

Silver Series Thermal Dispersion Airflow Measurement Technology



Figure 1. STx104-U Unit Ventilator Airflow Measurement System

OVERVIEW

EBTRON Silver Series STx104-U thermal dispersion unit ventilator airflow measurement station is designed for direct measurement and precise control of outdoor air intake flow rates for dilution air control and for ASHRAE 62.1 compliance. The STA104-U continuously measures intake rates in the unit ventilator, permitting precise control of outdoor air. The transmitter serves a single ventilator intake, and requires 24 VAC. The STx104-U provides the host controller with a linear output signal for airflow and temperature.

Each transmitter is fully independent of the sensor probes. "Smart" sensor technology embeds the calibration data of each sensor in the probe cable assembly. STx104-U transmitters feature field selectable, isolated 4-20 mA and 0-10 VDC analog output signals for airflow and temperature. Output scales can be easily reconfigured from the factory default settings in the field. In addition, a digital gain control permits field adjustment of factory calibration if required. The model STx104-U has typical installed accuracy of $\pm 3\%$ to 6% of reading when installed in accordance with **EBTRON** installation guides without field adjustment. Installed accuracy is a function of the velocity profile of the intake, and is ensured through individual sensor characterization over a range of 0 to 5,000 fpm (0 to 25.4 m/s) in wind tunnels calibrated to NIST-traceable volumetric airflow standards. Accuracy of the STx104-U is percent of reading, not percent of full scale (which is typical of other airflow instruments), resulting in much improved accuracy and performance, particularly at the lower air flow levels encountered at unit ventilator intakes.

EBTRON uses only precision "bead-in-glass" thermistors within each sensor to determine airflow rate and temperature. The sensor relates the thermal transfer rate of a heated element to airflow rate. As the velocity across the sensor increases, the thermal transfer rate increases.

The STx104-U is designed for years of trouble free operation. Periodic field calibration and maintenance are not required in most environments¹.

APPLICATIONS

- Direct outdoor airflow measurement for continuous reset of intake flow rates and true demand controlled ventilation compliance with **ASHRAE® 62.1-2007**.
- Direct outdoor airflow measurement for acquisition of **LEED® Credit EQc1 for Outdoor Air Delivery Monitoring**.
- High accuracy airflow measurement in unit ventilators for direct measurement and precise control of outdoor air intake flow for dilution air control.

SYSTEM FEATURES

- **EBTRON** Advanced Thermal Dispersion (TD) airflow measurement technology ensures accurate, repeatable measurement from zero flow (still air).
- Each sensor is factory calibrated to **NIST-traceable** volumetric airflow standards.
- True volumetric airflow rate using independent multi-point sensors.
- Superior performance compared to conventional differential pressure based pitot arrays and flow rings.
- Highest quality, stable hermetically sealed "bead-in-glass" thermistors.
- Exclusive "Plug and Play" SMART sensor design.
- Simple field installation.
- Model STA104-U: Analog Output.
- Model STN104-U: RS-485 output for **BACNet®-MS/TP Master, Modbus®-RTU or JCI N2-Bus®**

SILVER SERIES
DATA SHEET

¹In certain applications where a large amount of airborne particulate is present, especially fibrous material such as lint, pre-filtering of the return air (using MERV 5 or equivalent filter) may be required to ensure optimum instrument performance. If no pre-filtering is provided, it may be necessary to periodically inspect and clean sensors using compressed air or a small brush. Factory performance returns immediately after cleaning. Recalibration is NOT required. Periodic inspection of the sensors is always advised, and accessibility must be considered in these applications.

Table of Contents

APPLICATIONS	1
SYSTEM FEATURES	1
OVERVIEW	1
STx104-U FEATURES	3
Advanced Thermal Dispersion Technology	3
Versatile Sensor Probe Design	3
Field-Adjustable Gain Control	3
Flexible Interface Options	3
STx104-U APPLICATIONS	4
Acquisition of LEED® EQ Credits and ASHRAE® 62.1-2007 Compliance	4
Temperature Control and Energy Conservation	4
Outdoor Air Control	4
STx104-U SELECTION AND PLACEMENT GUIDE	4
PROBE PLACEMENT	4
Minimum Placement Guidelines	5
STx104-U INSTALLATION NOTES	6
STx104-U POWER AND SIGNAL WIRING NOTES	6
Power Requirements	6
Signal Interface to Host Control System	6
GETTING MORE INFORMATION	6
ENGINEER'S GUIDE SPECIFICATION	6
ORDERING GUIDE	6
STx104-U SPECIFICATIONS	7
STx104-U WARRANTY	7

List of Figures

Figure 1. STx104-U Unit Ventilator Airflow Measurement System	1
Figure 2. STx104-U Unit Ventilator Sensor Probe	3
Figure 3. STx104-U Unit Ventilator Sensor Probe Minimum Placement Guidelines	5
Figure 4. STx104-U Unit Ventilator Sensor Probe Mechanical Dimensions	5
Figure 5. STx104-U Unit Ventilator Ordering Guide	6

Copyright © 2008 EBTRON®, Inc.

All brand names, trademarks and registered trademarks are the property of their respective owners. Information contained within this document is subject to change without notice. Visit EBTRON.com to view and/or download the most recent versions of this and other documents.

All rights reserved.

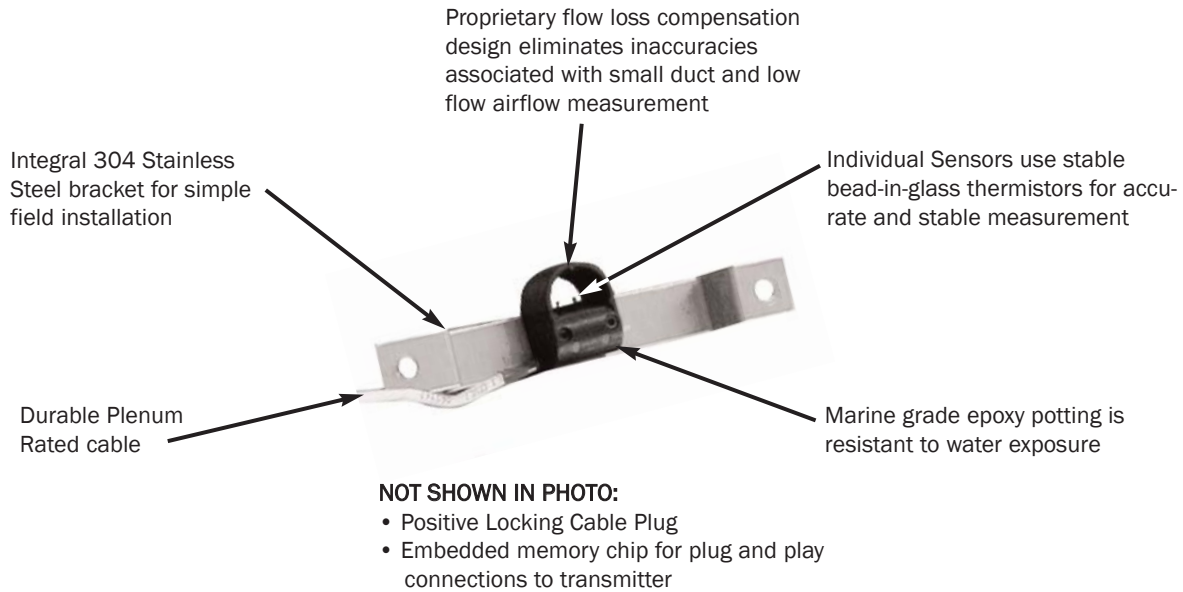


Figure 2. STx104-U Unit Ventilator Sensor Probe

STx104-U FEATURES

Advanced Thermal Dispersion Technology

EBTRON advanced thermal dispersion technology relates the velocity of the air to the power dissipation and rise in temperature of a heated element in a moving air stream. **EBTRON** uses extremely stable and reliable bead-in-glass, self-heated thermistors as the heated element and ambient air temperature sensors. Multiple sensing points are used to produce an average velocity for true volumetric airflow (cfm). Each probe is factory calibrated at 16 points to NIST-traceable airflow standards. Long term stability is ensured by the selection of high quality thermistors and signal processing components. Unlike pressure-based devices that frequently require field calibration and auto-zeroing, **EBTRON** does not recommend periodic calibration of its airflow measuring devices. In fact, there is no auto-zero function in **EBTRON** flow measuring devices. It simply is not required.

Versatile Sensor Probe Design

Sensor probes are designed to be installed upstream of the intake control damper, in the opening of approved unit ventilators. A unique mounting bracket constructed of type 304 stainless steel allows for direct mounting to the intake damper frame for those applications where no ductwork exists immediately upstream. Each sensor probe is provided with a standard 5 foot plenum rated cable (with optional cable lengths of up to 50 feet available) to connect to the remote transmitter via circular terminal connector.

Field-Adjustable Gain Control

A simple user interface allows for field adjustment to the factory gain calibration, if required. This feature allows for equalization of instrument accuracy and test and balance measurement accuracy.

Flexible Interface Options

As with all **EBTRON** transmitters, interface to the host control system is very flexible. The STA104-U is provided with isolated analog output signals for both airflow and temperature and can be configured as linear 0-10 VDC or 4-20mA. The RS-485 version, model STN104-U, is available with field selectable network outputs for **BACnet**[®] MS/TP, **Modbus**[®] RTU or **Johnson Controls N-2 bus**. There is no surcharge for the RS-485 configuration.

STx104-U APPLICATIONS

Acquisition of LEED[®] EQ Credits and ASHRAE[®] 62.1-2007 Compliance

The STx104-U is designed to measure direct outdoor airflow intake for acquisition of LEED[®] EQc1 for Outdoor Air Delivery Monitoring, and to provide true dilution air control at unit ventilators for ASHRAE[®] 62.1-2007 compliance. In addition, acquisition of LEED[®] Credit EQc2 can be achieved by increasing outdoor airflow by an additional 30%. These applications provide important environmental and financial benefit for architects, building automation system designers, property owners and occupants. Additional LEED[®] opportunities are provided in the [EBTRON GreenBook](#) available from your local representative.

Temperature Control and Energy Conservation

The STx104-U provides accurate airflow measurement in unit ventilators for improved temperature control and energy conservation. Higher accuracy translates into increased comfort and cost savings due to improved temperature control. **EBTRON** STx104-U advanced thermal dispersion technology and proprietary flow loss compensation design eliminates inaccuracies associated with low flow airflow measurement, which is typical of conventional pressure-based measurement techniques.

Outdoor Air Control

The STx104-U is ideal for outdoor air intake measurement and control on dedicated unit ventilators and small systems serving discrete spaces. Due to the inherent accuracy of the STx104-U airflow measurement station, dedicated outdoor airflow can be precisely controlled while minimizing overshoot and undershoot of delivery airflow volume.

STx104-U SELECTION AND PLACEMENT GUIDE

EBTRON STx104-U thermal dispersion probes are designed to be applied within approved unit ventilators at locations that have been a poor choice for other airflow measurement technologies. Contact **EBTRON** or your local **EBTRON** Representative for a current list of approved ventilators, or with assistance in your specific application.

Outdoor Air Intakes

STx104-U airflow measuring probes are designed to be mounted upstream of the outdoor air intake damper in approved unit ventilators. Contact **EBTRON** or your **EBTRON** Representative for the most current list of approved unit ventilator manufacturers.

PROBE PLACEMENT

The STx104-U is available in a dual probe configuration with a total of two sensors per intake. Probes are designed to fit in a 4 to 12 inch opening of approved unit ventilators. The following paragraphs detail the method for determining optimum placement of STx104-U sensor probes in typical applications of approved unit ventilators:

CAUTION



Installation of the STx104-U probes at the location specified in the Minimum Placement Guidelines (in the following section of this document) is critical for proper performance of the airflow measurement station.



Although STx104-U sensor probes are water resistant, avoid locating airflow measurement stations where they will be subject to frequent water exposure.



Field verification results will typically yield measurement uncertainties of 5% to 10% of reading depending upon the field verification equipment and measurement technique used. The installed accuracy of the STx104-U can be adjusted to more closely match the field verification results if desired by using the field adjustable gain feature.

Minimum Placement Guidelines

STx104-U unit ventilator sensor probes are computer calibrated between 0 and 5,000 fpm (0 and 25.4 m/s) in individual wind tunnels to volumetric airflow standards. Placement of the STx104-U sensor probes is critical for proper operation and accuracy of the airflow measurement station. Figure 3 shows minimum placement requirements for the STx104-U sensor probe in approved unit ventilators. As shown, the probes are located at $X/4$ from each end (left and right), and $X/2$ from one another on the inside of the unit ventilator outdoor air intake, where X = the overall width of the outdoor air intake opening. Note that the round sensor shrouds on the sensors face away from one another.

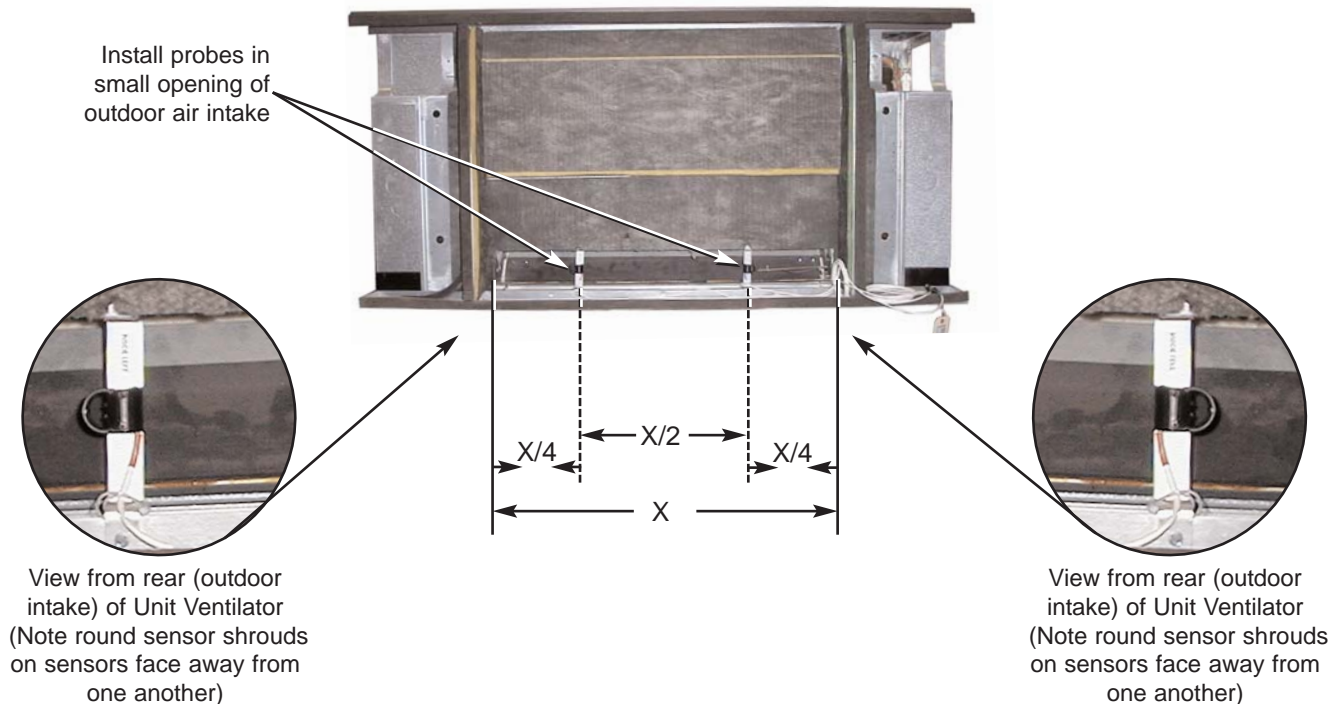


Figure 3. STx104-U Unit Ventilator Sensor Probe Minimum Placement Guidelines

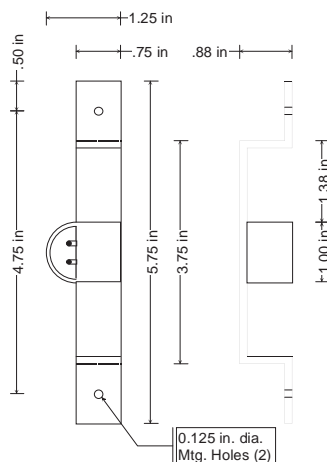


Figure 4. STx104-U Unit Ventilator Sensor Probe Mechanical Dimensions

STx104-U INSTALLATION NOTES

Complete installation instructions for the sensor probe and for the transmitter are contained in each of the respective Installation Operation and Maintenance Technical Manuals (under separate cover). The integral mounting bracket for the sensor probe shown in Figure 4 is installed across the outdoor air intake, on the inside of the approved unit ventilator, and is secured with two sheet metal screws as shown in Figure 3.

STx104-U POWER AND SIGNAL WIRING NOTES

Power Requirements

The STx104-U requires 24 VAC at 8 VA maximum. An isolated 24 VAC power source is NOT required on analog output transmitters to assure a "floating" output signal to the host controls since analog outputs are isolated.

Signal Interface to Host Control System

- STA104-U Analog Output: The output signal is field selectable between 0-10 VDC and 4-20 mA, independently for both the airflow rate and temperature. Analog output signal scaling has factory default settings or can be configured by the user in the field.
- STN104-T RS-485 Output: The RS-485 output can be configured for **BACnet® MS/TP Master**, **Modbus® RTU** or **Johnson Controls® N-2 bus®** networks.

NOTE:



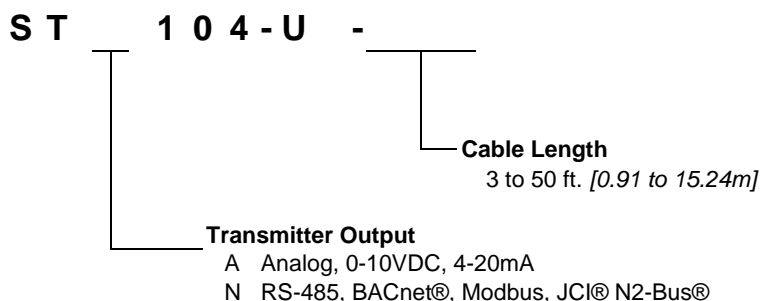
Refer to the separate STx104 Transmitter Installation, Operation and Maintenance Manual for detailed wiring, configuration and instrument set up information.

GETTING MORE INFORMATION

For additional information on this product, or for assistance with specific applications, refer to **EBTRON** Application Design Guides available in the **EBTRON** Engineer's catalog, online at www.EBTRON.com, or from your local **EBTRON** Representative. Application assistance is also available from the **EBTRON** Applications Engineering team at 800.2EBTRON (800. 232-8766).

ENGINEER'S GUIDE SPECIFICATION

Visit www.EBTRON.com/specs for the most updated version of the engineer's guide specification for this product line, or contact your local **EBTRON** Representative for assistance.



TD_STx104-U_R1A

Figure 5. STx104-U Unit Ventilator Ordering Guide

STx104-U SPECIFICATIONS

System Performance

STA104-U Measurement Range:	0 - 1,500 fpm (7.62 m/s)
STA104-U Installed Airflow Accuracy:	±3% to 6% of reading (typical)
Repeatability (± of reading):	±0.25% of reading

Sensor Probe Specifications

Sensor Assembly Model:	SU1
Sensor Assembly:	Two hermetically sealed "bead-in-glass" thermistors in a glass filled polypropylene housing
Mounting Brackets:	304 Stainless Steel
Probe Size:	4 to 12 inches (101.6 to 304.8 mm)
Cable Assembly:	PVC plenum rated 5 feet (1.5 m) standard; up to 50 feet (15.25 m) optional
Connection to Transmitter:	5/8-inch (15.875 mm) circular DIN connectors
Number of Airflow Calibration Points:	16 per sensing point
Number of Temperature Calibration Points:	3
Maximum Number of Sensors per Sensor Probe:	1
Sensor Distribution:	Equal area
Airflow Sensor Accuracy (± of reading):	2%
Calibrated Range:	0-5,000 fpm (25.4 m/s)
Temperature Sensor Accuracy:	0.15° F (0.083° C)
Sensor Temperature Range: 0-1,500 fpm:	-20° F to 160° F (-28.9° C to 71.1° C)
>1,500 fpm:	30° F to 160° F (-1.1° C to 71.1° C)
Humidity range:	0 to 99% RH, non-condensing

Transmitter Specifications

Transmitter Model:	STA104 (Analog Output); STN104 (RS-485 Network)
Maximum Number of SU1 Sensors per Location:	2
A/D Converter:	12 bit actual
Sensor Independent Electronics:	Yes
Power Requirement:	24 VAC @ 8 VA max. (fused and protected on transmitter; isolation not required)
Chassis (enclosure):	Aluminum (protect from water and condensation)
Output Signal Adjustments:	Field adjustable digital gain for airflow output
Analog Output protection:	Fused and protected, ISOLATED analog outputs
Analog Output Signals:	Field selectable, linear analog output signals of 4-20mA and 0-10 VDC for airflow and temperature

Output to Host Controls

Model STA104-U Interface (Analog Output):	Isolated 0-10 VDC or 4-20 mA, linear outputs
Output Resolution	0.025% of full scale
Model STN104-U Interface (RS-485 LAN Output)	Field selectable BACnet® MS/TP Master, Modbus RTU or JCI N2-Bus® interface
Baud Rates	9.6, 19.2, 38.4, and 76.8 kbaud

STx104-U WARRANTY

Standard Warranty Period is 3 years from shipment in accordance with **EBTRON**'s published Terms and Conditions of Sale.

