

Airflow Measurement Systems for Small Ducts

System Features

- Designed specifically for small ducts and VAV boxes.
- Each sensor is factory calibrated to NIST traceable airflow and temperature standards.
- Accurate and repeatable measurement from still air (0 ft./min.).
- True average, independent multi-point sensing.
- Advanced Thermal Dispersion (TD) airflow measurement technology.
- Sensor and transmitter diagnostics with intelligent sensor detection system.
- Aluminum alloy sensor probes.
- Stable, hermetically sealed "bead in glass" thermistor sensors.
- Exclusive "plug and play" SMART sensor design.
- Microprocessor based digital circuitry with FLASH memory.
- Fully temperature compensated.
- Provides direct signal(s) to all B.A.S.
- Very competitively priced.



Application

Thermal dispersion technology can accurately determine airflow in traditionally difficult locations since each sensor is independent and does not require that a stable total and static pressure profile be developed. **Laboratory test data demonstrates that thermal dispersion airflow measurement can be applied closer to duct fittings and accessories than any other technology¹.**

The **STA102-T** has been specifically designed for the accurate measurement of airflow rates in small ducts and upstream of VAV terminal boxes. Accurate measurement and turn-down is essential for precise volumetric tracking applications such as found in laboratories, hospitals, and clean rooms.

The **STA102-T** is also ideal for the monitoring critical zone airflow rates in VAV systems requiring the dynamic calculation of the multi-space equation for outdoor airflow setpoint determination in ASHRAE Standard 62.

For detailed application information refer to **EBTRON** application design guides, available in your engineer's catalog, online at www.ebtron.com or from your local **EBTRON Representative**.

Selection

The **STA102-T** has been developed with most "traditional" options included standard. Each transmitter serves a single duct location. The transmitter requires 24 VAC and provides the host controls with a linear output signal for airflow.

Each transmitter is fully independent of the sensor probe. "Smart" sensor technology embeds the calibration data of each sensor in the probe cable assembly. Each transmitter is provided with a field selectable, isolated 4-20 mA and 0-10 VDC analog output signal for airflow. The output scales can be configured easily in the field (see **Technical Specifications** for factory default settings). Each transmitter is provided with a "digital potentiometer" for airflow signal gain adjustment.

EBTRON
Thermal Dispersion Airflow Measurement

1663 Hwy. 701 S., Loris, SC 29569 USA
Toll Free: 800-2EBTRON (232.8766) Fax: 843.756.1838
Internet: www.ebtron.com e-mail: ebtron@ebtron.com


¹ Contact EBTRON for more information.


Sensor probes are designed for insertion mounting. Insertion mounting probes are installed through one side of the duct. Mounting brackets are constructed of corrosion resistant 304 stainless steel. The model **STA102-T** has a typical installed accuracy between 3% and 6% of reading when installed in accordance with **EBTRON** installation guides without any field adjustment (see: **Locating Probes**). Installed accuracy is a function of the velocity profile in the duct. An installed accuracy of \pm (2% to 3%) of reading can be obtained with field adjustment when the recommended setup procedures are followed.

Locating Probes

Ducts and Plenums

EBTRON thermal dispersion probes can be applied in duct locations traditionally considered to be a poor choice for other airflow measurement technologies. When placing airflow measurement probes, select a location that has at least 3 equivalent duct diameters ($(Length+Width)/2$) of straight run between disturbances (elbows, transitions, etc.). Turning vanes significantly improve performance near elbows. Use the “2/3” rule and place the airflow station 2/3 the distance downstream from the upstream disturbance. Locate probes upstream of VAV boxes. Contact **EBTRON** or your local **EBTRON Representative** for assistance in locating airflow stations. Mounting the probe across the major velocity profile will improve installed accuracy.

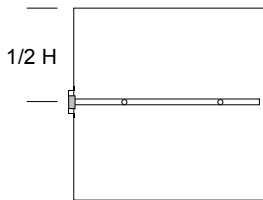
 **Avoid locating the airflow station immediately downstream of modulating damper.**

 **Do not locate the airflow station where it will be exposed to rain, or condensate from a humidifier or coil. Consult humidifier or coil manufacturer for absorption distance recommendations.**

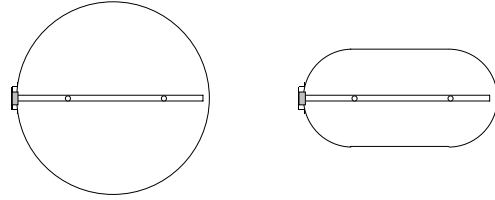
Probe and Sensor Density

The **STA102-T** is available as a single probe configuration. Probes with an 8 inch or greater free area opening will be provided with 2 sensors. Probes with a free area opening less than 8 inches will be provided with 1 sensor. Where condensing moisture is a concern, vertically mounted probes should be installed with the “wire out” end towards the top of the duct. Probes are ordered by Probe Length. Internal insulation should be specified so that the proper sensor spacing can be achieved. Probe mounting configurations are illustrated below.

Rectangular Ducts




Round/Oval Ducts

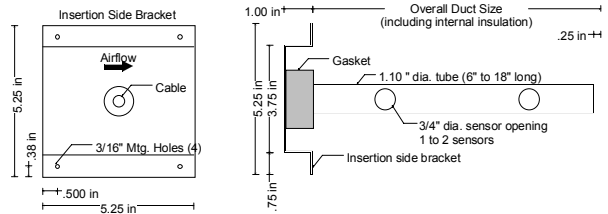


Probe Installation

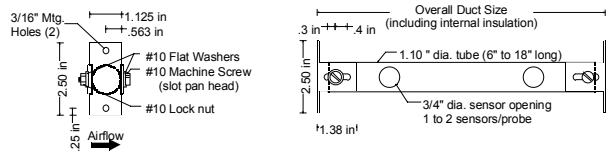
STA102-T probes have three mounting options for field installation flexibility. All probes have a standard 3 foot plenum rated cable (optionally up to 50 feet) for connection to the remotely located transmitter (required). Each Sensor probe is connected to the transmitter with a simple, positive locking, DIN connector. The connector is 5/8” O.D. The length of the cable is measured from the end of the sensor probe and is the same length for each probe in a given location. Probes should be installed with the airflow arrow pointing in the appropriate direction and fastened with suitable hardware.

 **The cable length ordered must be long enough to accommodate the distance between the transmitter and sensor probe.**

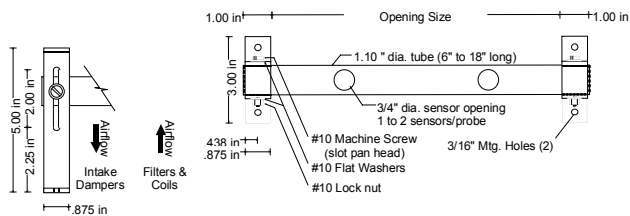
Insertion mounting: Install through one side of duct or plenum. External insulation that interferes should be temporarily removed prior to installation. Mounting requires a 1-1/4” hole on one side of the duct.



Internal mounting: Install inside of the duct or plenum. Any internal insulation should be removed prior to installation. There is approximately \pm 3/4” of adjustment from the nominal length of each probe.



Standoff mounting: Install directly on an outside air intake damper frame. The sensor probe should be mounted 2” from the full open blade position. Unducted standoff mounting can add up to 5% of additional uncertainty to the system installed accuracy.



Transmitter Installation

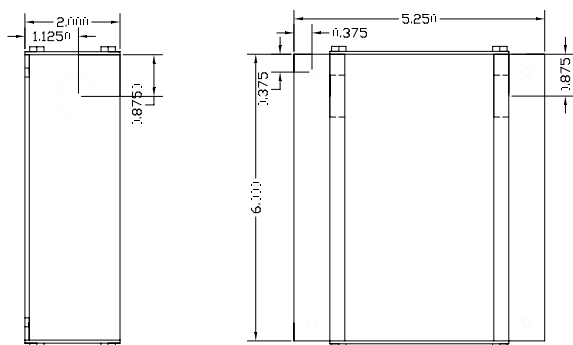
The STA102-T transmitter aluminum chassis has been designed for use in a protected environment between -20° F and 120° F where it will not be exposed to rain or snow.

The transmitter should be mounted **upright** in a field accessible location. The chassis is designed to accept 3/4" conduit fittings for power and signal wiring at the top left and right of the enclosure. The transmitter should be located such that the connecting cables from the sensor probes reaches the receptacle on the bottom of the transmitter enclosure.

! Do not expose the transmitter to rain or snow without providing a NEMA4 enclosure.

! Do not drill into the transmitter chassis since metal shavings could damage the electronics.

STA102-T Transmitter Dimensions



Electrical Connections

After mounting the sensor probe and transmitter, connect the sensor probe cable plug to the circular receptacle located at the bottom of the STA102-T transmitter enclosure. Probes are “plug and play” and do not have to be connected to a specific transmitter.

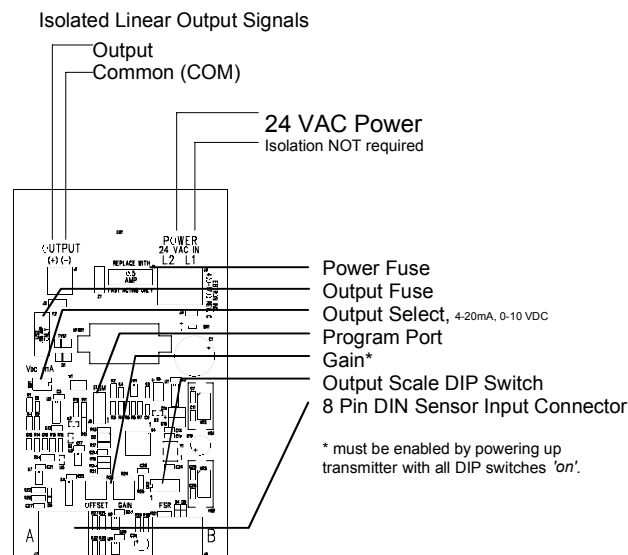
To wire the output signal and power, slide the cover plate up and out of the extruded chassis. Signal wires for airflow should be connected to the small, two position output terminal labeled “OUTPUT” on the upper left hand side of the main circuit board.

! When configured for a 4-20 mA output, the STA102-T is a “4-wire” device. The host controls should not provide an excitation voltage to the output of the STA102-T.

Make sure that the 24 VAC power source is not energized. 24 VAC power should be connected to the large, two position power input terminal labeled “POWER” on the upper right hand side of the main circuit board. Since the output signal is isolated from the power supply, it is not necessary to provide an isolated (secondary not grounded) power source.

! Multiple STA102-T transmitters wired on a single transformer must be wired “in-phase”.

STA102-T Transmitter Wiring and Circuit Board Functions



Start-up

To assure a successful startup, check that the airflow measuring station is installed in accordance with this document.

! Check the physical installation, power connections, and signal wiring prior to applying 24 VAC power.

The transmitter is factory shipped with the analog output signals set to the 4-20mA default. If a 0-10 VDC output is desired, simply move switch SW1 to the 0-10 VDC position prior to power-up. All output signals are linear. The factory default scaling for velocity is 0 to 5,000 FPM. To convert to CFM simply multiply the full scale velocity output by the duct area, in square feet. To change the factory default scaling, refer to the DIP switch diagram below.

Output Scale DIP Switch Settings

DIP Switch Position				Output 1
1	2	3	4	
off	off	off	off	Output = null
off	off	on	off	0-500 FPM
off	on	off	off	0-1,000 FPM
off	on	on	off	0-1,500 FPM
on	off	off	off	0-2,000 FPM
on	off	on	off	0-2,500 FPM
on	on	off	off	0-3,000 FPM
on	on	on	off	0-5,000 FPM
on	on	on	on	Output = 1/2 F.S.

Underlined items indicate the factory default settings.

Energize the 24VAC power source. The transmitter executes a complete self-check each time that power is applied. Check that scaling in the host control system returns an output that matches the output of the STA102-T.

Maintenance

In most HVAC environments, periodic maintenance or recalibration is neither required nor recommended¹.

Standard Limited Parts Warranty

If the **STA102-T** fails within 36 months from shipment, **EBTRON** will repair/replace the device free of charge as described in the company's warranty contained in **EBTRON's Terms and Conditions of Sale**. Defective equipment shall be shipped back to **EBTRON**, freight pre-paid, for analysis.

¹In extremely dirty environments, periodic inspection of the sensor element is advised. Carefully remove any excessive buildup of material with compressed air or with a small brush. Recalibration is not required.

STA102-T Technical Specifications

System Performance

STA102-T Installed Airflow Accuracy (typ. \pm of reading): 3% to 6%

Repeatability (\pm of reading): 0.25%

Sensor Probe Specifications

Sensor Assembly Model: ST1

Tube Construction: 6061 aluminum alloy [option:316 stainless steel tube]

Sensor Assembly: Two hermetically sealed "bead-in-glass" thermistors in a glass filled polypropylene housing.

[option: Kynar housing. Requires 316 SS tube.]

Mounting Brackets: 304 Stainless Steel

Mounting Options: Insertion, Internal or Stand-off

Probe Size Range: 6" to 18"

Cable Assembly:

Type: Plenum Rated

Length: 3' std. (50' opt.)

Connection to Transmitter: 5/8" Circular DIN connector

Number of Air Velocity Calibration Points: 16

Number of Temperature Calibration Points: 3

Maximum Number of Sensors per Sensor Probe: 2

Sensor Distribution: Equal area

Airflow Sensor Accuracy (\pm of reading): 2%

Calibrated Range: 0-5,000 FPM

Temperature Sensor Accuracy: 0.15° F

Sensor Temperature Range

0-1,500 FPM: -20° F to 160° F

0-3,000 FPM: 30° F to 160° F

Humidity range: 0 to 99% RH, non-condensing

Transmitter Specifications

Transmitter Model: STA102

Maximum Number of ST1 Sensors per Location: 2

A/D Converter: 12 bit

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 velocity output gain

Analog Output protection: Fused and protected, ISOLATED analog output

Analog Output Signals: Field selectable, linear analog output signal of 4-20mA and 0-10 VDC for airflow

Airflow Analog Output Scaling (0 to selected F.S.): Field selectable

Factory Default: 5,000 FPM

Transmitter Temperature Range: -20° F to 120° F

Analog Output Resolution (full scale output): 0.1%

Warranty

Standard Warranty: 36 months from shipment.

Underlined items indicate Factory Default settings.



1663 Hwy. 701 S., Loris, SC 29569 USA
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Internet: www.ebtron.com e-mail: ebtron@ebtron.com