DE 14-303

Wilson Engineering Services, PC
902 Market Street
Meadville, PA 16335
Office: (814) 337-8223

WES
Energy · Environment · Enterprise

February 18, 2015

NHPUC 27FEB'15PM12:31

Deborah A. Howland
Executive Director
New Hampshire Public Utilities Commission
21 South Fruit Street, Suite 10
Concord, NH 03301-2429

Re: MVRSD 3 – Enfield Village School Thermal REC Revised Application

Dear Ms. Howland,

Enclosed is Mascoma Valley Regional School District's (MVRSD) revised application for Renewable Energy Source eligibility for the Enfield Village School. This facility completed its installation in late 2013, and has implemented a metering protocol to meet the metering rules as per PUC 2506. This is being submitted along with 3 other school facilities by MVRSD.

The original application was for qualifying the facility through an Interim Alternative Metering Method for the period from January 1, 2014 through when the period for use of the Interim Method expires. MVRSD is submitting this revised application which describes ultimate metering protocol now in place.

WES thanks the PUC staff for all their efforts in making the Thermal RECs in NH a reality, and is pleased to submit this application. Please do not hesitate to call either MVRSD or me with any questions or clarifications on the application.

Sincerely,

Wilson Engineering Services, PC

Daniel A. Wilson, P.E
Vice President

Attachments:

- MVRSD 3 – Enfield Village School Thermal REC Revised Application

State of New Hampshire
Public Utilities Commission

21 S. Fruit Street, Suite 10, Concord, NH 03301-2429

DRAFT

APPLICATION FORM FOR

RENEWABLE ENERGY SOURCE ELIGIBILITY FOR CLASS I THERMAL SOURCES WITH RENEWABLE THERMAL ENERGY CAPACITY GREATER THAN 150,000 BTU/HR

Pursuant to New Hampshire Administrative Code PUC 2500 Rules

- Please submit one (1) original and two (2) paper copies of the completed application and cover letter* to:

  Debra A. Howland
  Executive Director
  New Hampshire Public Utilities Commission
  21 South Fruit Street, Suite 10
  Concord, NH 03301-2429

- Send an electronic version of the completed application and the cover letter electronically to executive.director@puc.nh.gov.

* The cover letter must include complete contact information and identify the renewable energy class for which the applicant seeks eligibility. Pursuant to PUC 2505.01, the Commission is required to render a decision on an application within 45 days of receiving a completed application.

If you have any questions please contact Barbara Bernstein at (603) 271-6011 or Barbara.Bernstein@puc.nh.gov.

Only facilities that began operation after January 1, 2013 are eligible.

Is this facility part of a Commission approved aggregation?

Yes X No ____

Aggregator's Company Name: WES Energy & Environment, LLC

Aggregator Contact Information: 902 Market St. Meadville, PA 16335

814-337-8223

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Attachment Labeling Instructions

Please label all attachments by Part and Question number to which they apply (e.g. Part 3-7). For electronic submission, name each attachment file using the Owner Name and Part and Question number (e.g. Pearson Part 3-7).

Part 1. General Application Information

Please provide the following information:

Applicant

Name: Mascoma Valley Regional School District SAU 62

Mailing Address: PO Box 789

Town/City: Enfield State: NH Zip Code: 03748

Primary Contact: Debra Ford

Telephone: 603-632-5563 Cell: 603-340-1101

Email Address: dford@mascoma.k12.nh.us

Facility

Name: Enfield Village School

Physical Address: 271 US Route 4

Town/City: Enfield State: NH Zip Code: 03748

If the facility does not have a physical address, the Latitude: _____ & Longitude _____

Installer

Name: Johnson Controls, Inc.

Installer License Number: n/a

Mailing Address: 116 Railroad Ave.

Town/City: Albany State: NY Zip Code: 12205

Primary Contact: John Sanborn

Telephone: _____ Cell: 518-894-8669

Email Address: john.b.sanborn@jci.com

If the equipment was installed by the facility owner, check here: ☐

Facility Operator

If the facility operator is different from the owner, please provide the following:

Name: Roger Hutchins

Facility Operator Telephone Number: 603-306-6281

Independent Monitor

Name: Adam S. Kohler, P.E.

Mailing Address: 27 Mechanic Street

Town/City: Keene State: NH Zip Code: 03431

Primary Contact: Adam S. Kohler, P.E., Kohler and Lewis Engineering

Telephone: (603) 352-4841 / (603) 686-5346 Cell: (603) 969-6459

Email Address: adam@kohlerandlewis.com

NEPOOL/GIS Asset ID and Facility Code

In order to qualify your facility's thermal energy production for RECs, you must register with the NEPOOL – GIS. Contact information for the GIS administrator follows:

James Webb
Registry Administrator, APX Environmental Markets
224 Airport Parkway, Suite 600, San Jose, CA 95110
Office: 408.517.2174
jwebb@apx.com

Mr. Webb will assist you in obtaining a GIS facility code and an ISO-New England asset ID number.

GIS Facility Code # NON 43519 Asset ID #

1. Has the facility been certified under another non-federal jurisdiction's renewable portfolio standards?

Yes [ ] No [X]

If you selected yes, *please provide proof of certification in the form of an attached document as Attachment 1-1.*

2. Attach any supplementary documentation that will help in classification of the facility as Attachment 1-9

Part 2. Technology Specific Data

All Technologies

Fuel type (solar, geothermal, or biomass): Biomass

Rated Thermal Capacity (Btu/hr): 191,000

Date of initial operation using renewable fuels: December, 2013

Biomass

If a thermal biomass facility, provide proof of New Hampshire Department of Environmental Services approval that the facility meets the emissions requirements set forth in Puc 2500, as Attachment 2-1.

Solar Thermal

If a solar thermal facility, please provide the Solar Rating and Certification Corporation rating based on Mildly Cloudy C (kBtu/day): _____

Geothermal

If a geothermal facility, please provide the following:

The coefficient of performance (COP): _____

The energy efficiency ratio of the system: _____

Part 3. Metering and Measurement of Thermal Energy and REC Calculations

This section deals with the thermal metering system including methods for calculation and reporting useful thermal energy. **A copy of PUC 2506.04 of the RPS rules is included as Appendix A.**

Using the table below, identify the thermal metering system or custom components (e.g., heat meters, flow meters, pressure and temperature sensors) used to measure the useful thermal energy and enter the accuracy of measurement for the entire system:

System or Component	Product name	Product Manufacturer	Model No.
Flow meter	Dual insertion flow meter	Onicon Inc.	F-1210
Temp sensor	Temperature sensor	Johnson Controls	TE-631AM-2
Total System Accuracy (Percent)	±2% for HS ±1% for Indian River, Enfield Village & Canaan E's		

Attach component specification sheets (Accuracy, Operating Ranges) as Attachment 3-1. ✓

Attach a simple schematic identifying the location of each sensor that is part of the metering system as Attachment 3-2. ✓

Check the applicable standard for meter accuracy prescribed in Puc 2506.04 among the six choices below (compliance with Puc 2506.04 shall be certified by a professional engineer licensed by the state of New Hampshire and in good standing):

If the facility is a large thermal source using a liquid or air based system, check the method that applies:

A. Installation and use of heat meters capable of meeting the accuracy provisions of European Standard EN 1434 published by CEN, the European Committee for Standardization. The heat meter shall have the highest Class flow meter that will cover the design flow range at the point of measurement and a temperature sensor pair of Class 5K or lower. [✓]

B. Installation and use of meters that do not comply with European Standard EN 1434, provided that the manufacturers' guaranteed accuracy of the meters is ±5.0% or better, [ ]

C. Use of an alternative metering method approved pursuant to Puc 2506.06. [ ]

If the facility is a large thermal source using a steam-based system, check the method that applies:

D. Installation and use of meters with accuracy of ±3.0% or better. [ ]

E. Installation and use of meters with system accuracy that do not meet D but are ±5% or better. [ ]

F. Use of an alternative metering method approved pursuant to Puc 2506.06. [ ]

Please summarize the manufacturer's recommended methods and frequency for metering system calibration and provide reference for source document (e.g. owners/operators manual):

2 yr warranty for certified flow calibration - Onicon Inc. information

REC Calculation Discount factor for meter accuracy (Enter 0 if no discount is required): 0 %

If the meters used to measure useful thermal energy comply with the accuracy of the European Standard EN 1434 for liquid systems or use of meters with accuracy of ±3.0% or better for steam systems enter zero, for all other systems enter the sum total of the manufacturer's guaranteed accuracy of the meters used or the accuracy of the alternative method approved pursuant to Puc 2506.06.

REC Calculation Discount factor for operating energy and thermal energy losses: 2 %

Check the method used for determining the operating energy and thermal loss factor among the choices below:

Default Factor [2%]

- For sources using solar thermal technology, the discount factor shall be 3.0% of the useful thermal energy produced;
- For sources using geothermal technology, the discount factor shall be 3.6% of the useful thermal energy produced;
- For sources using thermal biomass renewable energy technology, the discount factor shall be

2.0% of the useful thermal energy produced.

Actual Metering

- Include a simple schematic identifying the operating energy and thermal energy losses and placement of the meters.

Interim Alternative Metering Method

Until such time as the Puc 2500 rule is finalized applicants may utilize an alternative method as described in the draft rule 2505.02(e)(2):

> *In lieu of the information required by Puc 2505.02 (d) (11) through (13), a thermal source may submit a detailed explanation of the methodology used to measure and calculate thermal energy and an attestation by a professional engineer that is licensed in New Hampshire and in good standing that the methodology for measuring useful thermal energy and calculating certificates is sound.*

Part 4. Affidavits

Owners Affidavit

The following affidavit must be completed by the owner attesting to the accuracy of the contents of the application pursuant to PUC 2505.02 (b) (14).

AFFIDAVIT

I, Debora Ford have reviewed the contents of this application and attest that it is accurate and is signed under the pains and penalties of perjury.

Applicant's Signature _____ Date 1/29/15

Applicant's Printed Name Debora Ford

Subscribed and sworn before me this 29th Day of January (month) in the year 2015

County of Grafton State of New Hampshire

_____

Notary Public/Justice of the Peace Seal

My Commission Expires _____

KENDRA D. WITHINGTON
Notary Public - New Hampshire
My Commission Expires June 4, 2019

NH Professional Engineer Affidavit

AFFIDAVIT

I, Glenn R. Thomas, PE attest that this facility meets the requirements of the thermal REC eligibility requirements of Puc 2500, including the thermal metering and measurement methodologies and standards and REC calculation methodologies.

Professional Engineer's Signature _____ Date 1/24/15

Professional Engineer's Printed Name Glenn R. Thomas

NH Professional Engineer License Number 11500

PE Stamp

STATE OF NEW HAMPSHIRE
GLENN R. THOMAS
No. 11500
LICENSED
PROFESSIONAL ENGINEER

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

August 5, 2014

Debra A. Howland
Executive Director and Secretary
New Hampshire Public Utilities Commission
21 South Fruit Street, Suite 10
Concord, NH 03301-2429

Re: Recommended Certification as a Class I Thermal Renewable Energy Source
Mascoma School District (Mascoma)
Canaan and Enfield, NH

Dear Ms. Howland:

The New Hampshire Department of Environmental Services (DES) was contacted by Charles Niebling of Innovative Natural Resource Solutions on behalf of Mascoma School District (Mascoma) requesting certification of the wood pellet boilers located at Mascoma as a Class I thermal renewable energy source. DES recommends that the Public Utilities Commission (PUC) grant approval to Mascoma as a Class I thermal renewable energy source eligible to generate renewable energy certificates. A summary of the facility description, DES's review of best management practices (BMP) requirements, and a recommendation for approval are presented below.

Facility Description

Facility Name: Mascoma School District (Mascoma)
Facility Locations:

Indian River School, Canaan
Mascoma Valley Regional High School, Enfield
Canaan Elementary School
Enfield Village School, Enfield

Gross Nameplate Capacity:
80 kW or 273,000 BTU/hr x 3
56 kW or 191,000 BTU/hr x 5
Primary Fuel: wood pellets

Emissions

By definition, "*Thermal biomass renewable energy technologies*", requires units rated less than 3 MMBtu/hr gross heat input to meet best management practices (BMP) as established by DES for

control of particulate matter (PM) and nitrogen oxides (NOx) emissions. DES herein establishes BMP as conducting boiler tune-ups annually and conducting combustion efficiency testing initially and annually demonstrating results equal to or greater than 99%.

BMP Confirmation

Test data for carbon monoxide (CO) and carbon dioxide (CO_2) concentrations in the exhaust gas were used to determine combustion efficiency using the following equation:

$CE(\%) = 100 \times CO_2 / (CO_2 + CO)$

Where:

CE = combustion efficiency

CO_2 = % by volume of carbon dioxide in the flue gas, and

CO = % by volume of carbon monoxide in the flue gas.

The results of the initial tests indicate that the combustion efficiency meets the required 99%. DES anticipates that Mascoma will be able to meet ongoing BMP annually.

Conclusion and Recommendation for Approval

DES believes that Mascoma currently meets, and annually will meet, the requirements to be certified as a Class I - New Biomass thermal renewable energy source. DES recommends that the PUC certify Mascoma as a Class I thermal renewable energy source eligible to generate thermal renewable energy certificates, on the condition that Mascoma annually demonstrates that BMP continue to be met.

If you have any questions, please contact me at joseph.fontaine@des.nh.gov or (603) 271-6794.

Sincerely

Joseph T. Fontaine
Trading Programs Manager
Air Resources Division

HVAC, Plumbing, and Piping Systems Design
HVAC Systems Commissioning

Thomas Engineering Associates, P.C.
PO Box 1420, 4429 Main St., 2B
Waitsfield, Vermont 05673
www.TEA-VT.com
Tel: (802) 316-8888
Fax: (802) 583-1054

February 10, 2015

John Sanborn
Johnson Controls, Inc.
116 Railroad Ave.
Albany, NY 12205

RE: Mascoma Schools
BTU Meters installations Certification

John,

This is to certify that the following equation is applicable for the calculation of BTUs used at the subject schools, identified in the as-built installation plans attached to the certification package:

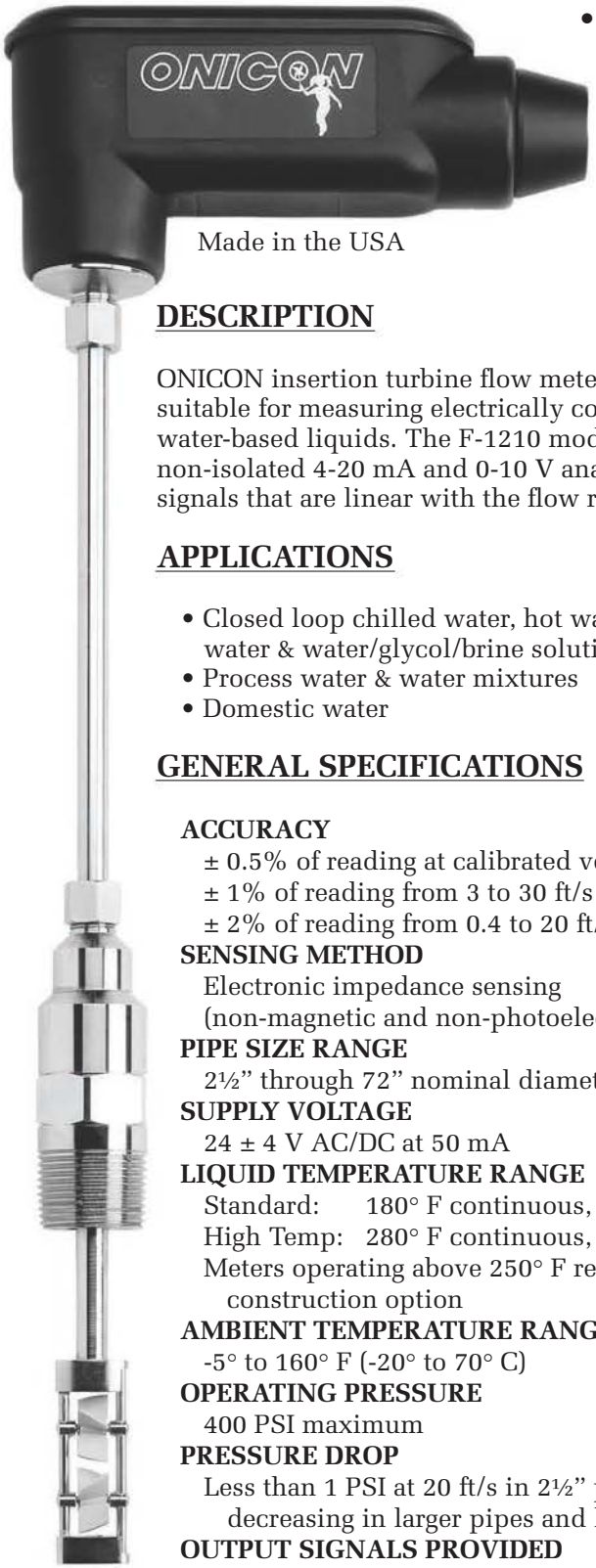
BTUH = Flow x delta T x 500 =
Flow (gallons/min) x Delta T (Hot water supply temp deg F – Hot water return temp deg F) x 8.34 lbs/gallon x 60 min/hr

Please let me know if there are any questions.

Yours truly,
Glenn R Thomas, PE

Glenn R Thomas

Thomas Engineering Associates, PC



• F-1210 DUAL TURBINE •
INSERTION FLOW METER
ANALOG OUTPUT

ONICON INCORPORATED

Made in the USA

DESCRIPTION

ONICON insertion turbine flow meters are suitable for measuring electrically conductive water-based liquids. The F-1210 model provides non-isolated 4-20 mA and 0-10 V analog output signals that are linear with the flow rate.

APPLICATIONS

- Closed loop chilled water, hot water, condenser water & water/glycol/brine solutions for HVAC
- Process water & water mixtures
- Domestic water

GENERAL SPECIFICATIONS

ACCURACY
± 0.5% of reading at calibrated velocity
± 1% of reading from 3 to 30 ft/s (10:1 range)
± 2% of reading from 0.4 to 20 ft/s (50:1 range)

SENSING METHOD
Electronic impedance sensing
(non-magnetic and non-photoelectric)

PIPE SIZE RANGE
2½" through 72" nominal diameter

SUPPLY VOLTAGE
24 ± 4 V AC/DC at 50 mA

LIQUID TEMPERATURE RANGE
Standard: 180° F continuous, 200° F peak
High Temp: 280° F continuous, 300° F peak
Meters operating above 250° F require 316 SS construction option

AMBIENT TEMPERATURE RANGE
-5° to 160° F (-20° to 70° C)

OPERATING PRESSURE
400 PSI maximum

PRESSURE DROP
Less than 1 PSI at 20 ft/s in 2½" pipe, decreasing in larger pipes and lower velocities

OUTPUT SIGNALS PROVIDED
Analog Output (non-isolated)
Voltage output: 0-10 V (0-5 V available)
Current output: 4-20 mA
Frequency Output
0 – 15 V peak pulse, typically less than 300 Hz

(continued on back)

CALIBRATION

Every ONICON flow meter is wet calibrated in our flow laboratory against primary volumetric standards that are directly traceable to N.I.S.T. A certificate of calibration accompanies every meter.

FEATURES

Unmatched Price vs. Performance -
Custom calibrated, highly accurate instrumentation at very competitive prices.

Excellent Long-term Reliability -
Patented electronic sensing is resistant to scale and particulate matter. Low mass turbines with engineered jewel bearing systems provide a mechanical system that virtually does not wear.

Industry Leading Two-year "No-fault" Warranty -
Reduces start-up costs with extended coverage to include accidental installation damage (miswiring, etc.) Certain exclusions apply. See our complete warranty statement for details.

Simplified Hot Tap Insertion Design -
Standard on every insertion flow meter. Allows for insertion and removal by hand without system shutdown.

OPERATING RANGE FOR COMMON PIPE SIZES
0.17 TO 20 ft/s
±2% accuracy begins at 0.4 ft/s

Pipe Size (Inches)	Flow Rate (GPM)
2½	2.5 - 230
3	4 - 460
4	8 - 800
6	15 - 1,800
8	26 - 3,100
10	42 - 4,900
12	60 - 7,050
14	72 - 8,600
16	98 - 11,400
18	120 - 14,600
20	150 - 18,100
24	230 - 26,500
30	360 - 41,900
36	510 - 60,900

11451 Belcher Road South, Largo, FL 33773 • USA • Tel +1 (727) 447-6140 • Fax (727) 442-5699
www.onicon.com • sales@onicon.com

F-1210 SPECIFICATIONS (cont.)

MATERIAL

Wetted metal components:

Standard: Electroless nickel plated brass

Optional: 316 stainless steel

ELECTRONICS ENCLOSURE

Standard: Weathertight aluminum enclosure

Optional: Submersible enclosure

ELECTRICAL CONNECTIONS

3-wire minimum for 4-20 mA or 0-10 V output

Second analog output and/or frequency output requires additional wires

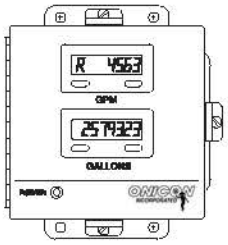
Standard: 10' of cable with ½" NPT conduit connection

Optional: Indoor DIN connector with 10' of plenum rated cable

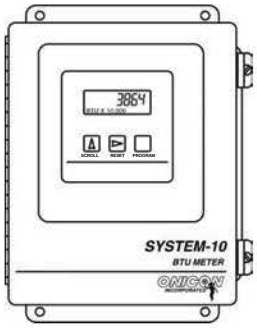
F-1210 WIRING INFORMATION

WIRE COLOR	DESCRIPTION	NOTES
RED	(+) 24 V AC/DC supply voltage, 50 mA	Connect to power supply positive
BLACK	(-) Common ground (Common with pipe ground)	Connect to power supply negative & analog input ground
GREEN	(+) Frequency output signal: 0-15 V peak pulse	Required when meter is connected to local display or Btu meter
BLUE	(+) Analog signal: 4-20 mA (non-isolated)	Both signals may be used independently
BROWN	(+) Analog signal: 0-10 V (non-isolated)	
DIAGNOSTIC SIGNALS		
ORANGE	Bottom turbine frequency	These signals are for diagnostic purposes - connect to local display or Btu meter
WHITE	Top turbine frequency	

ALSO AVAILABLE



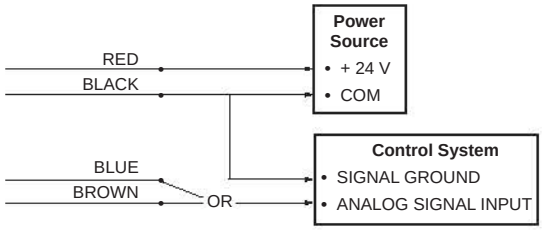
Display Modules



Btu Measurement Systems

F-1210 WIRING DIAGRAM

Flow meter into control system (no display or Btu meter)



NOTE:

1. Black wire is common with the pipe ground (typically earth ground).

2. Frequency output required for ONICON display module or Btu meter, refer to wiring diagram for peripheral device.

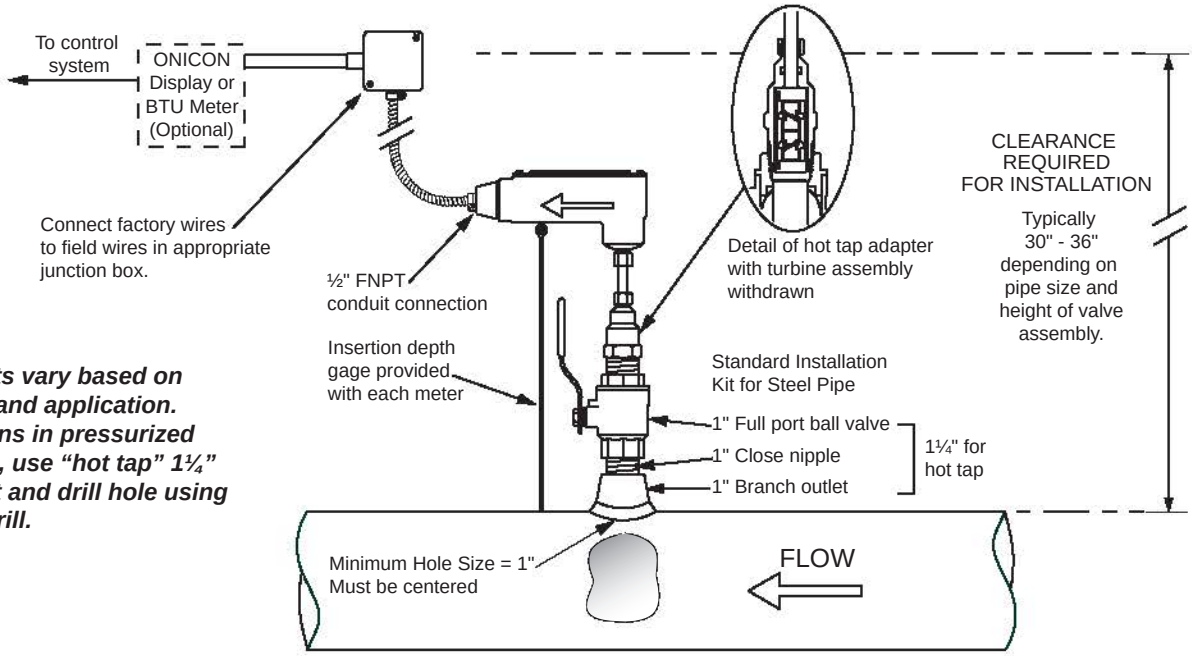
TYPICAL METER INSTALLATION

(New construction or scheduled shutdown)

Typical Meter Installation
(New construction or scheduled shutdown)

- Acceptable to install in vertical pipe
- Position meter anywhere in upper 240° for horizontal pipe

Horizontal Run Pipe



NOTE:
Installation kits vary based on pipe material and application. For installations in pressurized (live) systems, use "hot tap" 1¼" installation kit and drill hole using a 1" wet tap drill.

SECTION 3.0: INSTALLATION, REMOVAL & ADJUSTMENT

WARNING

Insertion flow meters may often be installed in pipes which are under high pressure. Accidents with these systems can cause serious injury or death. Only persons experienced with high pressure systems and related knowledge in the heating, cooling and fluid metering fields should attempt to install adjust or remove the flow meter. Carefully read the installation and removal instructions in this manual before performing any work on these meters.

ONICON will be happy to assist with technical recommendations and to provide guidance by telephone or e-mail. On-site field engineering, installation and service is also available at additional cost.

3.1 INSTALLATION SITE SELECTION

Install the flow meter where it will be accessible for personnel to perform necessary periodic maintenance. The clearance required for insertion meter installations is typically 23”-36” from the pipe wall to the nearest obstruction above the valve assembly. This clearance dimension will increase with large diameter pipes. Allow at least 6” of clearance for inline meter installations. The environment should be free of corrosive liquids/fumes, temperature extremes and heavy vibration. The following information should be used as a guide to the proper location for installing the meter.

GENERAL PRACTICES:

1. For best results, install the flow meter in a straight run of pipe, free of bends, tees, valves, transitions, and obstructions.

2. Straight run requirements vary based on the nature of the upstream obstruction. Review the following pages for guidelines in determining minimum upstream straight run requirements based on the nature of the obstruction.

   Note: Depending upon specific location details, more or less straight run may be required to produce a satisfactory flow profile.

3. If there is insufficient straight run, allow 80% of the run upstream and 20% of the run downstream. If the total length of straight run is less than 70% of the recommended length, performance may seriously degrade, and consideration should be given to changing to the series F-3000 In-line Electromagnetic Flow Meter.

How To Determine The Available Straight Pipe Diameters:

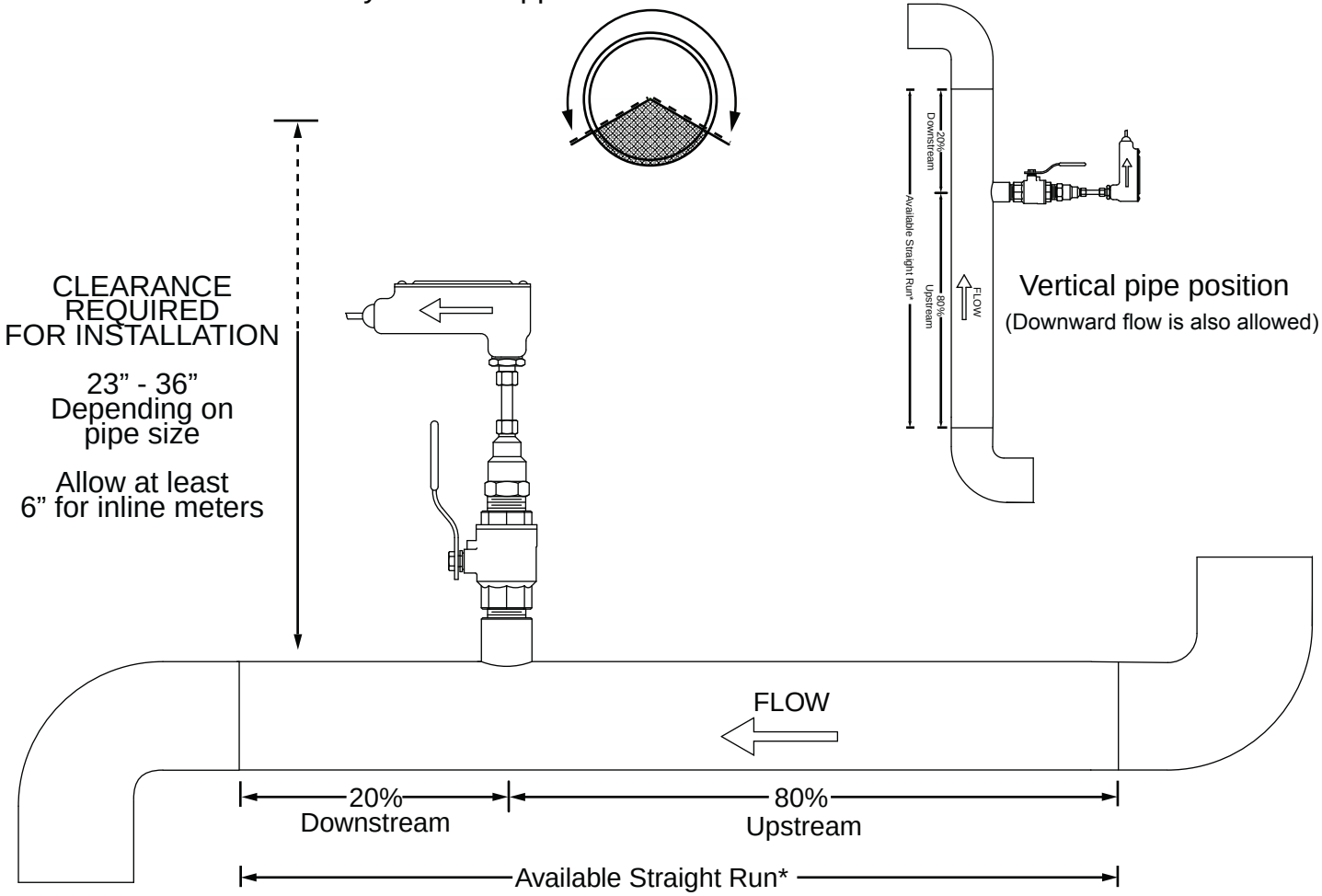
For each application, locate the longest straight, unobstructed section of pipe (no bends, tees, valves, other insertion probes, size transitions). The longest straight pipe run in inches divided by nominal pipe size in inches equals “diameters of straight pipe.” For closed loop applications, consider both the supply and return lines as possible locations.

IMPORTANT NOTE

Always use the maximum available straight run. When more than the minimum required straight run is available, place the meter such that the excess straight run is upstream of the meter location.

INSERTION AND INLINE FLOW METER SITE SELECTION GENERAL GUIDELINES (Shown with Insertion Meter)

- **Install in vertical or horizontal pipe.**
- For horizontal pipe position meter anywhere in upper 240˚.



*See following pages for model specific straight run requirements.

EVALUATING UPSTREAM PIPING CONDITIONS

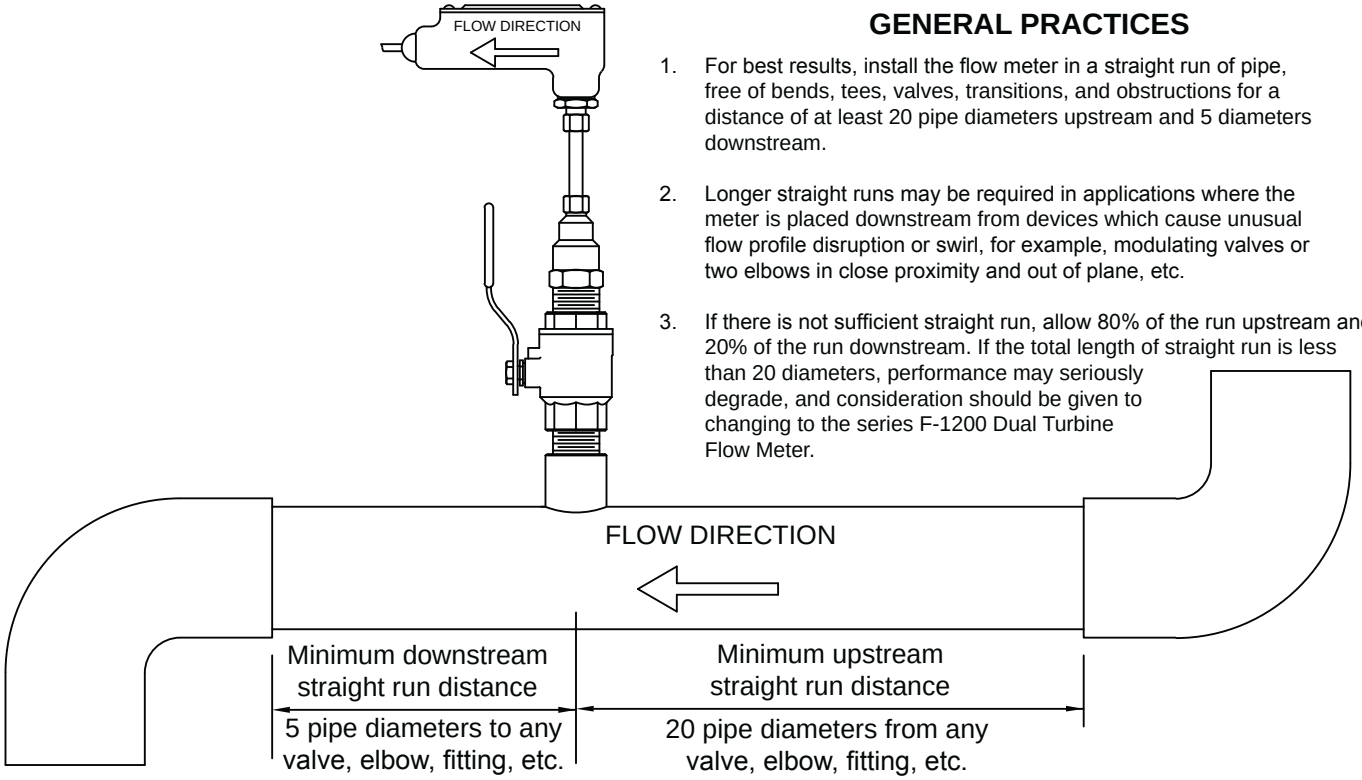
Better ↕ Worse

- Straight Pipe
- Single Bend
- Pipe Reduction or Enlargement
- Outflowing Tees
- Multiple Bends in Same Plane
- Multiple Bends Out of Plane
- Inflowing Tees
- Control Valves

3.2 INSERTION METER STRAIGHT RUN REQUIREMENTS

STRAIGHT RUN REQUIREMENTS FOR INSERTION TURBINE FLOW METERS

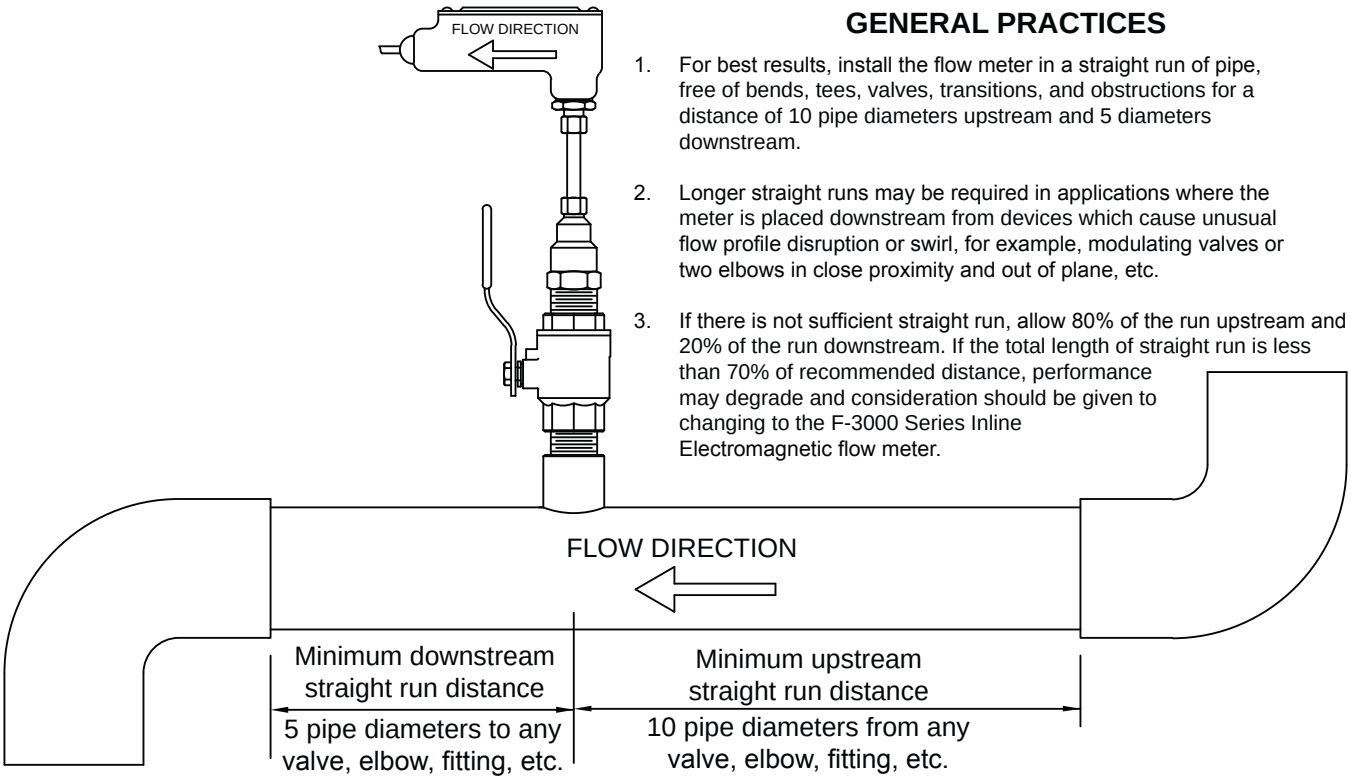
Series F-1100 Single Turbine Flow Meters



GENERAL PRACTICES

1. For best results, install the flow meter in a straight run of pipe, free of bends, tees, valves, transitions, and obstructions for a distance of at least 20 pipe diameters upstream and 5 diameters downstream.
2. Longer straight runs may be required in applications where the meter is placed downstream from devices which cause unusual flow profile disruption or swirl, for example, modulating valves or two elbows in close proximity and out of plane, etc.
3. If there is not sufficient straight run, allow 80% of the run upstream and 20% of the run downstream. If the total length of straight run is less than 20 diameters, performance may seriously degrade, and consideration should be given to changing to the series F-1200 Dual Turbine Flow Meter.

Series F-1200 Dual Turbine Flow Meters



GENERAL PRACTICES

1. For best results, install the flow meter in a straight run of pipe, free of bends, tees, valves, transitions, and obstructions for a distance of 10 pipe diameters upstream and 5 diameters downstream.
2. Longer straight runs may be required in applications where the meter is placed downstream from devices which cause unusual flow profile disruption or swirl, for example, modulating valves or two elbows in close proximity and out of plane, etc.
3. If there is not sufficient straight run, allow 80% of the run upstream and 20% of the run downstream. If the total length of straight run is less than 70% of recommended distance, performance may degrade and consideration should be given to changing to the F-3000 Series Inline Electromagnetic flow meter.

Code No. LIT-1900217
Issued April 18, 2013

TE-6300 Series Temperature Sensors

Description

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and Variable Air Volume (VAV) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and reduce both commissioning time and cost.

Refer to the *TE-6300 Temperature Sensors Product Bulletin (LIT-216320)* for important product application information.

Features

- full line of versatile sensors — supports all your temperature sensing needs from a single supplier: wall mount, outdoor air, duct probe, duct averaging, strap-mount, well insertion, and flange mount duct probe
- single assembly ordering — simplifies ordering; provides a complete assembly in one box
- models featuring an integral NPT Adaptor — increase sensor connection strength, which eliminates the need for a special adaptor
- models with a stainless steel sensor probe — protect the sensor while increasing corrosion resistance
- metal enclosure (TE-63xxM Models only) — meets plenum requirements
- models featuring a retainer for the sensor holder — allow you to lock the sensor holder into the conduit box
- brushed stainless steel mounting plate — offers a durable, aesthetically-pleasing design
- low profile flush mount design — provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more

All TE-6300 series sensors are two-wire, passive, resistance output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- feature thermally isolated sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG lead wires with low voltage installation

TE-63xxM Models

The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct averaging models
- offer (well models only) either a direct mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series thermal wells (Order the thermal well separately.)
- provide optional well sensor holders (order separately) to mount duct models in thermal wells.
- meet UL 1995 plenum use requirements
- offer optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with 1/2-14 NPT female thread for connecting to conduit
- provide aluminum mounting plate and 1/2-14 NPT threaded hub mounting options for the duct and duct averaging models
- use the 1/2-14 NPT female thread to mount the Outdoor Air models directly to ridged conduit
- provide optional sensor holders (order separately) to mount duct models in thermal wells
- offer an optional accessory metal cover kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements
- include a replaceable sensing probe on duct probe, outdoor air, and well insertion models

TE-6300 Series Temperature Sensors

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (Strap-Mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) diameter
- come equipped with a 10 ft (3 m) plenum rated cable
- meet UL 1995 plenum use requirements
- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads
- meet UL 1995 plenum use requirements

Repair Information

If the TE-6300 Series Temperature Sensor fails to operate within its specifications, refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for a list of repair parts available.

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TE-6300 Series Temperature Sensors (Continued)

Selection Charts

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable[1]	8 (203)	TE-6311A-1
	Averaging	8 ft (2.4 m)	TE-6315M-1
			TE-6315V-2[1]
		17 ft (5.2 m)	TE-6316M-1
			TE-6316V-2[1]
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-0
			TE-6310F-1
	Outdoor Air	3 (76)	TE-6313P-1
	Strap-Mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-2
		8 (203)	TE-6312M-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351-A
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-0
			TE-6350F-1
	Strap-Mount	3 (76)	TE-635S-1
	Outdoor Air	3 (76)	TE-6353P-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-2
		8 (203)	TE-6352M-1

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Platinum Equivalent	1k ohm Averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm Averaging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor Air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	8 (203)	TE-6342M-1
		6 (152)	TE-634AM-2
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flush	N/A	TE-6360F-0
			TE-6360F-1
	Outdoor Air	3 (76)	TE-6363P-1
	Strap-Mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-2
		8 (203)	TE-6362M-1

1. Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2. Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.

Optional Accessories

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for element wells (8 oz.)
T-4000-xxxx	Wall Mount Cover
T-4000-119	Allen Head Tool for Wall Mount Cover Screws (order in multiples of 30)
TE-1800-9600	Mounting Hardware for mounting the wall mount unit to a wall box
TE-6001-8	Element Holder for mounting an averaging sensor (order in multiples of 10)
TE-6001-13	Metal Cover and Gasket Kit (5 per package)
TE-6300-101	12 in. (305 mm) (1k ohm) Nickel Probe (cut to an appropriate length)[1]
TE-6300-105	12 in. (305 mm) (1k ohm) Platinum Class A Probe (cut to an appropriate length)[1]
TE-6300-103	1/2-14 NPT Plastic Sensor Holder without retainer (order in multiples of 10)
TE-6300-104	12 in. (305 mm) (2.2k ohm) Thermistor Probe (cut to an appropriate length)[1]
TE-6300-613	IMC Kit, Metal Knockout Plug, Metal Clamp Connector (order in multiples of 10)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
TE-6300-615	Cable Tie Mounting Kit, 11 in. (280 mm) Max Bundle Diameter
TE-6300-616	8 in. (203 mm) 1k ohm Platinum Class A Probe
TE-6300-617	3 in. (76 mm) 1k ohm Platinum Class A Probe
TQ-6000-1	4 to 20 mA Output Transmitter for use with the 100 ohm platinum sensor
TE-6300W-102	6 in. (152 mm) Stainless Steel Well (direct mount)
TE-6300W-101	6 in. (152 mm) Brass Well (direct mount with thermal grease included)
TE-6300W-110	8 in. (203 mm) Stainless Steel Well

1. Cut 12 in. probes to a minimum of 3 in. (76 mm).

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TE-6300 Series Temperature Sensors (Continued)

T-4000 Covers Available for the Wall Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer, with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]				Brushed Aluminum/Beige
T-4000-2139	■			
T-4000-2140	■		■	
T-4000-2144		■		
T-4000-2639	■			Brown and Gold/Beige
T-4000-2640	■		■	
T-4000-2644		■		
T-4000-3139	■			Brushed Aluminum/White
T-4000-3140	■		■	
T-4000-3144		■		

1. Without Johnson Controls logo

Technical Specifications

TE-6300 Series Temperature Sensors (Part 1 of 2)		
Sensor Reference Resistance	**1k ohm Nickel**	1k ohms at 70°F (21°C)
	1k ohm Nickel Averaging	
	1k ohm Platinum	1k ohms at 32°F (0°C)
	100 ohm Platinum Averaging	100 ohms at 32°F (0°C)
	1k ohm Platinum Averaging	1k ohms at 32°F (0°C)
	2.2k ohm Thermistor	2,252 ohms at 77°F (25°C)
	10k ohm Thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	**1k ohm Nickel**	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm Nickel Averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm Platinum Class A	±0.35F° at 70°F (±0.19C° at 21°C), DIN Class A
	1k ohm Platinum Class B	±0.73F° at 70°F (±0.41C° at 21°C), DIN Class B
	100 ohm Platinum Averaging	±1.0F°at 70°F (± 0.58C° at 21°C)
	1k ohm Platinum Averaging	
	2.2k ohm Thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm Thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient	**1k ohm Nickel**	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm Nickel Averaging	
	1k ohm Platinum	Approximately 2 ohms/F° (3.9 ohms/C°) 3850 ppm/K
	100 ohm Platinum Averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm Platinum Averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm Thermistor	Nonlinear, Negative Temperature Coefficient (NTC)
	10k ohm Thermistor	Nonlinear NTC, Johnson Controls Type II
Electrical Connection	**TE-63xxM**	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxP	
	TE-63xxF	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided-copper wires, low voltage insulation, half-stripped ends
	TE-63xxP Nickel Averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA, TE-63xxV	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable with 0.25 in. (6.35 mm) female quick-connect terminals

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TE-6300 Series Temperature Sensors (Continued)

TE-6300 Series Temperature Sensors (Part 2 of 2)		
Materials	**Probes**	Nickel Averaging: 0.094 in. (2.4 mm) Outside Diameter (O.D.) copper tubing Nickel Averaging Adaptor: 0.25 in. (6.35 mm) O.D. Brass Platinum Averaging Probe: 0.19 in. (4.8 mm) Aluminum tubing All others (except Averaging): 0.25 in. (6.35 mm) O.D. Stainless Steel
	TE-63xxA	Mounting Adapter Plate and Gland: Thermoplastic
	TE-63xxF	Flush Mount: Stainless Steel
	TE-63xxM	Enclosure: Corrosion-Protected Steel Well Sensor Holder: 0.875 in. (22.2 mm) Hex Brass
	TE-63xxP	Conduit box and Shield: Rigid Thermoplastic Mounting Plate: Aluminum Sensor Holder: Rigid Thermoplastic Wall Mount Base Plate: Corrosion-Protected Steel Wall Mount Cover: Rigid Thermoplastic (White) Wall Mount Face Plate: Brushed Aluminum
	TE-63xxV	Mounting Flange: Stainless Steel
Operating Conditions	**TE-63xxA**	-50 to 140°F (-46 to 60°C)
	TE-63xxF	32 to 104°F (0 to 40°C)
	TE-63xxM	-50 to 220°F (-46 to 104°C)
	TE-63xxP	Enclosure: -50 to 122°F (-46 to 50°C) Sensor Probe: -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor Probe: -50 to 220°F (-46 to 104°C) Wire Harness: -50 to 122°F (-46 to 50°C)
	TE-63xxV	
Shipping Weight	**TE-63xxA**	0.2 lb (0.09 kg)
	TE-63xxF	0.25 lb (113.4 kg)
	TE-63xxM	Duct Averaging: 0.9 lb (0.41 kg) Duct Mount: 0.4 lb (0.18 kg) Well Insertion: 0.5 lb (0.23 kg)
	TE-63xxP	Duct Averaging: 0.5 lb (0.23 kg) Duct Mount: 0.4 lb (0.18 kg) Outdoor Air: 0.5 lb (0.23 kg) Wall Mount: 0.2 lb (0.09 kg) Well Insertion: 0.35 lb (0.16 kg)
	TE-63xS	Strap-Mount: 0.2 lb (0.09 kg)
	TE-63xxV	Duct Averaging: 0.7 lb (0.32 kg) Duct Mount: 0.2 lb (0.09 kg)
Dimensions (H x W x D)	**TE-63xxA**	2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 m) element
	TE-63xxF	Flush Mount: 4-1/2 x 2-3/4 in. (114 x 70 mm)
	TE-63xxM	Duct Averaging: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element Well Insertion: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct Averaging: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element Duct Mount: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe Outdoor Air: 5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm) Wall Mount: 2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm) Well Insertion: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap-Mount: 0.25 in. (6.35 mm) diameter x 3.00 in. (76 mm.) long
	TE-63xxV	Duct Averaging: 2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 m) element

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TE-6300 Series Temperature Sensors

Product Bulletin

Code No. LIT-216320
Issued August 26, 2013
Supersedes April 18, 2013

Refer to the QuickLIT website for the most up-to-date version of this document.

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and VAV Modular Assembly (VMA) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Figure 1: TE-6300 Series Temperature Sensors

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and reduce both commissioning time and cost.

Table 1: Features and Benefits

Features	Benefits
Full Line of Versatile Sensors	Supports all your temperature sensing needs from a single supplier: wall-mount, outdoor-air, duct, duct-averaging, strap-mount, well-insertion, and flange-mount duct-probe.
Single Assembly Ordering	Simplifies ordering; provides a complete assembly in one box.
Models Featuring an Integral NPT Adaptor	Increase sensor connection strength, which eliminates the need for a special adaptor.
Models with a Stainless Steel Sensor Probe	Protect the sensor while increasing corrosion resistance.
Metal Enclosure (TE-63xxM Models Only)	Meets plenum requirements.
Models Featuring a Retainer for the Sensor Holder	Allow you to lock the sensor holder into the conduit box.
Brushed Stainless Steel Mounting Plate	Offers a durable, aesthetically pleasing design.
Low Profile Flush Mount Design	Provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more.

Product Overview

IMPORTANT: The TE-6300 Series Temperature Sensors are intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the sensor.

All TE-6300 Series sensors are two-wire, passive, resistance-output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m) plenum-rated cable with a 2-position plug terminal block for 1/4 in. (6.35 mm) male tab terminals on 0.197 in. (5 mm) centers, for direct connection to Johnson Controls VMA controller products

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- feature thermally isolated sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG lead wires with low voltage installation

TE-63xxM Models

The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct averaging models
- offer (for well models only) either a direct-mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series thermowells (order the thermowell separately)
- provide optional well sensor holders (order separately) to mount duct models in thermowells
- meet UL 1995 plenum use requirements
- offer an optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with 1/2-14 NPT female thread for connecting to conduit
- provide aluminum mounting plate and 1/2-14 NPT threaded hub mounting options for the duct and duct-averaging models
- use the 1/2-14 NPT female thread to mount the Outdoor Air models directly to ridged conduit
- provide sensor holders included to mount duct models in thermowells (order thermowell separately)
- offer an optional accessory metal cover kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements
- include a replaceable sensing probe on duct-probe, outdoor-air, and well-insertion models

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (Strap-Mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) diameter
- come equipped with a 10 ft (3 m) plenum-rated cable
- meet UL 1995 plenum use requirements

- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum-rated cable with a 2-position plug terminal block for 1/4 in. (6.35 mm) male tab terminals on 0.197 in. (5 mm) centers, for direct connection to Johnson Controls VMA controller products
- meet UL 1995 plenum use requirements

Additional Product Information

See Figure 2 for nickel and platinum sensor Resistance/Temperature (R/T) response characteristics. See Table 2 for all sensor Temperature/Resistance values.

Note: Figure 2 shows 1k ohm platinum sensor characteristic. For 100 ohm platinum sensor characteristic, divide the resistance value by 10.

See Figure 3 for 2.2k and 10k ohm thermistor sensor R/T response characteristics.

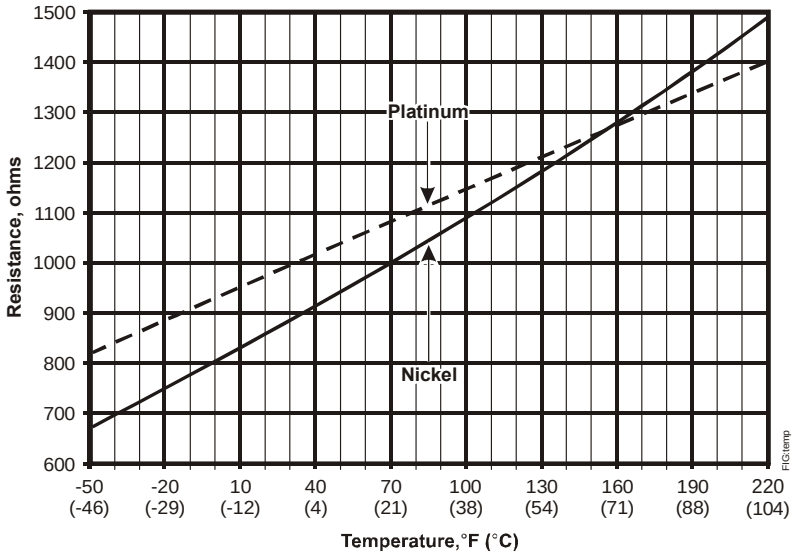


Figure 2: Nickel and Platinum Temperature Response

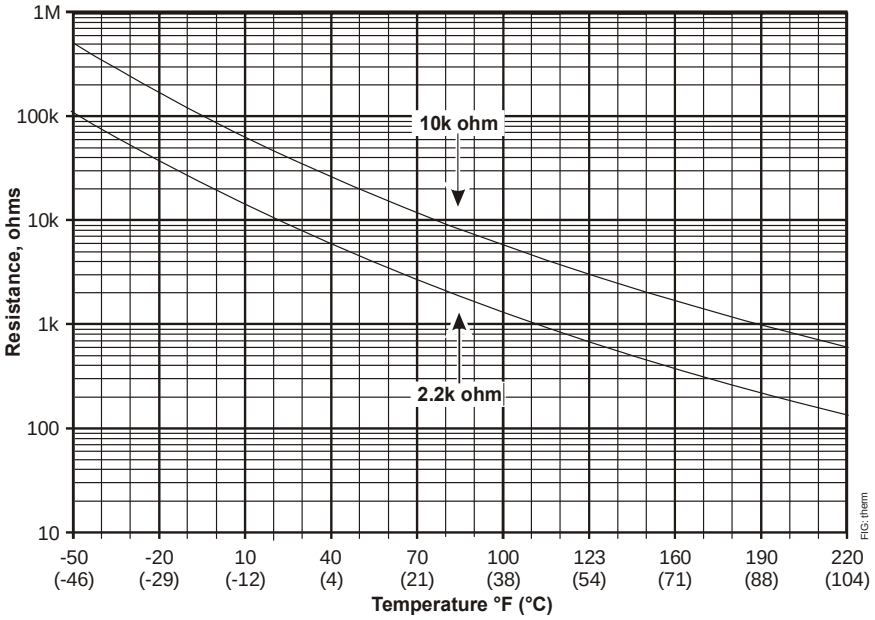


Figure 3: Thermistor Temperature Response

Table 2: Nominal Values for: Nickel (Ni), Platinum (Pt)[1], and Thermistor Sensors

Temperature		Resistance (ohms)			
°F	°C	1k Ni	1k Pt[1]	Thermistor	
				2.2k	10k
-50	-46	674	821	109,905	489,981
-40	-40	699	843	75,487	366,185
-30	-34	725	865	52,584	233,990
-20	-29	751	887	37,123	165,085
-10	-23	777	908	26,544	117,978
0	-18	803	930	19,210	85,349
10	-12	830	952	14,063	62,464
20	-7	858	974	10,408	46,221
30	-1	885	996	7,783	34,562
40	4	914	1,017	5,879	26,103
50	10	942	1,039	4,482	19,903
60	16	971	1,061	3,449	15,313
70	21	1,000	1,082	2,676	11,883
80	27	1,030	1,104	2,094	9,298
90	32	1,060	1,125	1,651	7,333
100	38	1,090	1,147	1,312	5,827
110	43	1,121	1,168	1,050	4,663
120	49	1,152	1,190	846	3,757
130	54	1,184	1,211	686	3,048
140	60	1,216	1,232	560	2,488
150	66	1,248	1,254	460	2,043
160	71	1,281	1,275	380	1,687
170	77	1,314	1,296	315	1,401
180	82	1,348	1,317	263	1,170
190	88	1,382	1,339	221	982
200	93	1,417	1,360	186	828
210	99	1,452	1,381	158	701
220	104	1,487	1,402	134	597

1. For 100 ohm platinum sensors, divide resistance values by 10.

Applications

Averaging Sensing

Series-parallel wiring arrangements of four (2 x 2), nine (3 x 3), sixteen (4 x 4), or more sensors provide an average temperature reading in an area or large duct when one sensor cannot provide a representative reading. (See Figure 4.)

A series-parallel arrangement requires the same number of parallel-connected sensors as there are series-connected sensors. For example:

- with four sensors, connect two parallel legs with two sensors in series in each leg
- with nine sensors, connect three parallel legs with three sensors in series in each leg

Note: All sensors in a series-parallel network must be of the same sensor type and value. For example, use all 100 ohm platinum or all 1k ohm nickel sensors.

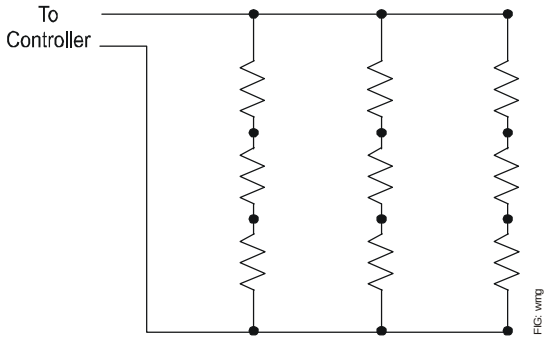
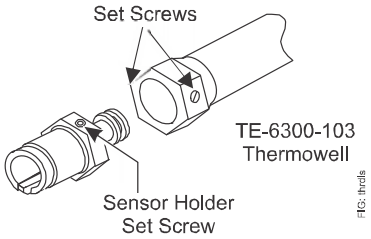


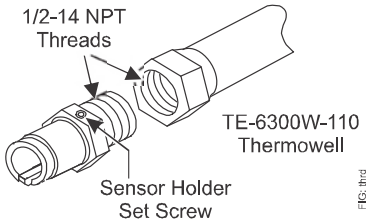
Figure 4: Nine-Sensor Series-Parallel Wiring

Installing the TE-63xAP-1 Sensor Holder



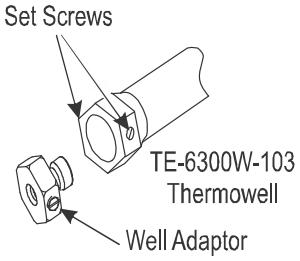
- Sensor model TE-63xAP-1
- Threadless Sensor Holder/Well Adaptor
- 6 in. (150 mm) probe
- includes well adaptor

Installing the TE-63x2P-1 Sensor Holder



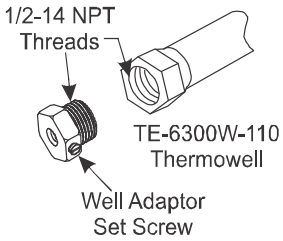
- Sensor model TE-63x2P-1
- 1/2-14 NPT Threaded Sensor Holder/Well Adaptor
- 8 in. (200 mm) probe
- includes well adaptor

Installing the TE-63xAM-1 Well Adaptor



- Sensor model TE-63xAM-1
- Threadless Well Adaptor
- 6 in. (150 mm) probe
- includes well adaptor

Installing the TE-63x2M-1 Well Adaptor



- Sensor model TE-63x2M-1
- 1/2-14 NPT Threaded Well Adaptor
- 8 in. (200 mm) probe
- includes well adaptor

For specific TE-6300 Series Temperature Sensor applications, see Table 3.

Table 3: TE-6300 Series Temperature Sensor Applications (Part 1 of 2)

Application	Nominal Probe Length, in. (mm)	Sensor Type	Application Notes
Duct Probe	4 (102) 8 (203) 18 (457)	1k ohm Thin-Film Nickel 1k ohm Thin-Film Platinum 2.2k ohm Thermistor 10k ohm Thermistor Type II	• Ideal in freezer lockers or for mounting outside of the sensed area. • Available with plastic enclosure, metal enclosure, flange mount, or with mounting bracket for adjustable length. • Use TE-63xxM or TE-63xxV models for plenum applications. • Use TE-6300-613 accessory kit with TE-63xxM models to meet IMC requirements. • Use TE-6001-13 metal cover kit with TE-63xxP models to meet UL 1995 plenum requirements. • Order an optional TE-63xxP model accessory: 12 in. (300 mm) probe.
Duct Averaging Element	8 ft (2.4 m) 10 ft (3 m) 17 ft (5.2 m) 20 ft (6.1 m)	1k ohm Nickel Wire 100 ohm Platinum Equivalent Wire 1k ohm Platinum Equivalent Wire	• Use to sense duct temperature where stratification can occur, such as mixed air ducts. • Duct averaging models come in three styles: plastic enclosure, metal enclosure, or flange mount. • Use about 1 ft (0.3 m) of sensor per sq ft (0.09 m^2) of duct cross section. • Use a series-parallel sensor network to cover larger ducts. • Use a TE-6001-8 element holder (recommended) when installing an averaging sensor in a duct. • Use TE-63xxM or TE-63xxV models for plenum applications. • Use TE-6300-613 kit with TE-63xxM models to meet IMC requirements. • Use the TE-6001-13 metal cover kit with TE-63xxP models to meet UL 1995 plenum requirements.
Outdoor Air	3 (76)	1k ohm Thin-Film Nickel 1k ohm Thin-Film Platinum 2.2k ohm Thermistor 10k ohm Thermistor, Type II	• Use to sense outside ambient temperature to determine efficient heating and cooling strategies. • Mount the sensor out of direct sunlight and away from exhaust vents or equipment that can cause inaccurate temperature sensing.
Strap-Mount	3 (76)	1k ohm Thin-Film Nickel 1k ohm Thin-Film Platinum 10k ohm Thermistor, Type II	• Clamp the probe directly to a pipe or the device to be sensed. • Mount the probe away from fans or radiant heat that can affect measurement of the sensed device. • Use for plenum applications. • Order an accessory mounting kit or use readily available hardware for pipe up to 11 in. (280 mm) diameter.
Wall Mount	N/A	1k ohm Thin-Film Nickel 1k ohm Thin-Film Platinum 2.2k ohm Thermistor	• Use to sense room or space temperature. • Order an accessory cover with a thermometer or to match the style of existing installations. • Mount the sensor on an inside wall, out of direct sunlight and away from radiant heat.
Wall Plate Flush Mount	N/A	Flush Mount 1k ohm Nickel Sensor Flush Mount 1k ohm Platinum Sensor Flush Mount 10k ohm NTC Sensor	• Flush mount 10k ohm NTC sensor: do not install the flush mount sensor in temperatures beyond 0–40°C • Use copper conductors only. Refer to installation diagrams for recommended wiring lengths.

Table 3: TE-6300 Series Temperature Sensor Applications (Part 2 of 2)

Application	Nominal Probe Length, in. (mm)	Sensor Type	Application Notes
Well Insertion Probe	6 (152) 8 (203)	**TE-63xxM** 1k ohm Thin-Film Nickel 1k ohm Thin-Film Platinum 2.2k ohm Thermistor 10k ohm Thermistor Type II	• Metal enclosure. • Mount the thermal well at an angle so condensation runs out of the well. If not possible, seal the well adaptor and wiring end of the sensor probe with RTV silicone sealant. • Use TE-63xxM models to meet UL 1995 plenum use applications. • No separate well adaptor to order when using recommended thermowell and sensor model combinations. • Threaded sensor holder has 1/2-14 NPT threads; threadless holder accommodates setscrew-type wells. • Order TE-63x2M-1, which includes 1/2-14 NPT adaptor, for TE-6300W-110 or retrofit applications of WZ-1000-2 and WZ-1000-4 thermowells. • Order TE-63xAM-2 for use with direct-mount thermowells, TE-6300W-101 and TE-6300W-102. • Order TE-63xAM-1, which includes threadless adaptor, for retrofit applications of TE-6300W-103 and WZ-1000-5 thermowells. • Order compatible thermowells using Table 5 and Table 6.
		TE-63xxP 1k ohm Thin-Film Nickel 1k ohm Thin-Film Platinum 2.2k ohm Thermistor	• Plastic enclosure. • Mount the thermal well at an angle so condensation runs out of the well. If not possible, seal the sensor holder and the wiring end of the sensor probe with RTV silicone sealant. • Use TE-6001-13 metal cover kit with TE-63xxP models to meet UL 1995 plenum requirements. • Use the accessory 12 in. (305 mm) probe with the TE-63xxP sensor in longer wells. • No separate well adaptor to order when using recommended thermowell and sensor model combinations. • Threaded sensor holder has 1/2-14 NPT threads; threadless holder accommodates setscrew-type wells. • Order TE-63x2P-1, which includes 1/2-14 NPT adaptor, for TE-6300W-110 or retrofit applications of WZ-1000-2 and WZ-1000-4 thermowells. • Order TE-63xAP-1, which includes threadless adaptor, for TE-6300W-103 or retrofit applications of WZ-1000-5 thermowells. • Order compatible thermowells using Table 5 and Table 7.

Ordering Information

To order a TE-6300 Series temperature sensor, contact the nearest Johnson Controls representative. Specify the desired sensor product code number from Table 4 and accessories from Table 5, depending on the model.

Note: Use the TE-63xxM or TE-63xxV model to meet plenum requirements where UL1995 rating is accepted, or replace the existing plastic cover on the TE-63xxP models with the TE-6001-13 Metal Cover Kit.

Use the TE-63xxM model and a TE-6300-613 Accessory Kit to replace the plastic bushing to meet International Mechanical Code (IMC) requirements.

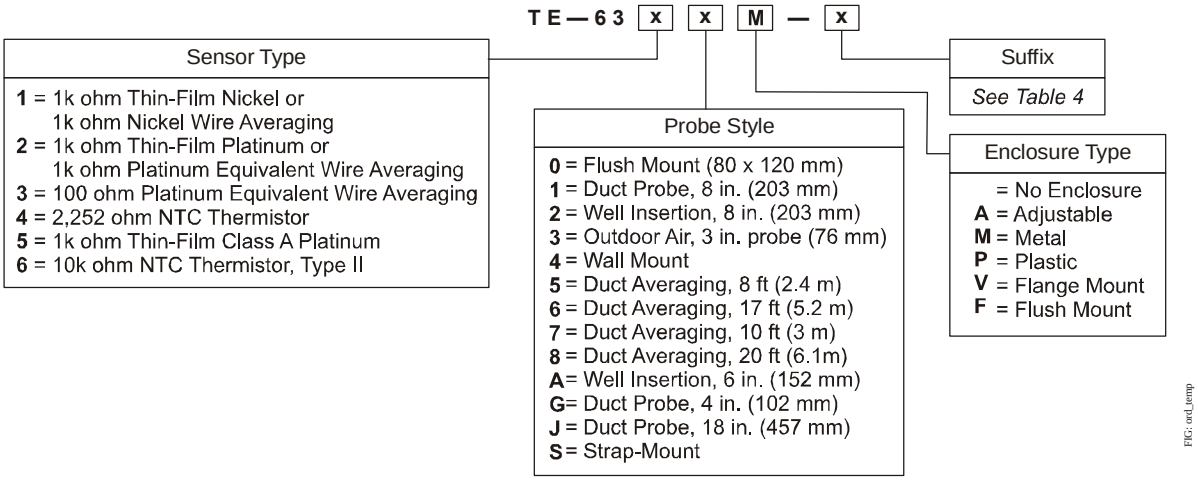


Figure 5: Ordering Template

Note: Not all possible combinations are available. See Table 4 for available models.

Table 4: Product Ordering (Part 1 of 2)

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable	8 (203)	TE-6311A-1
	Averaging[1]	8 ft (2.4 m)	TE-6315M-1
			TE-6315P-1
			TE-6315V-2
		17 ft (5.2 m)	TE-6316M-1
			TE-6316P-1
			TE-6316V-2
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-0
			TE-6310F-1
	Outdoor Air	3 (76)	TE-6313P-1
	Strap-Mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-1[3]
			TE-631AM-2
			TE-631AP-1
		8 (203)	TE-6312M-1
			TE-6312P-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351A-1
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-0
			TE-6350F-1
	Outdoor Air	3 (76)	TE-6353P-1
	Strap-Mount	3 (76)	TE-635S-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-2
			TE-635AP-1
		8 (203)	TE-6352M-1
			TE-6352P-1

Table 4: Product Ordering (Part 2 of 2)

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Platinum Equivalent	1k ohm Averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm Averaging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor Air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	6 (152)	TE-634AM-2
		8 (203)	TE-6342M-1
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flush	N/A	TE-6360F-0
			TE-6360F-1
	Outdoor Air	3 (76)	TE-6363P-1
	Strap-Mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-2
		8 (203)	TE-6362M-1

1. Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2. Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.
3. TE-631AM-1 includes TE-6300-612 brass threadless well adaptor for retrofit to TE-6300W-103 or WZ-1000-5 thermowells.

Table 5: Optional Accessories[1]

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for Element Wells (8 oz. [.23 kg])
T-4000-xxxx	Wall Mount Cover (see Table 9)
T-4000-119	Allen Head Tool for Wall Mount Cover Screws (order in multiples of 30)
TE-1800-9600	Mounting Hardware for Mounting the Wall Mount Unit to a Wall Box
TE-6001-8	Element Holder for Mounting an Averaging Sensor (order in multiples of 10)
TE-6001-13	Metal Cover and Gasket Kit (5 per package)
TE-6300-101	12 in. (305 mm) (1k ohm) Nickel Probe (cut to an appropriate length)[2]
TE-6300-105	12 in. (305 mm) (1k ohm) Platinum Class A Probe (cut to an appropriate length)[2]
TE-6300-103	1/2-14 NPT Plastic Sensor Holder without retainer (order in multiples of 10)
TE-6300-104	12 in. (305 mm) (2.2k ohm) Thermistor Probe (cut to an appropriate length)[2]
TE-6300-613	IMC Kit, Metal Knockout Plug, Metal Clamp Connector (order in multiples of 10)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
TE-6300-615	Cable Tie Mounting Kit, 11 in. (280 mm) Maximum Bundle Diameter
TQ-6000-1	4 to 20 mA Output Transmitter for Use With the 100 ohm Platinum Sensor
TE-6300W-101	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe model TE-63xAM-2
TE-6300W-102	Thermowell, stainless steel, 2.38 in. (60.5 mm) immersion depth, without thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe model TE-63xAM-2
TE-6300W-103	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, threadless adaptor required, for use with 6 in. (150 mm) probe models TE-63xAM-1 (adaptor included) and TE-63xAP-1 (adaptor included)
TE-6300W-110	Thermowell, stainless steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe models TE-63x2M-1 (adaptor included) and TE-63x2P-1 (adaptor included)

1. For accessory usage, see Table 6, Table 7, and Table 8.
2. Cut 12 in. (305 mm) probes to a minimum of 3 in. (76 mm).

Table 6: Typical Accessory and Replacement Part Usage for TE-6300M Models

Product Code Number	Description	TE-6311M-1	TE-6312M-1	TE-6315M-1	TE-6316M-1	TE-631AM-1	TE-631AM-2	TE-631GM-1	TE-631JM-1	TE-6351M-1	TE-6352M-1	TE-635AM-2	TE-635GM-1	TE-635JM-1	TE-6361M-1	TE-6362M-1	TE-636AM-2	TE-636GM-1	TE-636JM-1	TE-634AM-2
TE-6001-8	Averaging Bracket			X	X															
TE-6300-611	Well Adaptor, Brass, 1/2-14 NPT, for use with TE-6300W-110 (replacement part, included with TE-63x2M-1)		X								X					X				
TE-6300-612	Well Adaptor, Brass, Threadless, for use with TE-6300W-103 (included with TE-631AM-1)					X	X					X					X			X
TE-6300-613	IMC Kit with Metal Plugs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TE-6300W-101	Thermowell, Brass with Copper Bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease included, direct mount, no adaptor required, for use with 6 in. (150 mm) probe						X					X					X			X
TE-6300W-102	Thermowell, Stainless Steel, 2.38 in. (60.5 mm) immersion depth, without thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe						X					X					X			X
TE-6300W-103	Thermowell, Brass with Copper Bulb, 2.38 in. (60.5 mm) immersion depth, thermal grease included, threadless adaptor required, for use with 6 in. (150 mm) probe (TE-631AM-1 includes adaptor)					X														
TE-6300W-110	Thermowell, Stainless Steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe (TE-63x2M-1 includes adaptor)		X								X					X				

Note: Direct-mount thermal wells TE-6300W-101 and TE-6300W-102 can be used only with the TE-6300M sensors.

Table 7: Typical Accessory and Replacement Part Usage for TE-6300P Models

Product Code Number	Description	TE-6311P-1	TE-6312P-1	TE-6313P-1	TE-6314P-1	TE-6315P-1	TE-6316P-1	TE-631AP-1	TE-6324P-1	TE-6327P-1	TE-6328P-1	TE-6337P-1	TE-6338P-1	TE-6341P-1	TE-6343P-1	TE-6344P-1	TE-6351P-1	TE-6352P-1	TE-6353P-1	TE-635AP-1	TE-6361P-1	TE-6363P-1
T-4000-119	Allen Head Tool				X				X							X						
TE-1800-9600	Mounting Hardware				X				X							X						
TE-6001-8	Averaging Bracket					X	X			X	X	X	X									
TE-6001-13	Metal Cover Kit	X	X	X		X	X	X		X	X	X	X	X	X		X	X	X	X	X	X
TE-6300-101	12 in. (305 mm), 1k ohm Nickel Probe	X																				
TE-6300-104	12 in. (305 mm), 2.2k ohm Thermistor Probe													X								
TE-6300-105	12 in. (305 mm), 1k ohm Platinum Class A Probe																X					
TE-6300-601	8 in. (203 mm), 1k ohm Nickel Probe	X																				
TE-6300-603	3 in. (76 mm), 1k ohm Nickel Probe			X																		
TE-6300-605	Sensor Holder/Well Adaptor, Plastic, 1/2-14 NPT, for use with TE-6300W-110 (replacement part, included with TE-63xxP-1)	X	X			X	X			X	X	X	X	X			X	X			X	
TE-6300-606	8 in. (203 mm), 2.2k ohm Thermistor Probe													X								
TE-6300-607	3 in. (76 mm), 2.2k ohm Thermistor Probe														X							
TE-6300-609	Sensor Holder/Well Adaptor, Plastic, Threadless, for use with TE-6300W-103 (replacement part, included with TE-63xAP-1)							X												X		
TE-6300-616	8 in. (203 mm), 1k ohm Platinum Class A Probe																X					
TE-6300-617	3 in. (76 mm), 1k ohm Platinum Class A Probe																		X			
TQ-6000-1	4 to 20 mA Output Transmitter											X	X									
Thermowells																						
F-1000-182	Thermal Conductive Compound, 8 oz. Container		X					X										X		X		
TE-6300W-103	Thermowell, Brass with Copper Bulb, 2.38 in. (60.5 mm) immersion depth, thermal grease included, threadless adaptor required, for use with 6 in. (150 mm) probe (TE-63xAP-1 includes adaptor)							X												X		
TE-6300W-110	Thermowell, Stainless Steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe (TE-63x2P-1 includes adaptor)		X															X				

Note: Direct-mount thermal wells TE-6300W-101 and TE-6300W-102 can be used only with the TE-6300M sensors.

Table 8: Typical Accessory and Replacement Part Usage for TE-63xS Models

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for element wells (8 oz.)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
TE-6300-615	Cable Tie Mounting Kit, 11 in. (280 mm) Maximum Bundle Diameter

Table 9: T-4000 Covers Available for the Wall-Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer, with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]				Brushed Aluminum/Beige
T-4000-2139	X			
T-4000-2140	X		X	
T-4000-2144		X		
T-4000-2639	X			Brown and Gold/Beige
T-4000-2640	X		X	
T-4000-2644		X		
T-4000-3139	X			Brushed Aluminum/White
T-4000-3140	X		X	
T-4000-3144		X		

1. Without Johnson Controls logo

Repair Information

If the TE-63xxA, TE-63xxM, TE-63xS, or TE-63xxV Series temperature sensor fails to operate within its specifications, replace the unit. For a replacement temperature sensor, see Table 4 and contact the nearest Johnson Controls representative. For a replacement sensor probe for TE-63xxP duct, well, and outdoor-air models, see Table 10.

Table 10: Replacement Parts

Product Code Number)	Description
TE-6300-601	8 in. (203 mm), 1k ohm Nickel Probe
TE-6300-616	8 in. (203 mm), 1k ohm Platinum Class A Probe
TE-6300-603	3 in. (76 mm), 1k ohm Nickel Probe
TE-6300-617	3 in. (76 mm), 1k ohm Platinum Class A Probe
TE-6300-605	1/2-14 NPT Threaded Plastic Sensor Holder with Retainer (10 per package)
TE-6300-606	8 in. (203 mm), 2.2k ohm Thermistor Probe
TE-6300-607	3 in. (76 mm), 2.2k ohm Thermistor Probe
TE-6300-609	Threadless Plastic Sensor Holder with Retainer (10 per package)
TE-6300-611	1/2-14 NPT Threaded Brass Sensor Holder (Order in multiples of 10)
TE-6300-612	Threadless Brass Sensor Holder (Order in multiples of 10)

Technical Specifications

TE-6300 Series Temperature Sensors (Part 1 of 3)

Sensor Reference Resistance	**1k ohm Nickel**	1k ohms at 70°F (21°C)
	1k ohm Nickel Averaging	
	1k ohm Platinum	1k ohms at 32°F (0°C)
	100 ohm Platinum Averaging	100 ohms at 32°F (0°C)
	1k ohm Platinum Averaging	1k ohms at 32°F (0°C)
	2.2k ohm Thermistor	2,252 ohms at 77°F (25°C)
	10k ohm Thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	**1k ohm Nickel**	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm Nickel Averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm Platinum Class A	±0.35F° at 70°F (±0.19C° at 21°C), DIN Class A
	1k ohm Platinum Class B	±0.73F° at 70°F (±0.41C° at 21°C), DIN Class B
	100 ohm Platinum Averaging	±1.0F°at 70°F (±0.58C° at 21°C)
	1k ohm Platinum Averaging	
	2.2k ohm Thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm Thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient (see Table 2)	**1k ohm Nickel**	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm Nickel Averaging	
	1k ohm Platinum	Approximately 2 ohms/F° (3.9 ohms/C°) 3,850 ppm/K
	100 ohm Platinum Averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm Platinum Averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm Thermistor	Nonlinear, Negative Temperature Coefficient (NTC)
	10k ohm Thermistor	Nonlinear NTC, Johnson Controls Type II
Electrical Connection	**TE-63xxM**	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxP	
	TE-63xxF	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided copper wires, low voltage insulation, half-stripped ends
	TE-63xxP Nickel Averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA, TE-63xxV	22 AWG x 10 ft (3 m) long plenum-rated cable, with 2-position plug terminal block for 1/4 in. (6.35 mm) male tab terminals on 0.197 in. (5 mm) centers

TE-6300 Series Temperature Sensors (Part 2 of 3)

Materials	**Probes**	Nickel Averaging: Nickel Averaging Adaptor: Platinum Averaging Probe: All Others (except Averaging):	0.094 in. (2.4 mm) Outside Diameter (O.D.) copper tubing 0.25 in. (6.35 mm) O.D. Brass 0.19 in. (4.8 mm) Aluminum tubing 0.25 in. (6.35 mm) O.D. Stainless Steel
	TE-63xxA	Mounting Adaptor Plate and Gland:	Thermoplastic
	TE-63xxF	Flush Mount:	Stainless Steel
	TE-63xxM	Enclosure: Well Sensor Holder:	Corrosion-Protected Steel 0.875 in. (22.2 mm) Hex Brass
	TE-63xxP	Conduit box and Shield: Mounting Plate: Sensor Holder: Wall Mount Base Plate: Wall Mount Cover: Wall Mount Face Plate:	Rigid Thermoplastic Aluminum Rigid Thermoplastic Corrosion-Protected Steel Rigid Thermoplastic (White) Brushed Aluminum
	TE-63xxV	Mounting Flange:	Stainless Steel
Operating Conditions	**TE-63xxA**		-50 to 140°F (-46 to 60°C)
	TE-63xxF	Temperature Limits:	32 to 104°F (0 to 40°C)
	TE-63xxM		-50 to 220°F (-46 to 104°C)
	TE-63xxP	Enclosure: Sensor Probe:	-50 to 122°F (-46 to 50°C) -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor Probe: Wire Harness:	-50 to 220°F (-46 to 104°C) -50 to 122°F (-46 to 50°C)
	TE-63xxV		
Shipping Weight	**TE-63xxA**		0.2 lb (0.09 kg)
	TE-63xxF		0.25 lb (113.4 kg)
	TE-63xxM	Duct Averaging: Duct Mount: Well Insertion:	0.9 lb (0.41 kg) 0.4 lb (0.18 kg) 0.5 lb (0.23 kg)
	TE-63xxP	Duct Averaging: Duct Mount: Outdoor Air: Wall Mount: Well Insertion:	0.5 lb (0.23 kg) 0.4 lb (0.18 kg) 0.5 lb (0.23 kg) 0.2 lb (0.09 kg) 0.35 lb (0.16 kg)
	TE-63xS	Strap-Mount:	0.2 lb (0.09 kg)
	TE-63xxV	Duct Averaging: Duct Mount:	0.7 lb (0.32 kg) 0.2 lb (0.09 kg)

TE-6300 Series Temperature Sensors (Part 3 of 3)

Dimensions (H x W x D)	**TE-63xxA**		2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 m) element
	TE-63xxF	Flush Mount:	4-1/2 x 2-3/4 in. (114 x 70 mm)
	TE-63xxM	Duct Averaging:	1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element
		Duct Mount:	1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element
		Well Insertion:	1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct Averaging:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element
		Duct Mount:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
		Outdoor Air:	5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm)
		Wall Mount:	2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm)
		Well Insertion:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap-Mount:	0.25 in. (6.4 mm) diameter x 3.00 in. (76 mm) long
	TE-63xxV	Duct Averaging:	2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element
		Duct Mount:	2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 m) element

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Building Efficiency
507 E. Michigan Street, Milwaukee, WI 53202

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PROJECT DRAWING SYMBOLS

- UNION
- TRIPLE DUTY VALVE
- GATE VALVE
- CHECK VALVE
- BACKFLOW PREVENTOR
- BALL VALVE
- BUTTERFLY VALVE
- PIPE UP RISER
- PIPE DOWN
- PIPE TEE DOWN
- TEMPERATURE SENSOR
- BTU METER
- DEMOLISH TO THIS POINT
- CONNECT TO EXISTING

AFF - ABOVE FINISH FLOOR
BFP - BOILER FEED PUMP
BBP - BOILER BLOWDOWN PIPING
FWP - FEEDWATER PIPING
CP - CONDENSATE PIPING
CFP - CHEMICAL FEED PIPING
NGP - NATURAL GAS PIPING
FOP - FUEL OIL PIPING
VFD - VARIABLE FREQUENCY DRIVE
MC - MECHANICAL CONTRACTOR

MECHANICAL PERFORMANCE SPECIFICATIONS:

PIPING AND FITTINGS:

BOILER / HYDRONIC: SCHEDULE 40 BLACK STEEL OR COPPER TYPE L.

BALL VALVE: BRONZE BODY, FULL PORT BALL, SCREWED OR SOLDERED ENDS, 600WOG, NIBCO OR APOLLO.

GATE VALVE: BRONZE BODY, SCREWED ENDS, 600WDG, NIBCO OR APOLLO.

BUTTERFLY VALVE: FLANGE BODY, JENKINS SERIES 200 OR EQUAL.

CHECK VALVE: BRONZE BODY, SCREWED OR SOLDERED ENDS, SWING TYPE, JENKINS FIGURE 762A OR EQUAL.

PIPE HANGAR: HANGAR TO BE CLEVIS TYPE HANGAR BY SIOUX CHIEF; OR EQUAL.

PIPING TO BE INSULATED PER THE LATEST INTERNATIONAL ENERGY CONSERVATION CODE.

TESTING AND BALANCING:

FURNISH LABOR AND INSTRUMENTS AND ADJUST THE WATER SYSTEMS AS SHOWN ON THE DRAWINGS. AFTER ADJUSTMENT AND TESTING OF ALL SYSTEMS, SECURELY FASTEN ALL MANUAL VALVES IN POSITION. FURNISH TWO COPIES OF THE FINAL BALANCING REPORT TO ENGINEER FOR APPROVAL AND INCLUDE IN THE O&M MANUALS.

INSTALLATION:

A. ROUTE PIPING IN ORDERLY MANNER, PLUMB AND PARALLEL TO BUILDING STRUCTURE, AND MAINTAIN GRADIENT.

B. INSTALL PIPING TO CONSERVE BUILDING SPACE AND NOT INTERFERE WITH USE OF SPACE, OTHER WORK, OR EQUIPMENT.

C. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT.

D. PROVIDE CLEARANCE FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS.

E. WHERE PIPE SUPPORT MEMBERS ARE WELDED TO STRUCTURAL BUILDING FRAMING, SCRAPE, BRUSH CLEAN, AND APPLY ONE COAT OF ZINC RICH PRIMER TO WELDING.

F. INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.

G. INSTALL UNIONS DOWNSTREAM OF VALVES AND AT EQUIPMENT OR APPARATUS CONNECTIONS. INSTALL DIELECTRIC UNIONS WHERE JOINING DISSIMILAR MATERIALS.

GENERAL NOTES:

A. MC TO ACT AS TURN KEY CONTRACTOR. REMOVE AND LEGALLY DISPOSE OF ALL REMOVED MATERIAL AND EQUIPMENT. TURN COMPLETED WORK OVER TO THE OWNER WITH TWO SETS OF OPERATION AND MAINTENANCE MANUALS. TRAIN THE OWNERS OPERATING PERSONNEL IN THE COMPLETE OPERATION OF THE NEW EQUIPMENT.

B. VERIFY EXISTING CONDITIONS IN FIELD, INCLUDING LOCATIONS, SIZES AND ELECTRICAL SERVICE, ETC.

C. MECHANICAL CONTRACTOR TO COORDINATE ALL NEW WORK WITH THE EXISTING CONDITIONS.

D. INSTALL ALL EQUIPMENT PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.

E. ALL WORK SHALL BE DONE IN ACCORDANCE WITH GOOD INDUSTRY PRACTICE BY LICENSED, PERMITTED AND QUALIFIED MECHANICS AND SHALL BE IN ACCORDANCE WITH ALL APPLICABLE CODES AND STANDARDS. ANY REQUIRED PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL BE FULLY INSURED AND SHALL PROVIDE STANDARD INSURANCE DOCUMENTS TO THE OWNER PRIOR TO STARTING ANY WORK.

F. OWNER IS RESPONSIBLE FOR ALL CHEMICAL TREATMENT FOR BOILERS.

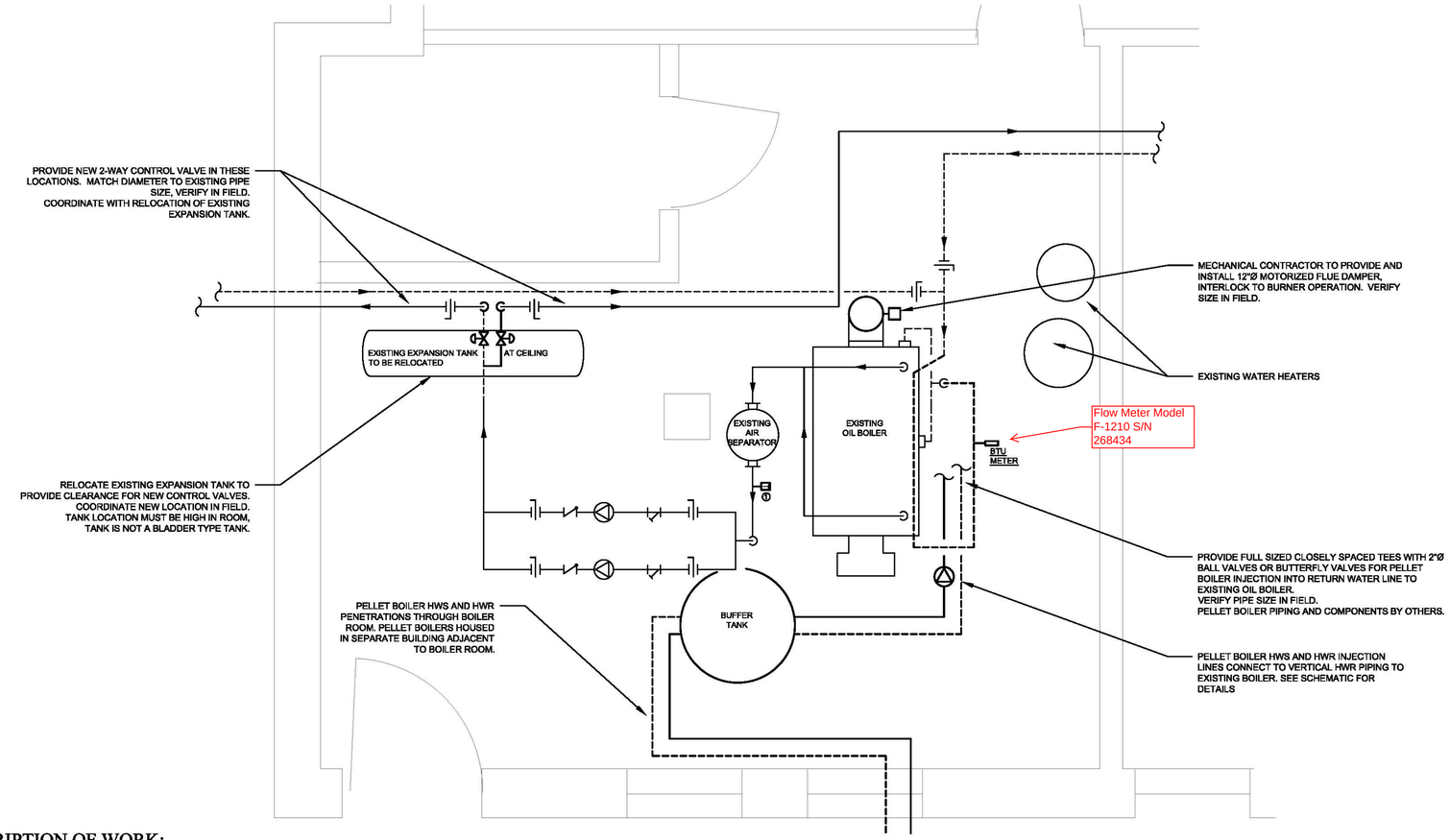
G. ALL CONFLICTS AND ITEMS FOR CLARIFICATIONS SHALL BE BROUGHT TO JOHNSON CONTROLS ATTENTION PRIOR TO WORK IN THE AREA.

H. POSITION AND INSTALL ALL NEW EQUIPMENT SO AS TO PROVIDE ADEQUATE ACCESS FOR SERVICE, OPERATIONS, AND MAINTENANCE.

I. PROVIDE ADEQUATE COVERING TO ALL NEW ENDS OF PIPING TO PREVENT DUST, DIRT, AND DEBRIS FROM ENTERING DURING CONSTRUCTION.

J. PAINT NEW MISCELLANEOUS STEEL AND PIPING THAT DOES NOT NORMALLY GET INSULATED, EXCEPT FOR; COPPER PIPING, STAINLESS STEEL, GALVANIZED STEEL, ETC.

K. THESE PLANS ARE INTENDED TO INDICATE PERFORMANCE LEVELS FOR THE INSTALLATION. THEY ARE NOT INTENDED TO SHOW ALL COMPONENTS REQUIRED TO MAKE A COMPLETE INSTALLATION. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND INSTALLING ALL COMPONENTS NECESSARY TO MAKE A COMPLETE, OPERATING SYSTEM.

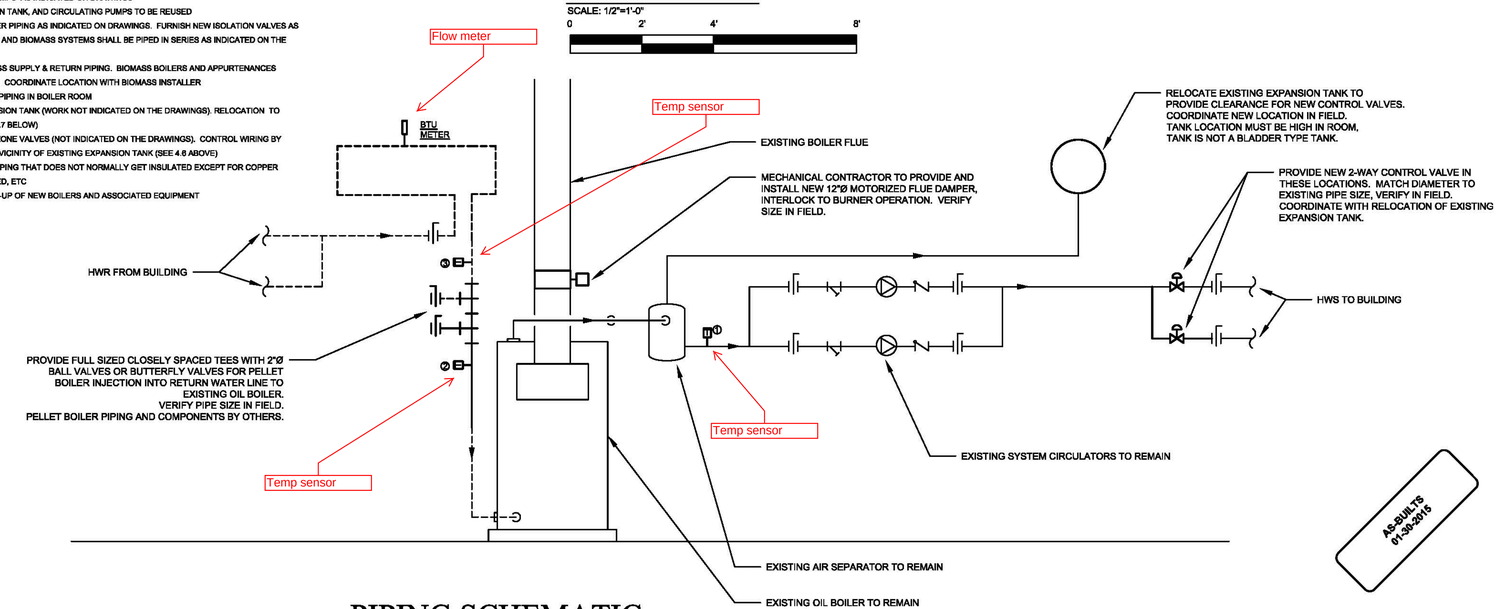


PIPING PLAN

SCALE: 1/2"=1'-0"
0 2' 4' 8'

DESCRIPTION OF WORK:

1.1. DISCONNECT HW BOILER PIPING & PUMPS AS INDICATED ON DRAWINGS
1.2. EXISTING AIR SEPARATOR, EXPANSION TANK, AND CIRCULATING PUMPS TO BE REUSED
1.3. FURNISH AND INSTALL NEW HW BOILER PIPING AS INDICATED ON DRAWINGS. FURNISH NEW ISOLATION VALVES AS INDICATED ON DRAWINGS. OIL-FIRED AND BIOMASS SYSTEMS SHALL BE PIPED IN SERIES AS INDICATED ON THE DRAWINGS.
1.4. INSTALL INJECTION TEES FOR BIOMASS SUPPLY & RETURN PIPING. BIOMASS BOILERS AND APPURTENANCES FURNISHED & INSTALLED BY OTHERS. COORDINATE LOCATION WITH BIOMASS INSTALLER
1.5. INSULATE ALL HW SUPPLY & RETURN PIPING IN BOILER ROOM
1.6. RELOCATE & REUSE EXISTING EXPANSION TANK (WORK NOT INDICATED ON THE DRAWINGS). RELOCATION TO ACCOMMODATE ZONE VALVES (SEE 4.7 BELOW)
1.7. INSTALL (2) CONTRACTOR SUPPLIED ZONE VALVES (NOT INDICATED ON THE DRAWINGS). CONTROL WIRING BY OTHERS. VALVES TO BE LOCATED IN VICINITY OF EXISTING EXPANSION TANK (SEE 4.6 ABOVE)
1.8. PAINT MISCELLANEOUS STEEL AND PIPING THAT DOES NOT NORMALLY GET INSULATED EXCEPT FOR COPPER PIPING, STAINLESS STEEL, GALVANIZED, ETC
1.9. ASSIST MANUFACTURER WITH START-UP OF NEW BOILERS AND ASSOCIATED EQUIPMENT



PIPING SCHEMATIC

NO SCALE

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REVISIONS

Job No.	12074
File No.	AS NOTED
Drawn By	CFL
Checked By	GRT
Scale	AS INDICATED
Date	01-30-2015

ENFIELD ELEMENTARY SCHOOL
Enfield, NH
BOILER PIPING MODIFICATIONS

SHEET NO.:
M-1