**System-1000 - Master Specification**

1. Flow and Energy Measurement in Hydronic Systems
   1. Products:
      1. Subject to compliance with requirements, for energy/BTU Meters in hydronic systems. American Made, Buy America Act FAR 52.225.1, ASHREA 62, field serviceable.
      2. Basis of Design: ONICON System 1000, or Pre-approved equal by
   2. Applications:
      1. Chilled Water and heating hot water systems.
      2. Chilled Water and Condenser Water Loops
      3. Total chiller performance and efficiency
      4. Boiler Performance and efficiency
      5. Campus Monitoring
      6. Thermal/Ice Storage
      7. Domestic Water, recirculation systems
      8. Water Source Heat Pump loops,
      9. Lake Solar, Geothermal, ground sourcing energy monitoring
      10. Institutional energy allocations
      11. Commercial Office Tenant Billing
      12. Central Plant Monitoring
      13. Performance Contracting Energy Monitoring
   3. Description:
      1. Single Source Responsibility: The entire Energy Measurement System including micro-processor-based flow computer, flowmeters, matched set of temperature sensors, mechanical installation hardware and cabling required for a complete system installation. The measurement system shall be configured for the specific application prior to delivery.
      2. A certificate of NIST\* traceable calibration shall be provided with each system. Installation, operating instructions and wiring diagrams shall be provided for each system.
      3. The contractor shall be responsible for selecting the meter options submitted based on the application. The system shall be constructed, calibrated, and scaled for the intended application in terms of pipe size, pipe material, installation requirements, expected energy rate, ambient conditions and fluid characteristics which include but are not limited to pressure, temperature and viscosity.

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* + 1. Each system 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)
    2. BTU Calculator: Computation error </= 0.09% @ 30-degree F delta T.
    3. Enclosure: NEMA 13, painted die cast aluminum enclosure, designed for wall or DIN Rail mounting.
    4. Backlit Alphanumeric display, energy total, energy rate, flow rate, supply temperature and return temperature.
    5. Non-Volatile EEPROM memory
    6. Power: 24VAC or 120-230VAC, electronics shall provide 24 Vdc @ 1000mA power to flow meters and electronics.
  1. Liquid Temperature Sensor Accuracy:
     1. Current (mA) based sensors: Provide two matched pair of loop powered, current (mA) based temperature sensors, wet calibrated over the intended application range against NIST traceable standards. Current (mA) signal shall be unaffected by wire length. Differential temperature measurement uncertainty within calibrated range shall be </= to +/- 0.15-degree F.
     2. Resistance Temperature Device (RTD): Provide two matched pair of 1000 Ohm platinum RTDs, wet calibrated to a differential measurement uncertainty of +/- 0.18-degree F over the stated range. RTD’s must meet EN1434/C900 accuracy requirements for 2K sensors.
  2. Calibration and Configuration: Each system shall be factory programmed for the specific application and each metering system component, including temperature sensors and flow meter, shall receive a certificate of calibration, directly traceable to N.I.S.T.
  3. Transmitter and Display: Provide an operator interface consisting of four pushbuttons and graphical interface. Display shall visually indicate two channels for dual thermal energy measurements and auxiliary inputs calculation, including total fluid volume, instantaneous flow rate, supply temperature, return temperature, delta temperature, thermal energy flow rate, thermal-energy flow total, auxiliary flow rate, auxiliary accumulation totals, alarm contact, and coefficient of performance (COP).
  4. Input signals:
     + - 1. (4) active frequency input
         2. (4) active analog input
         3. (4) open collector / Isolated dry contacts
         4. (4) passive temperature analog inputs
         5. (4) 1000 Ω RTD inputs
  5. Output signals:

1. RS485 serial network protocol, native BACnet MS/TP
2. IP network port, native BACnet IP,
3. (8) programmable dry contact
4. (8) active analog output signals
   1. Flow Meters: Refer to meter schedule for specific flow meter type. The flow meter selected shall be suitable for the specific application.
   2. Thermowell:
      1. Insertion, Pipe sizes ≤ 5”- ½” NPT brass construction, (Dry pipe installation)
      2. Insertion, Pipe sizes >= 6” - ½” NPT 316 stainless steel construction, (Dry pipe installation)
      3. Insertion, High Temperature >= 300° F, ½” NPT 316 stainless steel construction (Dry pipe installation)
      4. Insertion, Pipe sizes 1 1/4” to 48” ≤ 250° F brass construction, (Hot Tap-able)
      5. Insertion, Pipe sizes 1 1/4” to 48” ≤ 250° F 316 SS construction, (Hot Tap-able)
      6. Clamp-on, Pipe size 1 1/4” to 48”, Aluminum construction
      7. <Select one or multiples as required for each application>
   3. Listings and Certifications:
      1. Meter shall have FCC: Part 15, Subpart B
      2. Meter shall have CE approval.
      3. Meter shall be UL listed.
      4. Meters selected with BACnet shall have BTL Certification to ASHRAE 135:2009
   4. Warranty: Each system shall be covered by the manufacturer’s three-year warranty and 1 year No-Fault Warranty.
   5. Execution:
      1. Installation: System shall be installed according to the manufacturer’s recommendations.
      2. Connections: Install meters, transmitters/displays adjacent to machines and equipment to allow service and maintenance.
      3. Contractor shall be responsible for connecting all flow meter-system elements.
      4. The contractor shall be responsible for connecting thermal-energy meter transmitters to flow meters.
      5. 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 installation instructions with particular attention paid to upstream and downstream straight pipe runs.
      6. 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 insert able up to 400 psi.
      7. For installations in non-metallic pipes, install grounding rings or probes as required.
      8. Verify that temperature sensors, flow meter, thermowells are matched together.
      9. Wire per and per all local, state, and federal requirements and NEC requirements After installation, commission all meters according to manufacturer's written instructions.
   6. Commissioning:
      1. After installation, commission all meters according to manufacturer's written instructions.
      2. Adjust faces of meters and transmitters/displays to proper angle for best visibility. Refer to manufacturers written instructions.