



# ONICON

Flow and Energy Measurement

## SYSTEM-1000 FLOW AND ENERGY MEASUREMENT SYSTEM

ONICON's System-1000 Flow and Energy Measurement System is an advanced multi-channel interface for accurately measuring and reporting thermal energy usage, flow, temperatures, efficiency, and other engineering parameters required by today's high performance buildings.



## FLOW AND THERMAL ENERGY APPLICATION NOTE



FACTORY CONFIGURED



ON TIME DELIVERY



BEST CUSTOMER SERVICE

- Chilled Water • Heating Hot Water • Condenser Water •
- Domestic Hot Water • System Efficiency •

# Flow and Thermal Energy Application Note

## System-1000 Flow and Energy Measurement System



### DESCRIPTION

The System-1000 Flow and Energy Measurement System is a dual-channel BTU Meter that provides highly accurate thermal energy measurements in chilled water, hot water, condenser water, and domestic water systems.

Energy measurement is calculated by signal inputs from matched precision temperature sensors and any of ONICON's inline, insertion, or clamp-on style flow meters.

A maximum of eight (8) flow meters can be integrated into the System-1000. Two (2) are reserved for energy calculation, two (2) for auxiliary flow rate, and four (4) digital inputs for totalization or binary signals.

The System-1000 measures thermal energy and uses electrical energy data via an analog input to calculate the real-time coefficient of performance (COP). Each channel on the System-1000 allows for the addition or subtraction of two flow rates to solve challenging flow measurement locations.

The System-1000 provides multiple calculations of energy, flow, temperature, and efficiency data which is displayed and available to be transmitted via BACnet MS/TP or IP and analog and pulse outputs.



### WHY MEASURE THERMAL ENERGY?

Measuring thermal energy (BTU) on a commercial HVAC hydronic system is important for several reasons:

**Energy Efficiency:** Measuring thermal energy allows for monitoring the performance and efficiency of your HVAC system. By tracking the BTU usage, any inefficiencies or anomalies in the system can be identified, helping to optimize energy consumption and reduce operational costs.

**System Performance:** Measuring BTU helps evaluate the overall performance of the hydronic system. It provides insights into how effectively the system is managing flow, temperature, and thermal energy, ensuring that it meets the required comfort levels and operates within design specifications.

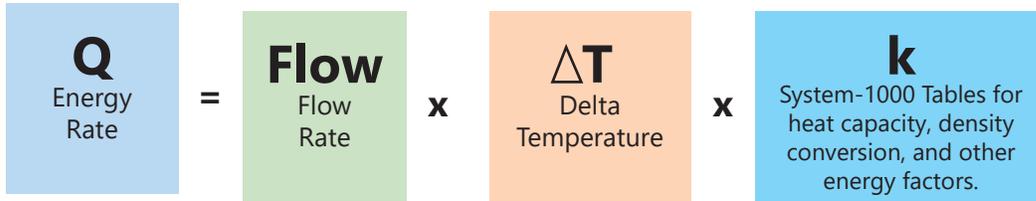
**Equipment Maintenance:** Thermal energy trend data can help pinpoint performance issues in the HVAC system. Unusual variations in thermal energy measurements can indicate problems such as leaks, pump failures, or control system malfunctions. Early detection helps prevent equipment breakdowns and allows for timely maintenance or repairs.

**Billing and Cost Allocation:** In commercial settings, thermal energy measurements are often used for billing purposes. By accurately measuring BTU usage, building owners or managers can allocate energy costs to different tenants or departments based on their actual consumption, promoting fairness and accountability.

**System Optimization:** BTU measurements provide valuable data for system optimization and future planning. By analyzing historical thermal energy data, you can identify patterns, trends, and peak demand periods. This information can guide decisions on system upgrades, capacity expansions, or energy-saving initiatives.

Overall, measuring thermal energy (BTU) on a commercial HVAC hydronic system is essential for energy management, system performance evaluation, maintenance, cost allocation, and optimization. It helps ensure efficient operation, cost savings, and improved comfort levels within the building.

### HOW DOES THE SYSTEM-1000 MEASURE FLOW AND ENERGY ACCURATELY?



When it comes to calculating hydronic energy rates, it is crucial to understand the impact of each variable in the energy equation. All terms carry equal weight in terms of their error contribution. This means that even if one term has a larger associated error, it will affect the accuracy of the overall calculation by that percentage error, regardless of the magnitude of the individual terms.

One of the most common sources of error in CHW/HW energy measurement is the Delta-T error. This error arises when using temperature sensors that are not matched and calibrated for a specific temperature range. When these sensors are used in a Btu meter to establish Delta-T for energy calculations, they introduce significant measurement uncertainties that go beyond the published absolute accuracy statement. Uncalibrated temperature sensors can contribute an error of 5-10% in a typical CHW energy calculation.

To address this issue, the System-1000 offers solid-state temperature sensors that are specifically designed to provide a high degree of accuracy and reliability for challenging energy measurement and cost allocation applications. Each sensor is bath-calibrated to within 0.01°F and characterized over an application-specific temperature range. The signal conditioner ensures a stable output signal over long wire runs. By programming the data for each sensor into the System-1000 meter, ONICON achieves better than 0.15°F Delta-T accuracy. As a result, ONICON temperature sensors contribute only 1.5% uncertainty in a typical CHW energy calculation.

To simplify the process and ensure accuracy, the System-1000 provides a complete package that includes BTU measurements, flow measurements, and matched temperature sensors. This package is specified, purchased, and installed as a complete factory-calibrated, NIST traceable system, guaranteeing the highest level of accuracy and reliability.

With ONICON's comprehensive solution, you can have confidence in the accuracy of your energy measurements and make informed decisions based on reliable data.

### APPLICATIONS

The System-1000 is ideal for measuring two of the following applications simultaneously:

TWO CHILLERS MEASUREMENT			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Chiller 1 - Evaporator	Make-up Water, COP	Chiller 2 - Evaporator	Make-up Water, COP

TOTAL CHILLER MEASUREMENT			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Chiller 1 - Evaporator	Make-up Water, COP	Chiller 1 - Condenser	Make-up Water, Blowdown Water

# Flow and Thermal Energy Application Note

## System-1000 Flow and Energy Measurement System



### APPLICATIONS (Continued)

CENTRAL PLANT MAIN MEASUREMENT			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Chilled Water Main	Make-up Water, COP	Condenser Water Main	Make-up Water, Blowdown Water

HW AND CHW BUILDING MEASUREMENT			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Building Chilled Water	Building Domestic Water	Building Hot Water	Not used but available

TWO BOILER MEASUREMENTS			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Boiler 1 - HW BTU	Make-up Water, Natural Gas	Boiler 2 - HW BTU	Make-up Water, Natural Gas

BUILDING STEAM DISTRIBUTION			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Building Hot Water	Supply Saturated Steam	Not used but available for a secondary system	

DOMESTIC ENERGY SYSTEM EXCLUDING RECIRCULATION LOSSES			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Supply Domestic Hot Water	Return Domestic Hot Water	Building Recirculation Losses	Not used but available

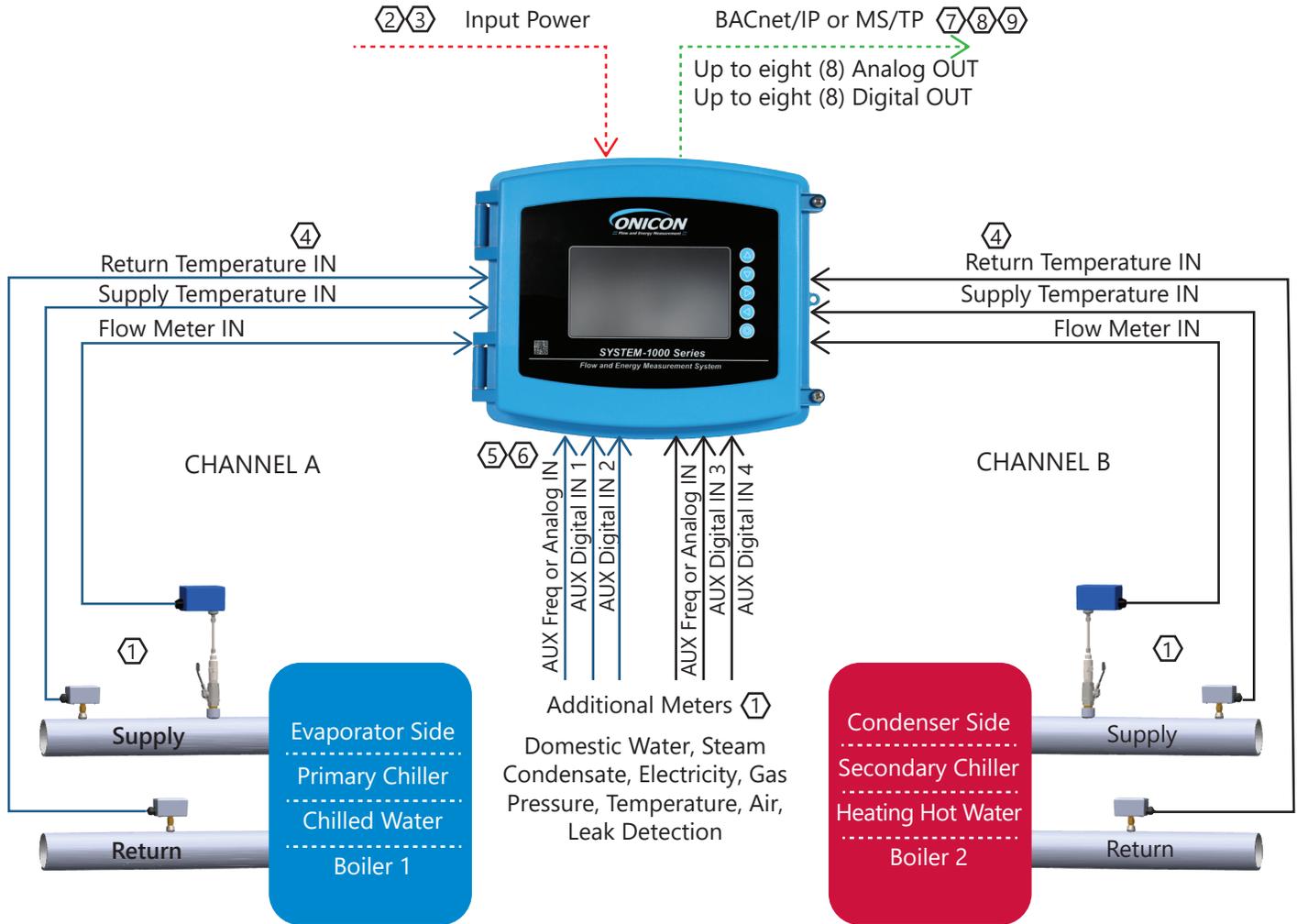
TOTAL DOMESTIC ENERGY SYSTEM INCLUDING RECIRCULATION LOSSES			
CHANNEL 1		CHANNEL 2	
Flow and Energy Measurements	Additional Measurements	Flow and Energy Measurements	Additional Measurements
Supply Domestic Hot Water	Not used by available	Building Recirculation Losses	Not used but available

# Flow and Thermal Energy Application Note

## System-1000 Flow and Energy Measurement System

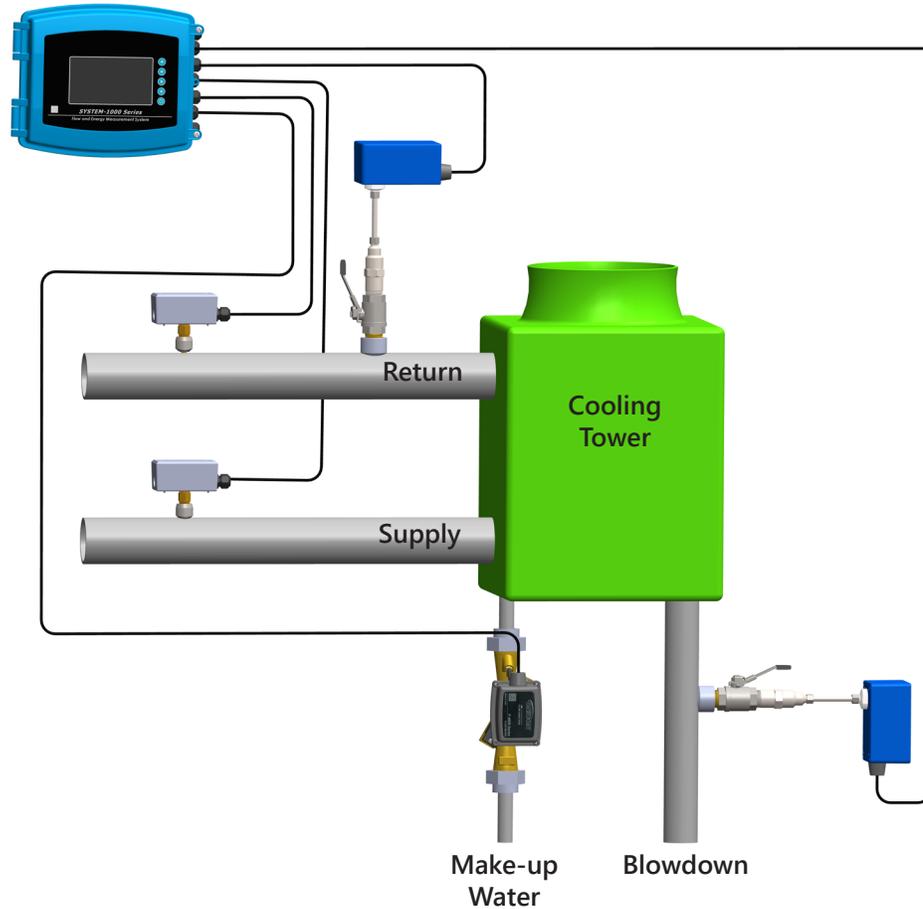


### TYPICAL INSTALLATION



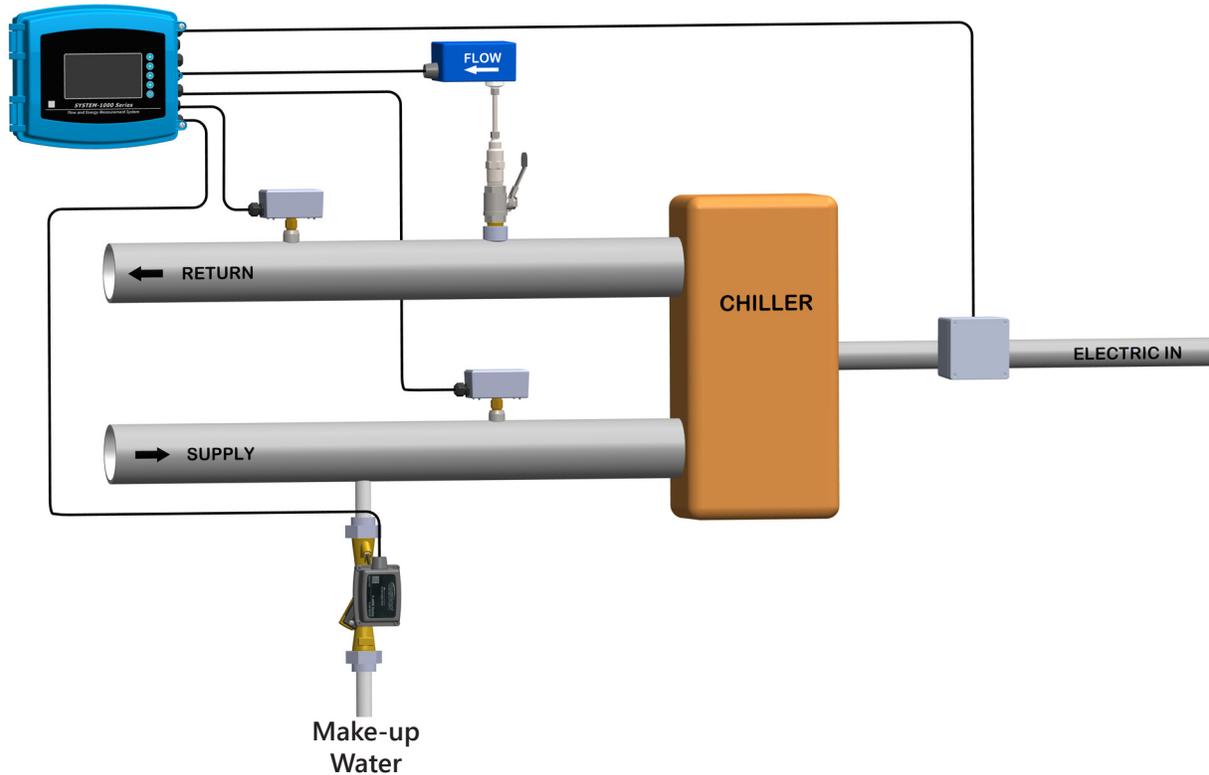
1. ONICON Flow Meters and Temperature Sensors are provided separately
2. Provide a Power supply 24VAC/DC, 100VA Class II or 120/230 VAC 50/60 Hz, 200VA
3. Provide sufficient power supply when the combined current of all devices connected to the SYS-1000 exceeds 1 Amp
4. Flow Meter and Temperature sensors used for thermal energy calculations
5. Auxiliary Digital Inputs are available for close contact alarm signals and totalization
6. Auxiliary Digital Inputs designed for Dry or Wet Contact and Open Collectors
7. Digital Outputs are available for Energy Totals, Flow Totals, Operating Modes, and Alarms
8. Analog outputs are available for Energy Rate, Flow Rate, Supply Temp, Return Temp, Efficiency, and Aux Inputs
9. BACnet® IP or MS/TP

### COOLING TOWER FLOW AND ENERGY MEASUREMENTS



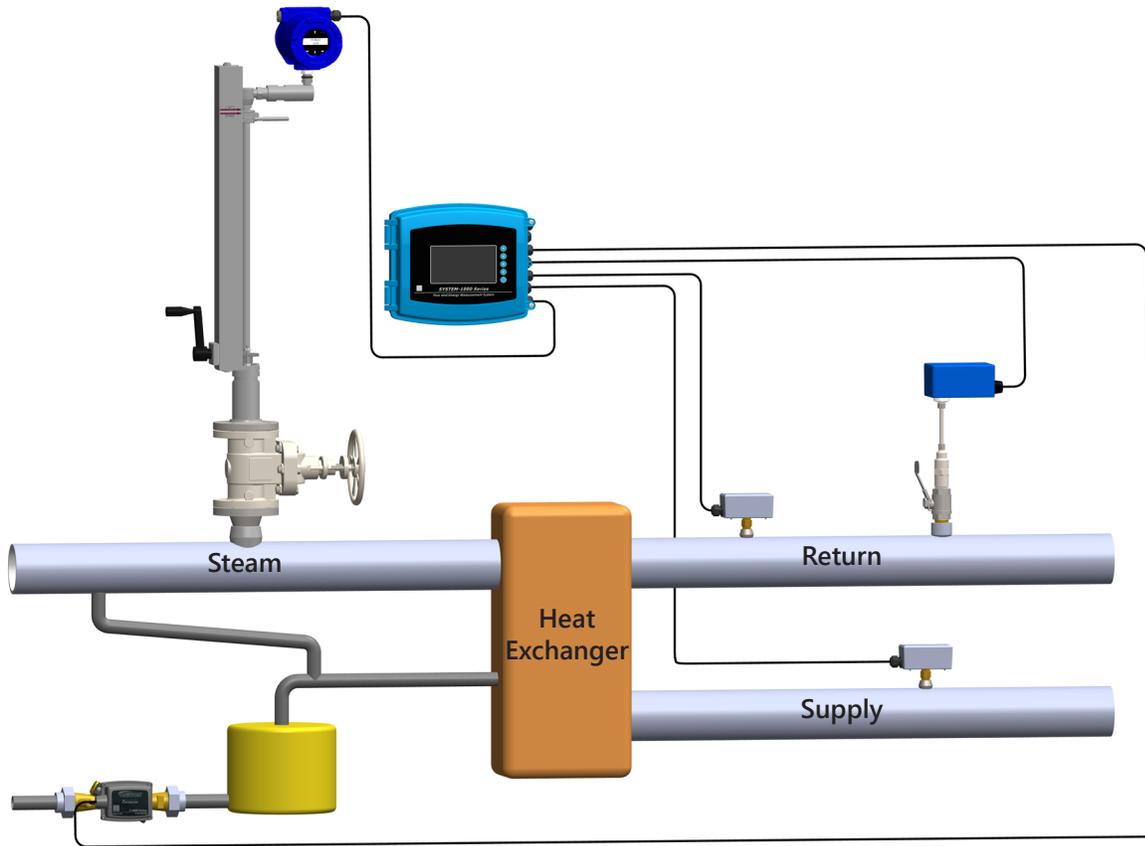
Measurement Integration Of:	System-1000	System-10
Condenser Water Flow Meter	√	√
Make-up Domestic Water Meter	√	
Cooling Tower Blowdown Meter	√	
Supply And Return Temperature Sensors	√	√
Outputs Available Over Remote Display, (4) Analog Out, BACnet IP, and MS/TP Outputs:		
Condenser Water Flow Rates	√	√
Cooling Tower Energy Consumption Rates	√	√
Total Volume Water Consumption From The Make-up Domestic Water	√	
Total BTU Is Consumed By The Cooling Tower	√	√
Supply, Return, And Delta-T	√	√
Blowdown Flow Rate	√	
Blowdown Totalization	√	

### CHILLER FLOW AND ENERGY MEASUREMENTS:



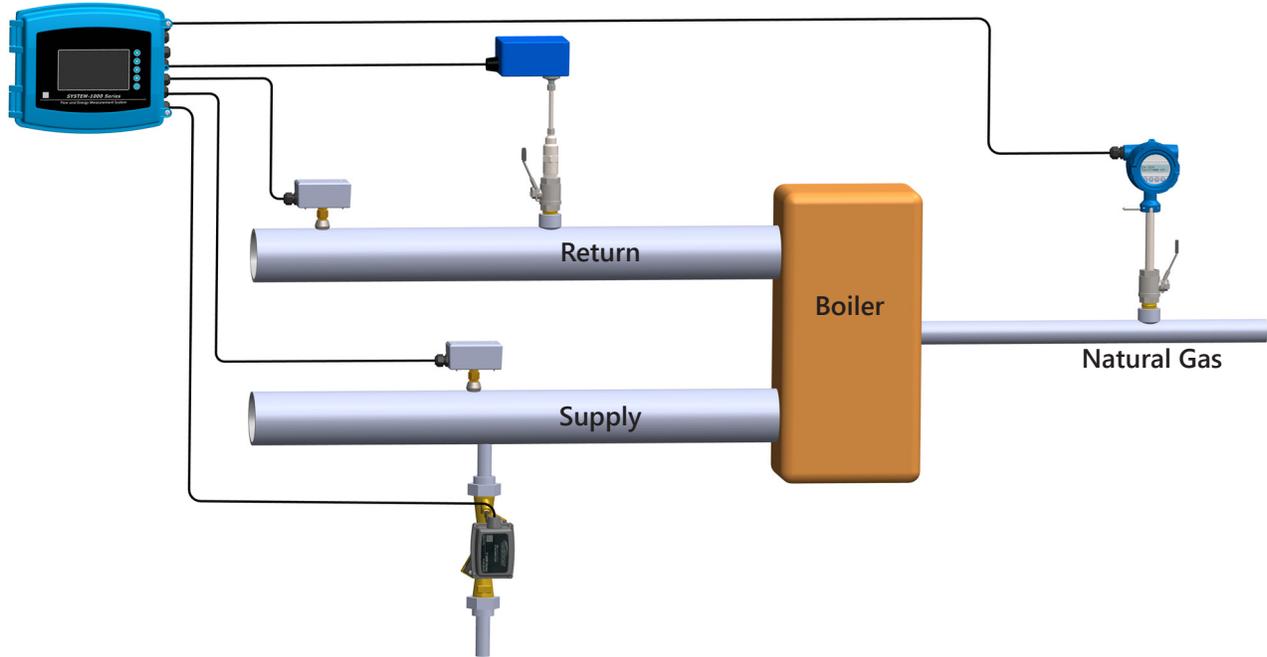
Measurement Integration Of:	System-1000	System-10
Chilled Water Flow Meter	√	√
Make-up Domestic Water Meter	√	
Electric Meter	√	
Supply And Return Temperature Sensors	√	√
<b>Outputs Available Over Remote Display, (4) Analog Out, BACnet IP, and MS/TP Outputs:</b>		
Chilled Water Flow Rates	√	√
Electricity Rate	√	
Chiller Energy (BTU) Production Rate	√	√
Total Electrical Consumption	√	
Total BTU Produced By The Chiller	√	√
Chiller Efficiency (COP)	√	
Supply, Return, And Delta-T	√	√

### HEAT EXCHANGER AND ENERGY MEASUREMENTS:



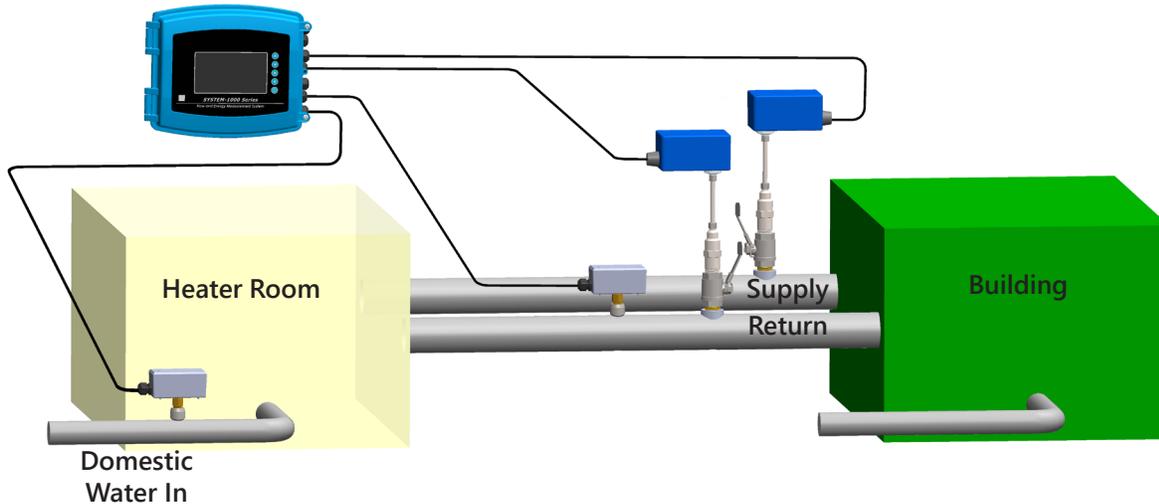
Measurement Integration Of:	System-1000	System-10
Heating Hot Water Flow Meter	√	√
Saturated Steam Flow Meter	√	
Supply And Return Temperature Sensors	√	√
Domestic Water Flow Meter	√	
<b>Outputs Available Over Remote Display, (4) Analog Out, BACnet IP, and MS/TP Outputs:</b>		
Heating Hot Water Flow Rate	√	√
Saturated Steam Flow Rate	√	
Energy (BTU) Exchange Rate	√	√
Total Pumped Steam Condensate	√	
Total BTU Consumed by Heat Exchanger	√	√
Supply, Return, And Delta-T	√	√
Heat Exchanger Efficiency (BTU/Lb of Steam)	√	
<b>Additional Integration Available With The System-1000:</b>		
A domestic water meter can be integrated to measure the total steam and water consumption of the building.	√	

### BOILER FLOW AND ENERGY MEASUREMENTS:



Measurement Integration Of:	System-1000	System-10
Heating Hot Water Flow Meter	√	√
Natural Gas Flow Meter	√	
Supply And Return Temperature sensors	√	√
Make-up Water Flow Meter	√	
Outputs Available Over Remote Display, (4) Analog Out, BACnet IP, and MS/TP Outputs:		
Heating Hot Water Flow Rate	√	√
Natural Gas Flow Rate	√	
Boiler Energy (BTU) Production Rate	√	√
Total Natural Gas Consumption	√	
Total BTU Produced By The Boiler	√	√
Boiler Efficiency (Thermal BTU Per CF Of Natural Gas)	√	
Supply, Return, And Delta-T	√	√

### DOMESTIC WATER FLOW AND ENERGY SYSTEM EXCLUDING RECIRCULATION LOSSES:



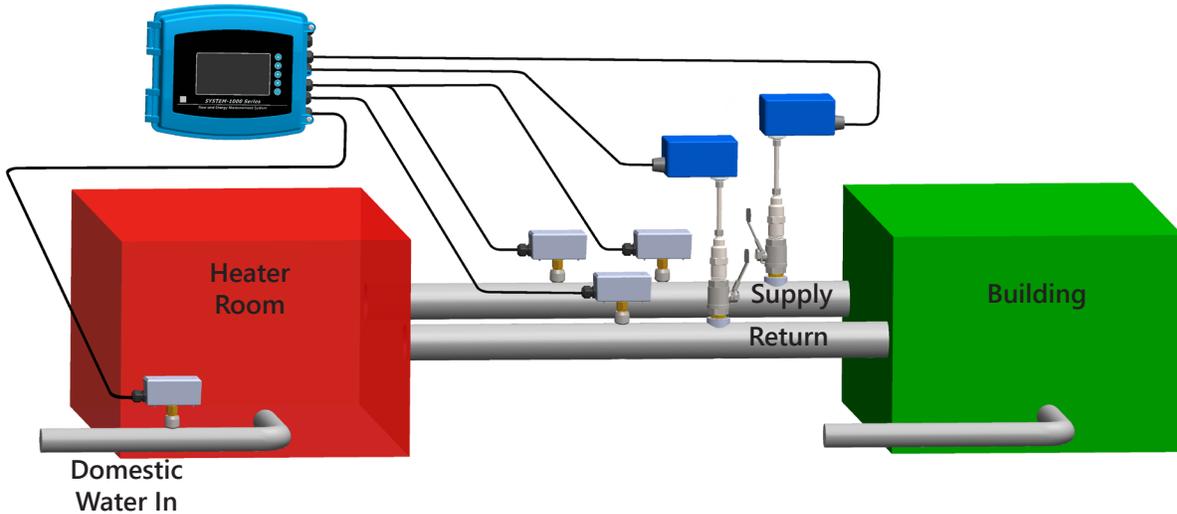
Measurement Integration Of:	System-1000	System-10
Domestic Hot Water Supply Flow Meter	√	
Domestic Hot Water Return Flow Meter	√	
DHW Make-up Flow Meter	√	
<b>Outputs Available Over Remote Display, (4) Analog Out, BACnet IP, and MS/TP Outputs:</b>		
Supply Domestic Hot Water Flow Rate	√	
Recirculate Domestic Water Flow Rate	√	
Energy (BTU) Rate Consumed By The Building	√	
Total Energy (BTU) Consumed By The Building	√	
Total Water Supply To The Building	√	
Total Water Consumption By The Building	√	
Supply, Return, And Delta-T	√	

# Flow and Thermal Energy Application Note

## System-1000 Flow and Energy Measurement System



### TOTAL ENERGY SUPPLIED INCLUDING RECIRCULATION LOSSES (Requires a Dual Channel Configuration):



Measurement Integration Of:	System-1000	System-10
Domestic Hot Water Supply Flow Meter	√	
Domestic Hot Water Return Flow Meter	√	
Hot Supply And Return Temperature Of The Building	√	
Hot Supply Temperature To Central Plant And Building	√	
<b>Outputs Available Over Remote Display, (4) Analog Out, BACnet IP, and MS/TP Outputs:</b>		
Supply Domestic Hot Water Flow Rate	√	
Recirculate Domestic Water Flow Rate	√	
Energy (BTU) Rate Consumed By The Building	√	
Energy (BTU) Rate Lost From The Recirculation Loop	√	
Total Energy (BTU) Consumed By The Building	√	
Total Energy (BTU) Lost From The Recirculation Loop	√	
Total Water Supply To The Building	√	
Total Water Consumption By The Building	√	
Supply, Return, And Delta-T	√	

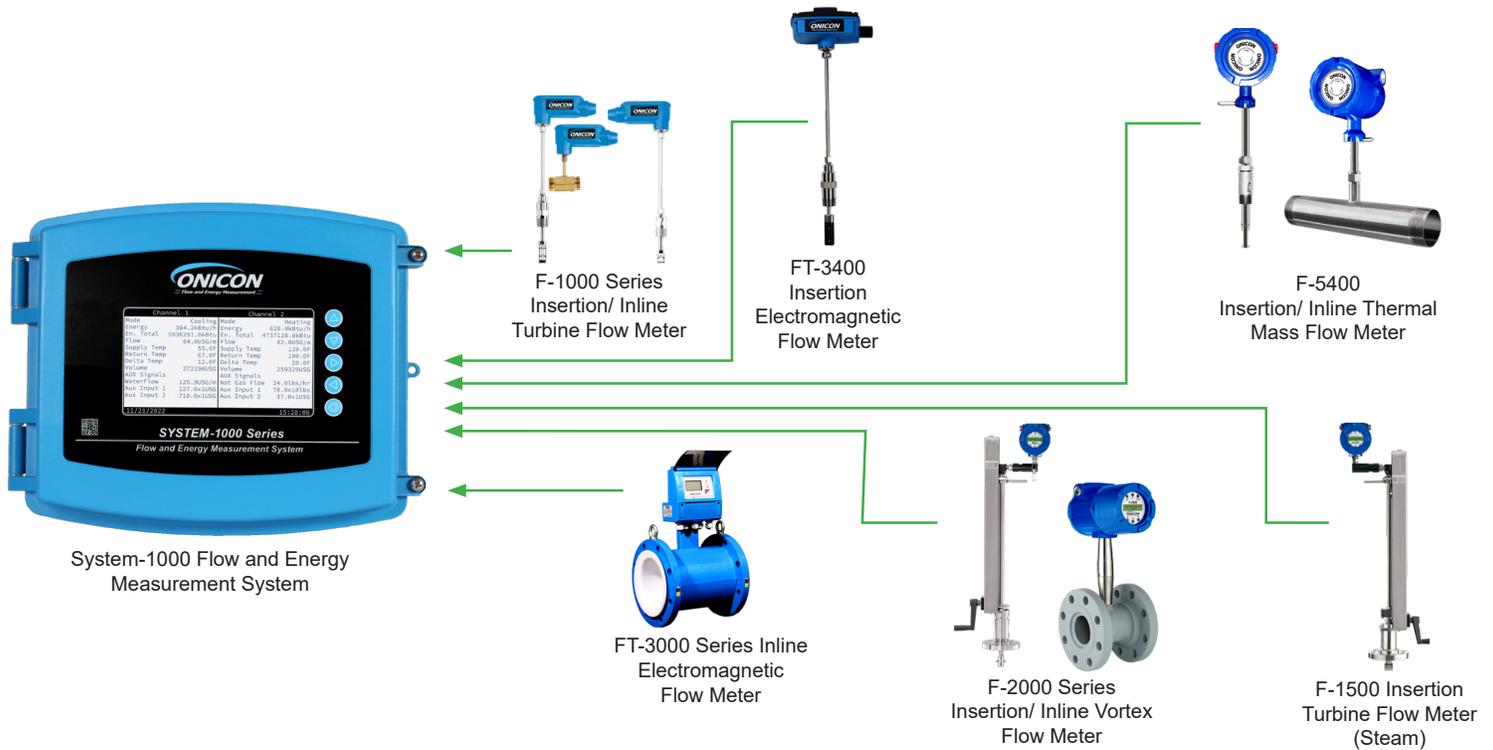
# Flow and Thermal Energy Application Note

## System-1000 Flow and Energy Measurement System



### SYSTEM-1000 FLOW AND ENERGY MEASUREMENT SYSTEM

The System-1000 is a multi-input interface that provides a single network point for up to eight devices. Its innovative design allows dual channel energy measurement and is the ideal solution to accurately measure and report thermal energy usage, flow, temperatures, and efficiency.



#### FEATURES:

- Total System Integration
- Dual Thermal Energy Measurement
- Multiple Flow Meter and Temperature Sensor Options
- Single Output Network Connection for up to 8 Meters
- Wall Space Reduction
- Simple Installation & Commissioning
- Limited Straight Run Solution
- Efficiency Calculations

## Quote Requests & Ordering



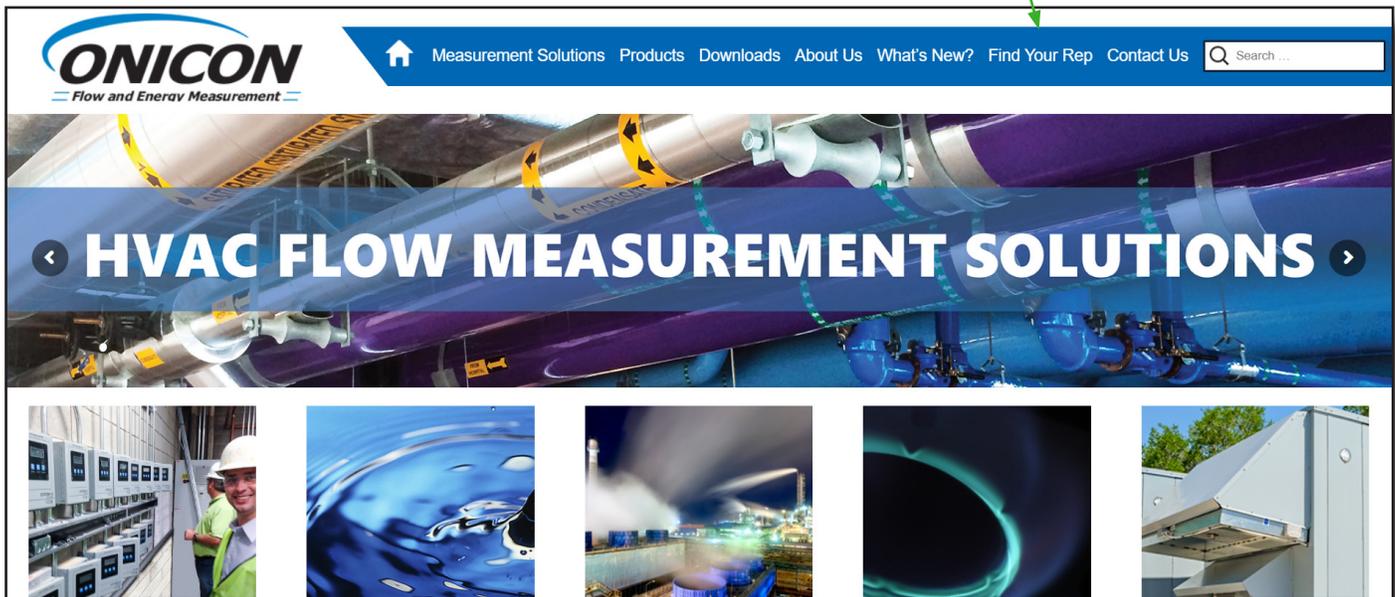
Find Your Rep

### *How do I get help with selecting the right meter or help with placing an order?*

ONICON has a global network of factory trained independent representatives who are ready to assist you. Use the "Find a Representative" tool on our web site to find your rep today. You can also call our office and ask to be contacted by your local representative.

Additionally, you can contact ONICON directly. ONICON has an experienced staff of knowledgeable sales engineers standing by to assist you. Call today or contact us online at [www.onicon.com](http://www.onicon.com). Send us an e-mail, use our online quote tool or send us a completed order form to request assistance at any time. Send your inquiry, quote request or completed order form to [sales@onicon.com](mailto:sales@onicon.com) today.

Find a Representative





We believe in our products, so should you.

**1 YEAR NO FAULT WARRANTY**  
**3 YEAR MANUFACTURER WARRANTY**



**READY TO GO...**

ONICON meters are wet-calibrated and configured to your specifications, **right out of the box.** This attention to detail simplifies installation and maximizes performance.

**LEADING THE WAY**  
**SINCE 1987**



For over 35 years, ONICON has been delivering quality engineered flow and energy measurement instruments for hydronic heating and cooling systems. Our flow meter technologies include: electromagnetic, turbine, ultrasonic, thermal, and vortex. We also offer BTU (energy) meters that integrate flow inputs from the technology of your choice. Experience the ONICON Difference today.