizing solid state contact closure pulse outputs** may be programmed for energy, volume, alarm indication, mode indication or coil indication (MODBUS® RTU only)

- Contact ratings: 50 mA, 30 V

- Contact pulse duration: 50, 100, 500/or 1000 ms

- Analog 4-20 mA, 0-5 V or 0-10 V output** for energy rate, flow rate, supply temperature, return temperature, or  $\Delta T$

#### NETWORK CONNECTION

- Isolated RS485 serial interface

#### COMMUNICATION PROTOCOLS

- BACnet® MS/TP per ASHRAE Standard 135.1: 2009
- MODBUS® RTU

#### NETWORK CONFIGURATION & ADDRESSING

- Baud Rates: 4800, 9600, 19200, 38400, 76800, or 115200
- Device Address Range: 1 – 255 (1 - 247 MODBUS® RTU)
- Device Instance Range: 1 – 4,194,303 (BACnet® only)
- Parity: None, Even, Odd (MODBUS RTU only)

### APPROVALS

- FCC: Part 15, Subpart B
- CE
- ANSI/NSF 61 & 372
- BTL Certified to ASHRAE 135:2009

\*Specifications subject to change without notice

### TYPICAL SYSTEM-40 INSTALLATION

(Meter may be installed in supply or return.)

