



Flow & Energy Metering For  
**CENTRAL ENERGY PLANTS**

# Flow and Energy Measurement for Central Energy Plants

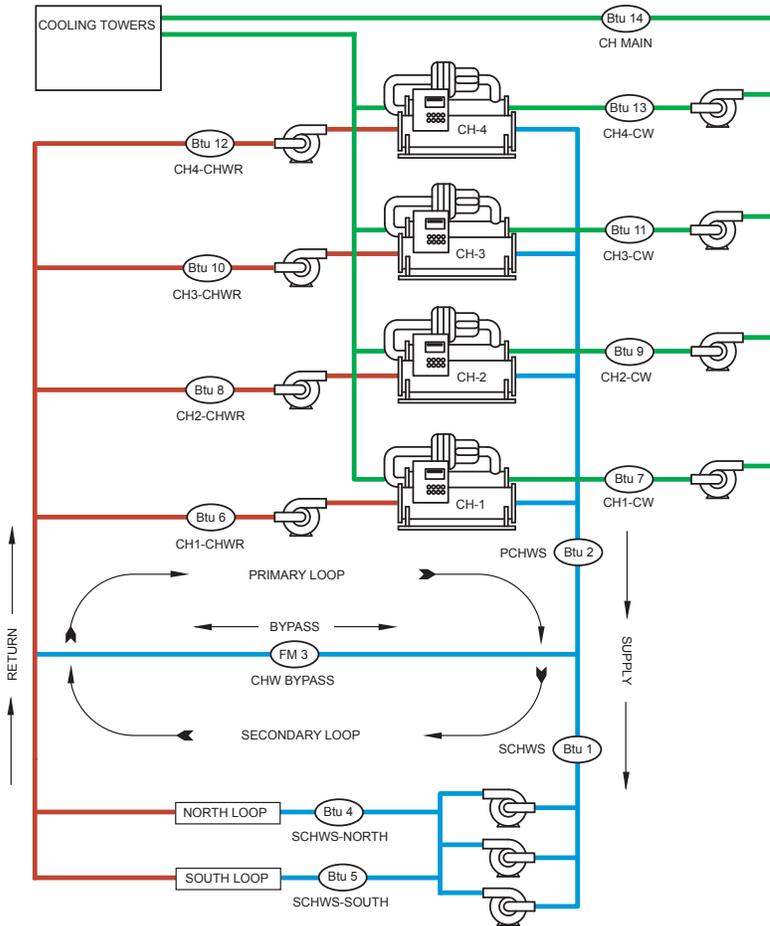
To ensure the highest return on investment, a comprehensive metering program is essential for managing today's complex central energy plants.

Accurate flow and energy measurement provides:

- Improved chiller plant control
- Real-time commissioning and balancing data
- Continuous monitoring of chiller performance (kW/ton)

Contributes to LEED points in multiple categories:

- New Construction - EA
- Core & Shell - EA
- Commercial Interiors - EA
- Existing Building; O & M - EA and WE



## A note on energy measurement in central plant environments...

ONICON's flow meters have become the recognized standard for accurate, reliable flow measurement at a reasonable cost.

Traditionally, energy calculations, if done at all, have been performed within the building automation system based on analog inputs from a flow transmitter and two temperature sensors. However, the effect of using typical HVAC grade flow and temperature sensors with analog control inputs for energy calculations is widely misunderstood, which can result in relatively high error for the energy calculation.

## ONICON has solved this problem...

ONICON's System-10 BTU Meters utilize a calibrated system approach to provide highly accurate flow, temperature and energy data. Furthermore, with a serial network communication option, this system can actually be less expensive than traditional energy calculation methods.

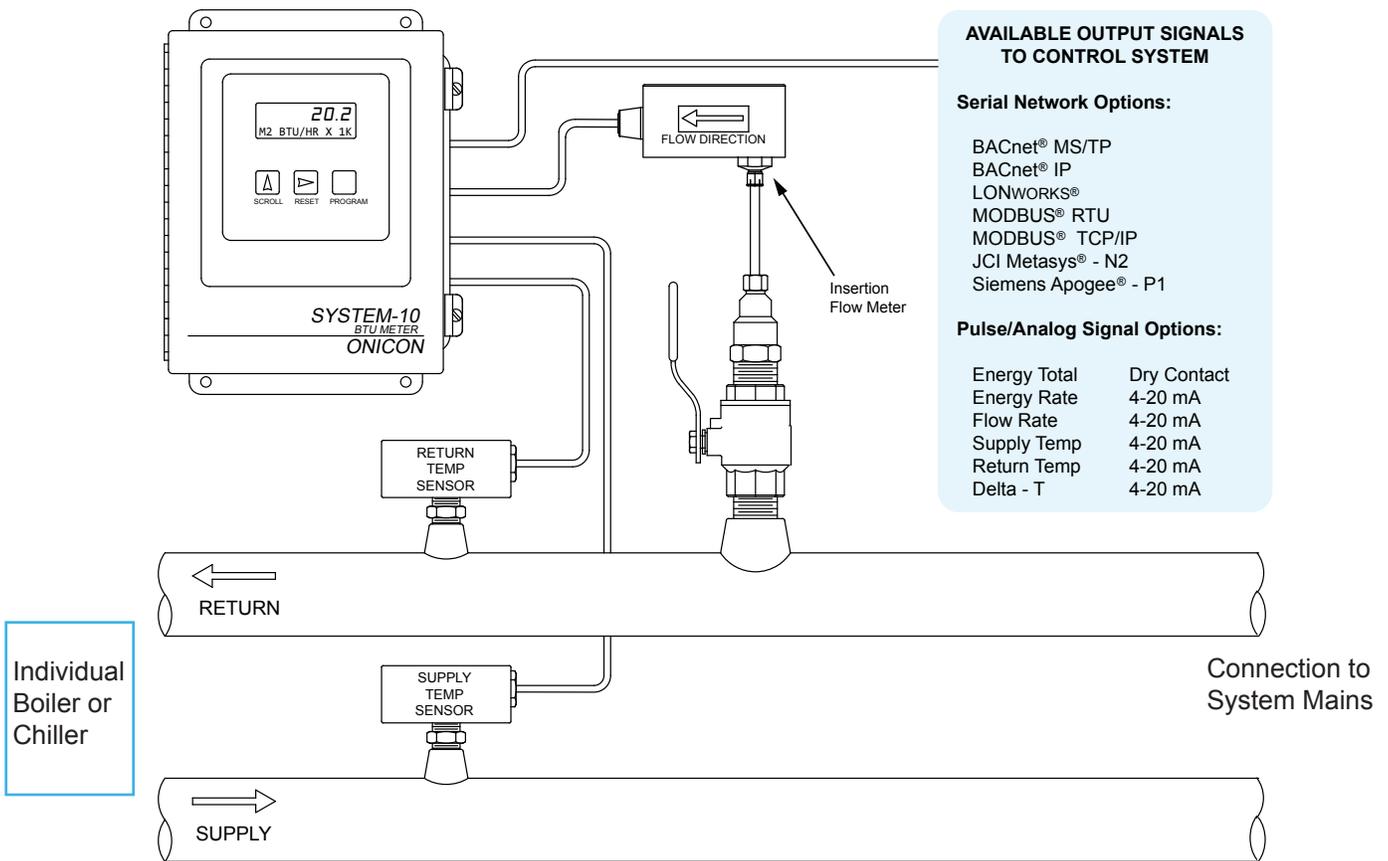
Contact an ONICON representative today to learn more about this exciting improvement in energy measurement.

## SAMPLE METER SCHEDULE

METER #	TAG	LINE SIZE	DESIGN FLOW (GPM)	FLOW METER	DISPLAY OR BTU METER	POINTS LIST
BTU 1	SCHWS	20	8,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 2	PCHWS	20	8,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
FM 3	CHW BYPASS	16	1,000	F-3100	D-100	gpm, flow direction
BTU 4	SCHWS-NORTH	12	3,500	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 5	SCHWS-SOUTH	14	4,500	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 6	CH1-CHWR	10	2,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 7	CH1-CW	12	2,500	F-3500	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 8	CH2-CHWR	10	2,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 9	CH2-CW	12	2,500	F-3500	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 10	CH3-CHWR	10	2,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 11	CH3-CW	12	2,500	F-3500	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 12	CH4-CHWR	10	2,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 13	CH4-CW	12	2,500	F-3500	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$
BTU 14	CW MAIN	24	10,000	F-1200	System-10	gpm, tons, ton-hrs, $T_{supply}$ $T_{return}$

# A Calibrated System for Energy Measurement

## Highly Accurate, Surprisingly Affordable



## Choose from the following flow measurement technologies:

### All ONICON flow meters offer:

- Individual wet calibration with certificate included.
- Accuracy to within  $\pm 1\%$  of rate (or better) over a wide flow range.
- Factory programming for your application - Ready to use right out of the box.

### Insertion Turbine



**F-1100 Series**  
**F-1200 Series**

#### Proven reliability and performance...

- Thousands of satisfied customers

#### Simple to Install...

- Hand insertable hot tap design

#### Highly Accurate...

- Patented dual-turbine design improves accuracy in limited straight run conditions

#### Wide Flow Range...

- Low mass turbines operate at very low flow rates

### Inline Electromagnetic

**F-3100 Series**  
**F-3200 Series**



#### Highly Accurate...

- Accuracy within  $\pm 0.2\%$  of reading
- Maintains accuracy in short pipe runs

#### Outstanding Reliability...

- Proven electromagnetic sensing technology
- No moving parts - ideal for cooling towers and other open loop applications

### Insertion Electromagnetic

**F-3500 Series**



#### Ideal Combination of Features...

- Magmeter technology with the price and flexibility of an insertion flow meter

#### Highly Accurate...

- Highly accurate over a wide flow range

#### Enhanced Reliability...

- Patented dual electromagnetic sensing technology
- No moving parts - ideal for cooling towers and other open loop applications

#### Simple to Install...

- Hand insertable hot tap design

# **Energy (Btu) Measurement System Specification For Central Energy Plant and Campus Applications (Chilled Water, Hot Water, Condenser Water)**



## **Energy Measurement System Specification**

The entire Energy Measurement System shall be built and calibrated by a single manufacturer, ONICON Incorporated, and shall consist of a flow meter, two temperature sensors, a Btu meter, temperature thermowells, and all required mechanical installation hardware. A certificate of N.I.S.T.\* traceable calibration shall be provided with each system. All equipment shall be covered by the manufacturer's two year warranty.

### **Btu Meter:**

Provide an ONICON System-10 BTU Meter. The Btu meter shall provide the following points both at the integral LCD and as outputs to the building control system: Energy Total, Energy Rate, Flow Rate, Supply Temperature and Return Temperature. Output signals shall be either serial network (protocol conforming to BACnet® MS/TP, BACnet/IP, LONWORKS®, JCI-N2, MODBUS RTU RS485, MODBUS RTU TCP, or Siemens-P1) or via individual analog and pulse outputs. Each Btu meter shall be factory programmed for its specific application, and shall be re-programmable using the front panel keypad (no special interface device or computer required).

### **Temperature sensors:**

Temperature sensors shall be loop-powered current based (mA) sensors and shall be bath-calibrated and matched (N.I.S.T.\* traceable) for the specific temperature range for each application. The calculated differential temperature used in the energy calculation shall be accurate to within +0.15° F (including the error from individual temperature sensors, sensor matching, input offsets, and calculations).

### **Flow Meter:**

Refer to meter schedule for specific flow meter type. The flow meter shall be installed either in the supply or return pipe of the system to be measured following the manufacturer's instructions with particular attention to upstream and downstream straight pipe runs. Insertion type flow meters shall be provided with all installation hardware necessary to enable insertion and removal of the meter without system shutdown and shall be hand insertable up to 400 psi.

### **Insertion Turbine Type:**

Provide an ONICON Model F-1200 Dual Turbine Flow Meter. The flow meter shall have two contra-rotating axial turbines, with electronic impedance-based sensing and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Each flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to N.I.S.T.\* A certificate of calibration shall be provided with each flow meter. Accuracy shall be within  $\pm 0.5\%$  of rate at the calibrated velocity, within  $\pm 1\%$  of rate over a 10:1 turndown (3.0 to 30 ft/s) and within  $\pm 2\%$  of rate over a 50:1 turndown (from 0.4 to 20 ft/s). Output signal shall be a 0-15 V square wave pulse.

### **Insertion Electromagnetic Type:**

Provide an ONICON Model F-3500 Insertion Electromagnetic Flow Meter. Materials of construction for wetted metal components shall be 316 SS. The flow meter shall average velocity readings from two sets of diametrically opposed electrodes. Each flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to N.I.S.T.\* A certificate of calibration shall be provided with each flow meter. Accuracy shall be within  $\pm 1\%$  of rate from 2-20 ft/s. Overall turndown shall exceed 80:1. Output signals shall be completely isolated and shall consist of the following: (1) high resolution frequency output for use with peripheral devices such as an ONICON display module or Btu meter, (1) analog output; 4-20 mA, 0-10 V, or 0-5 V jumper selectable, and (1) scalable dry contact output for totalization. Each flow meter shall be covered by the manufacturer's two-year warranty. Bi-directional meters shall be FB-3500 series and shall include an isolated contact closure output for directions.

### **Inline (full bore) Electromagnetic Type:**

Provide an ONICON F-3200 Series Electromagnetic Flow Meter complete with integral or remote electronics module. The electronics module shall include a backlit graphic display and keypad. Connections to the piping shall be ANSI class 150 flanges (ANSI class 300 available where required). The installing contractor is responsible for providing suitable mating flanges. The flow tube shall be epoxy coated steel; the sensing electrodes shall be 316 SS; the liner shall be polypropylene or ebonite for low temperature service, PTFE for hot water service. Each flow meter shall be individually wet-calibrated and accurate to within  $\pm 0.2\%$  of reading from 3 to 33 feet per second velocity. A certificate of calibration shall be provided with each flow meter. Output signals shall be 4-20 mA and programmable pulse. The flow meter shall be capable of measuring bi-directional flow. For installations in non-metallic pipe, install grounding rings between flanges. Each flow meter shall be factory programmed for its specific application, and shall be re-programmable using the integral keypad on the converter (no special interface device or computer required).

\* U.S. National Institute of Standards and Technology (or equivalent ISO standard)