EBTRON®
Thermal Dispersion Airflow Measurement

Model **GP1**
Technical Manual

Gold Series Thermal Dispersion Airflow Measurement Technology

Advantage Gold Series by Ebtron

GOLD SERIES *TECHNICAL MANUAL*

Installation, Operation and Maintenance Technical Manual

GP1

Duct and Plenum Probes

For use with GTx116 Transmitters

Includes: Combination Analog/RS-485 output models: GTC116-P
Ethernet output models: GTE116-P
LonWorks® output models: GTL116-P
Document Name: TM_GP1_R3D

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Part Number: 930-0025

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LIST OF EFFECTIVE AND CHANGED PAGES

Insert latest changed pages (in bold text); remove and dispose of superseded pages.
Total number of pages in this manual is **32.**

Page No	Revision *	Description of Change	Date
1, 2	**R3D**	**Updated Title page and List of Effective pages to R3D**	**01/12/2012**
28	**R3D**	**Revised note and statement on standoff mount probe size**	**01/12/2012**
1, 6, 30	R3C	Removed references to GTN products	01/03/2012
9	R3B	Updated Figure 4 Hybrid/Silver sensor density references	05/18/2011
14, 15	R3A	Added Minimum placement Guidelines for Filter and Filter Media Bank Applications	03/07/2011
5-13, 16-32	R3A	Updated Figure references , page numbers and reissued all other pages as R3A	03/07/2011
1	R2A	Updated Revision to R2A	09/29/2010
2-24	R2A	Clarified text for sensor density and placement; removed all references to GTA116 and replaced with GTC116 where appropriate; Accumulated all prior changes; Reissued as R2A	09/29/2010
1	R1J	Added model GTC116-P. Updated Rev to R1J on Title Page	05/20/2010
2	R1J	Updated List of Effective Pages for R1J Revision	05/20/2010
6	R1J	Added compatible model GTC116-P	05/20/2010
28	R1J	Added reference to TM_GTx116 for interconnections	05/20/2010
29	R1J	Modified footnote 1.	05/20/2010
6	R1H	Updated duct sizes to reflect minimum internal probe size change - from 8 inches to 12 inches	08/13/2009
18 through 20	R1H	Updated insertion mounting instructions to reflect no terminal end bracket plate on round/oval applications.	
19, 23, 26	R1H	Enlarged probe and bracket detail.	
23	R1H	Updated internal probe detail mechanical dimensions - changed minimum size from 8 inches to 12 inches.	
25 through 27	R1H	Updated standoff probe detail mechanical dimensions and modified text to clarify supplied standoff probe length	08/13/2009
1	R1G	Added Part number; updated Revision to R1G on Title Page	03/19/2009
5	R1F	Updated footnote	12/16/2008
27	R1F	Updated footnote	12/16/2008
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TM_GP1_R3D

* R3A indicates an original page (re-release with all prior changes).

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Table of Contents

TM_GP1_R3A

List of Figures

List of Tables

TM_GP1_R3A

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Figure 1. GP1 Duct and Plenum Sensor Probes

OVERVIEW

EBTRON's top-of-the-line GP1 Gold Series airflow sensor probes are ideal for the direct measurement of outside air intakes as well as precise airflow measurement in ducts and plenums. GP1 probes (Figure 1) with available high sensor density (up to 8 individual sensing points per probe) and flexible mounting options, provides accurate airflow measurement and ease of installation in locations where most traditional technologies cannot be applied. GP1 sensor probes are available in 4 sensor densities and 3 mounting configurations to meet virtually any application. Options are available for ***EB-Link*** remote data acquisition and general analog and/or network output for all standard BAS communication protocols. The GP1 features outstanding airflow measurement accuracy, repeatability and quality using ***EBTRON***'s advanced thermal dispersion airflow measurement technology.

The GP1 is ideal for dilution ventilation control of outside air intake flow rates for ASHRAE® 62.1-2007 compliance, and is paramount for the acquisition of LEED® points for EA and EQ credits. In addition, this airflow measurement technology is essential for the control of the pressurization flow and building and space pressurization, a prerequisite for moisture and contaminant control for indoor air quality (IAQ), healthcare and process applications. Sensor probes can be installed directly in outside air intakes, supply and return ducts, exhaust ducts and air handler cabinets to accurately measure airflow rates.

Unlike pitot arrays, ***EBTRON*** advanced thermal dispersion uses heat transfer rather than differential pressure to determine airflow rate. Accuracy is percent of reading, rather than percent of full scale and sensitivity increases as the flow rate decreases. Individual sensors, rather than a single averaging pressure manifold, assure true average airflow in extreme velocity profiles typical for HVAC applications. Pitot arrays have significant averaging error in extreme velocity profiles since only a single sensor, the pressure transducer, is used to convert the average velocity pressure to airflow. ***EBTRON*** sensing probes and transmitters are designed for years of trouble free operation. Periodic field calibration and maintenance are not recommended or required in most environments[1].

EBTRON uses only precision '**bead-in-glass**' thermistor probes. These extremely stable and reliable thermistors, developed for use in the space program, are also used in precision milli-degree laboratories where precise temperature control is required with negligible long-term drift. Our competitors typically use inexpensive 'chip' style thermistors that do not have the same long-term performance and reliability, and are subject to drift and mechanical failure over time.

ADVANCED TECHNOLOGY

- ***EBTRON*** Advanced Thermal Dispersion (TD) airflow measurement technology ensures accurate, repeatable measurement from zero flow (still air).
- Each sensor factory calibrated to **NIST-traceable standards**.
- Sensor density option permits matching instrument performance to application measurement accuracy requirements.
- ***EBTRON*** sensor design permits placement in locations typically not possible with other sensing technologies.
- True average, multi-point, independent sensors.
- Highest quality and stability hermetically sealed '**bead-in-glass**' thermistors.
- Exclusive '**Plug and Play**' SMART sensor design with provision for up to 16 airflow sensors.
- Versatile mounting options for placement in the most challenging field locations.
- Gold anodized sensor probes.

APPLICATIONS

- Outside Air (OA) measurement for dilution control and **ASHRAE® 62.1 2007** compliance.
- Ideal for attainment of **LEED® EQc1** - Outdoor Air Delivery Monitoring and contributes towards attainment of other **LEED® EA** and **EQ** Credits
- Building, floor or room pressurization and volumetric tracking.
- Direct measurement of OA intake flow rates.
- Constant volume air change monitoring, control and validation.
- Process control.
- Continuous commissioning

[1] In certain applications where a large amount of airborne particulate is present, especially fibrous material such as lint, pre-filtering of the return air may be required to ensure optimum instrument performance. If no pre-filtering is provided, periodic inspection and cleaning of sensors may be required using compressed air or a small soft tipped 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.

SPECIFICATIONS

Sensor Probe Configurations

- Type A (probes x sensors):
  2x8 (independent sensors)
- · Type B (probes x sensors):
  4x4 (independent sensors)

Sensor Accuracy

- Airflow: ± 2% of reading, ±0.25% repeatability
- Temp: ± 0.15°F (± 0.08° C)

Sensor Ranges

- 0 to +5,000 fpm[1]
  (0 to +25.4 m/s)
- Temperature: -20°F to 160°F
  (-28.9°C to 71.1°C)
- Humidity: 0 to 99% RH, non-condensing

Sensor Distribution

- Equal area (std.) or
  Log-Tchebycheff

Sensor Assembly (each sensing point)

- Heated element: One bead-in-glass, hermetically sealed, thermistor probe
- Temperature sensor: One bead-in-glass, hermetically sealed, thermistor probe
- Sensor housing: Glass-filled polypropylene (Kynar® w/316 SS option)
- Sensor potting material: Marine grade, waterproof epoxy
- Internal wiring: Kynar® coated copper

Duct Sizes

- Standard Insertion and Standoff Mounts:
  8 in to 120 in (203.2 mm to 3048 mm)
  Standard Internal Mount:
  12 in to 120 in (304.8 mm to 3048 mm)
- Custom: (may not meet sensor density requirements)
  120 in to 192 in (3048 mm to 4876.84 mm)
  [sensor quantity may be limited]

Tube Construction

- Standard: Gold anodized, 6063 aluminum alloy
  Stainless steel option: Type 316 polished stainless steel
- Nominal Tube Diameter:
  Aluminum: 1.1 in (27.94 mm)
  S/S: 1.125 in (28.575 mm)
- Mounting Brackets: Type 304 stainless steel
- Mounting Styles: Insertion, Internal or Standoff

Cable Assembly

- Type: UL® Plenum Rated FEP cable for extended operating temperature range and durability.
- Length: 10 ft std. (3.048 m), 50 ft (15.24 m) max.
- Termination: 0.875 in (22.2 mm) plug [transmitter end], gold plated pins

'Plug and Play' Sensor Probes

- Probes do not require matching to transmitter

Compatible Transmitters

- GTC116, GTE116 and GTL116

Listings

- UL® 873 Airflow & Temperature Indicating Devices
- CE (European Union shipments only)

Warranty

- 36 months from shipment

[1] Transmitter can be configured for output higher than calibrated range.

TM_GP1_R3C

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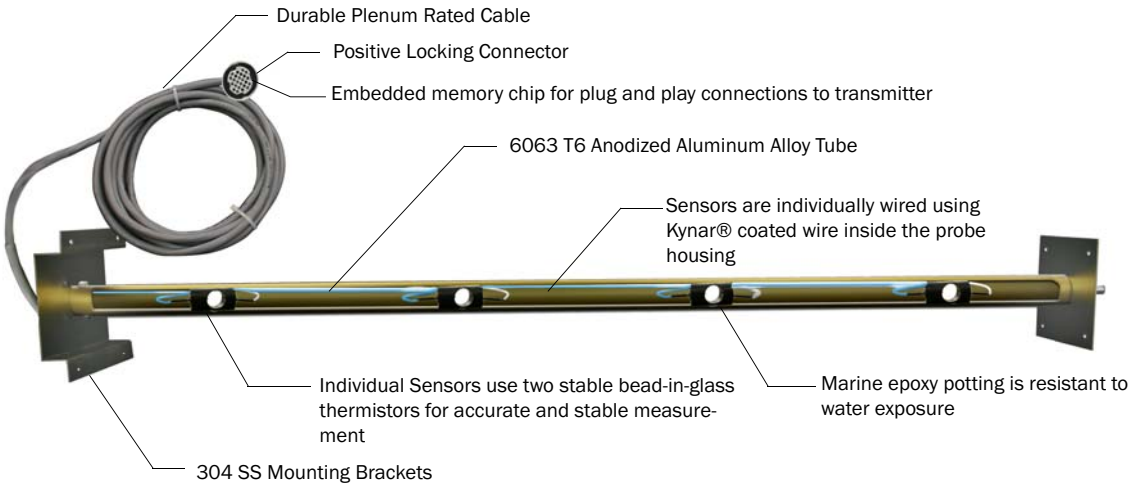

Figure 2. GP1 Sensor Probe Features

GP1 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 sensor. Multiple sensing points are used to produce an average velocity for true volumetric airflow (cfm). Each probe is factory calibrated at sixteen points to NIST traceable airflow standards. The sensitivity to airflow increases as the flow rate decreases, and accuracy is percent of reading. Greater sensitivity results in better accuracy, especially with turn down, when compared to differential pressure-based devices. As a result, ***EBTRON*** advanced thermal dispersion technology is ideal for the measurement of relatively low airflow rates typically found in most HVAC applications. 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 device. It simply is not required.

Display and User Interface

GP1 probes are designed for use with the Gold Series Transmitter model GTx116 and result in a model designation of **GTx116-P.** The airflow station includes a standard 16-character alpha-numeric display for local indication of airflow rate and temperature, and a convenient user interface for simple user selection of units of measure, display units, output scaling, dampening filter, diagnostics and instrument status.

GP1 Sensor Density Options

GP1 sensor probes are available in 4 sensor densities, ('D', 'C', 'B' and 'A'). The highest density available is 'D', suitable for continuous commissioning and laboratory measurement use. The 'C' sensor density probes are the most widely recommended for applications requiring accurate airflow measurement without field adjustment.

Refer to the SENSOR DENSITY SELECTION OPTIONS section, and the LOCATING PROBES section of this technical manual, or consult your local ***EBTRON*** sales representative, or the ***EBTRON*** application engineering team for other available sensor densities and applications.

GP1 APPLICATIONS

Dilution Ventilation (Outside Airflow Measurement)

- **ASHRAE® 62 Compliance**
  ASHRAE® 62 is a rate-based standard. Outside airflow rates should be monitored and controlled to compensate for wind and stack pressure variations on the intake system. This is especially important on VAV systems that have the additional challenge of changes in mixed air plenum pressure that are a result of changes in the supply airflow rate. Direct measurement of outside airflow rates can save energy by ensuring that only the required amount of outside air is provided while improving IAQ.

- **USGBC LEED New Construction & Major Renovation v3**
  LEED EQ Credit 1 *Outdoor Air Delivery Monitoring* requires that a permanent direct outside airflow measuring device be installed on all mechanical systems providing air to spaces with an occupant density of less than 25 people per 1,000 square feet. GP1 sensors are ideal for this application, combining the benefits of ***EBTRON*** outdoor air intake monitoring in a single high performance package. Additional LEED® points can also be realized by using ***EBTRON*** airflow measurement to improve system control, energy conservation and long-term building performance.

Compartmentalized Pressure Control

Building, floor or room pressure is maintained by producing either a positive, negative or neutral pressurization flow across adjacent pressure zones. The pressurization flow results in a measurable pressure drop across pressure zone boundaries. However, it is the pressurization flow, rather than boundary pressure drop that should be controlled to ensure that net pressurization is maintained. This is best accomplished by controlling the differential airflow rate between supply and return (or exhaust) flow rates to the pressure zone. Pressure control is achieved by compartmentalizing the building into unique pressure zones. In some cases, the pressure zone will require that the supply and return flow rates at the air handler are maintained (volumetric flow tracking), while other cases may require that the supply and return differentials are maintained at either the floor level or individual zone level. Pressurization control has direct influence on the following:

Moisture control

- Envelope moisture
  - -Pressure-driven water as vapor
  - -Pressure-driven water as liquid
- Space humidity
- Space temperature

Contaminant control

- Dirt/debris
- Bio-contaminants
- Infection control
- Chemical contaminants

GP1 SELECTION GUIDE

The GP1 Gold Series sensor probes are ***EBTRON***'s most accurate and repeatable airflow measurement sensor probes. Several sensor densities are available permitting a balance between application physical placement and cost. The Gold Probe Sensor Density table indicates sensor densities that are available for each probe size.

When sensor probes are installed at their designated locations (‘D’, ‘C’, ‘B’, or ’A’) as shown in the Minimum Placement Guide (Figure 7), the installed accuracy typically will be ±3% of reading.

TM_GP1_R3A

When sensor probes are installed at the 'C' location, the installed accuracy typically will be as follows:

- 'D' sensor density probe: ±3% of reading
- 'C' sensor density probe: ±3% of reading
- 'B' sensor density probe: ±6% of reading
- 'A' sensor density probe: ±10% of reading

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SENSOR DENSITY SELECTION OPTIONS

EBTRON introduced the concept of application-based and disturbance-based sensor densities over 20 years ago. As a result, engineers can select the most appropriate cost effective flow meter for their application. There are two questions routinely asked by engineers. The first is, ***"If I have more straight run than EBTRON's minimum guidelines require, do I need the same number of sensors?"*** and the second is, ***"How will less sensors perform at EBTRON's minimum guideline location for 'C' density configuration?"***

EBTRON research indicates that as the distance between disturbances is increased, the sensor density can be reduced. ***EBTRON****'s* minimum placement guidelines reflect this research and indicate the locations ('D', 'C', 'B' and 'A') where each sensor density should perform similarly to our standard 'C' density.

EBTRON research also indicates that considerable uncertainty exists in predicting results of airflow devices as sensor density is decreased at the 'C' density location. Use the typical installed performance values indicated in Figure 4 when using 'D', 'C','B' or 'A' density sensors at 'C' locations in the Minimum Placement Guide.

Airflow measurement for HVAC applications is a complex science, and ***EBTRON***'s reputation has been built on extremely accurate and repeatable airflow measurement with advanced thermal dispersion technology in both laboratory and field conditions. Since field conditions rarely imitate laboratory conditions, other manufacturers' devices that test well in labs may not function as desired in the field. To minimize the uncertainty of other devices, choose ***EBTRON*** 'C' density sensor probes whenever possible.

Using the Sensor Density Tables

Figure 3 is a sample sensor density table for 'C' density rectangular probe applications. For each sensor density ('D', 'C', 'B' and 'A') separate tables are provided for rectangular and for round/oval ducts (Tables 1-4). Figure 4 shows typical performance of each sensor density at 'C' placement, and Figure 5 shows factors that can affect performance.

Rectangular Ducts

To determine the total number of probes and the number of sensors each probe contains, refer to the appropriate Sensor Density Tables (Tables 1-4). Look up the free area **PROBE LENGTH** (in the top row of the table) and the **ADJACENT SIDE LENGTH** (the left column in the table). For sizes not shown on the table, use the next higher size. ***EBTRON*** schedules always list rectangular ducts as Probe Length x Adjacent Side Length, <u>not</u> Duct Width x Duct Height as is common for mechanical products and duct fittings.

Example: Find the number of probes and sensors for 'C' density GP1 insertion mount probes, mounted inside the 24 inch side of a 34(W) x 24(H) inch rectangular duct. Since 34 is not shown on 'C' density table (Table 2), use the column labeled 36 for probe/sensor count. The intersection between the column labeled 36 and the row labeled 24 shows '2/3'. This application will require two 34-inch probes, each with three sensors (for a total of 6 sensors).

Rectangular Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PC

ADJACENT SIDE LENGTH	PROBE LENGTH - RECTANGULAR DUCTS														
	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120
12	1/2	2/2	1/4	1/4	1/4	1/4	1/6	1/6	1/6	1/6	1/6	1/6	2/4	2/4	2/4
18	2/2	2/2	2/2	2/2	2/3	2/3	2/3	1/6	1/6	1/8	1/8	1/8	2/6	2/6	2/6
24	3/1	2/2	2/3	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/6	2/6	2/8	2/8	2/8
30	3/1	3/1	3/2	2/3	2/3	2/4	2/4	2/4	2/6	2/6	2/6	2/8	2/8	2/8	2/8
36	3/1	3/2	3/2	3/2	3/3	3/3	3/4	3/4	3/4	4/4	4/4	4/4	2/8	2/8	2/8
42	4/1	4/2	3/2	3/3	3/3	3/4	3/4	3/4	4/4	4/4	4/4	4/4	4/4	2/8	2/8
48	4/2	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
54	4/2	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
60	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
66	4/2	4/2	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
72	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
84	4/2	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
96	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
108	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
120	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
144	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
168	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
192	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4

B ⇒ B ⇓ D

Figure 3. Sample Sensor Density Table

Model	Density Suffix	Typical Installed Accuracy using 'C' placement guidelines
GTx116-PD	D	better than or equal to ±3%
GTx116-PC	C	better than or equal to ±3%
HTx104-PX	X	
GTx116-PB	B	better than or equal to ±6%[2]
HTx104-PB	B	
GTx116-PA	A	better than or equal to ±10%[2]
HTx104-PA	A	
STA102-PA	A	

[1] Limited sizes available.
[2] See outside air intakes for excepted 'B' and 'A' density placement near dampers and louvers.

Figure 4. Typical Performance at 'C' Location

Factors shown to improve performance of 'B' and 'A' density devices in the 'C' location
Coils (avoid water carry-over)
Filters
Honeycomb
Turning vanes (supply and return)

Factors shown to lessen performance of 'B' and 'A' density devices in the 'C' location
Absence of turning vanes (supply and return)
Dampers
Fan discharges
Louvers
Sound attenuators (unless installed in attenuator)

Figure 5. GP1 Application Tips

CAUTIONS/WARNINGS

Do not apply *EBTRON* placement guidelines to other manufacturers' devices, even for similar technology. Extensive testing, development and *EBTRON's* proprietary probe design allows for optimum placement at more challenging duct locations than other manufacturers' probes.

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

Round and Oval Ducts

To determine the total number of probes and sensors within each probe for a given duct size, refer to the appropriate Sensor Density Table (Tables 1-4). Look up the free area **PROBE LENGTH** (duct width - top row of table) and the **ADJACENT SIDE LENGTH** (duct height - left column of table). For sizes in between those shown, use the next higher size. ***EBTRON*** schedules always list round and oval ducts as Duct Width x Duct Height as is common for mechanical products and duct fittings. The letter suffix after the number of probes indicates orientation (see INSTALLATION section).

Example: Determine probes and sensors required for 'C' density GP1 insertion mount probes for a 48(W) x 24(H) inch flat oval duct. Using the 'C' Sensor Density Table for Round-Oval Ducts (lower part of Table 2), locate the intersection between the column labeled 48 and the row labeled 24. The result is 2b/4 or two probes having four sensors each for a total of eight sensors. The suffix 'b' indicates probe location and configuration; in this case, the probes must be installed across the major and minor axes of the flat oval as shown in Probe Mounting Configuration diagram, Figure 13.

Sensor Density Table Anomalies

In some cases, the resulting sensor density either exceeds, or is less than the specified table sensor density for the indicated size. For instance, a 12 x 48 on the 'C' Sensor Density Table (Table 2) is equivalent to a 'D' density probe, while a 96 x 120 on the same table is equivalent to a 'B' density probe. Devices should be located using the actual sensor density and not the equivalent sensor density indicated on the table.

LOCATING PROBES

EBTRON's default sensor density is 'C' and is ideal for most HVAC applications and installations. The following guidelines define the location where the installed accuracy of the airflow measuring station will approach the individual sensor accuracy. ***EBTRON*** offers free software, ***EBTRON Auto-Select Tool***, to assist in optimizing the placement of ***EBTRON*** airflow measuring probes in ducts or plenums. The selection tool uses a Microsoft® Excel® spreadsheet to create a schedule for printing or e-mailing to ***EBTRON***. The latest version of the software can be downloaded from ***www.ebtron.com/autoselecttool***.

NOTE:
For those applications where multiple probes are necessary at one location, refer to the Probe Spacing Configuration for the installation mounting option chosen.

Duct/Plenum Applications

EBTRON has conducted extensive research at its airflow measurement test facility to optimize the number of advanced thermal dispersion sensors required in typical duct and plenum applications. The result of that research is reflected in ***EBTRON*** Sensor Density Tables (Tables 1-4), the Minimum Placement Guidelines (Figures 7, 9 and 10), and the installation configuration recommended for each mounting style. Recommended placement is designed to result in installed accuracy that equals or exceeds that of 'C' sensor density probes. The specified sensor density is indicated by the the model number suffix ('D', 'C', 'B' or 'A').

Consult the OUTSIDE AIR INTAKE APPLICATIONS section of this manual for intake dampers and/or louver applications.

Verify that Minimum Placement Guidelines can be achieved for the selected sensor density before applying the following procedure.

TM_GP1_R3A

Duct/Plenum Sensor Probe Placement Procedure

To manually perform the calculations for sensor location and placement, please use the following procedure:

1. Identify the immediate up and downstream disturbances.
2. Determine the minimum distances required up and downstream of each disturbance for the sensor density selected and specific applications shown in Figure 7. Convert the equivalent diameters to inches *(mm)* first. Label the distance required from the upstream disturbance as 'X' and the distance required from the downstream disturbance as 'Y'.
3. Determine the total distance between disturbances as 'Z' inches (mm).
4. Locate the probes [X/(X+Y)]*Z from the upstream disturbance.

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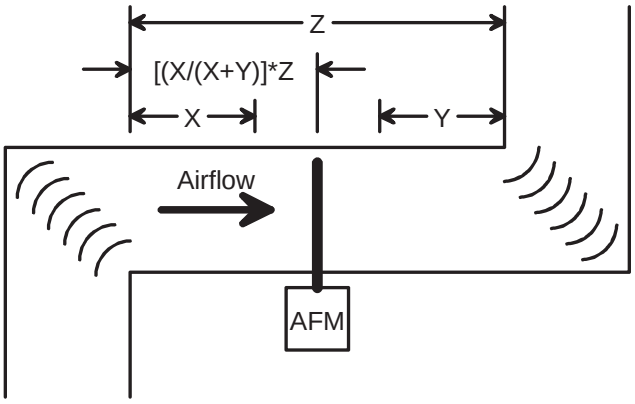


Figure 6. Typical GP1 Placement Example

CAUTIONS/WARNINGS

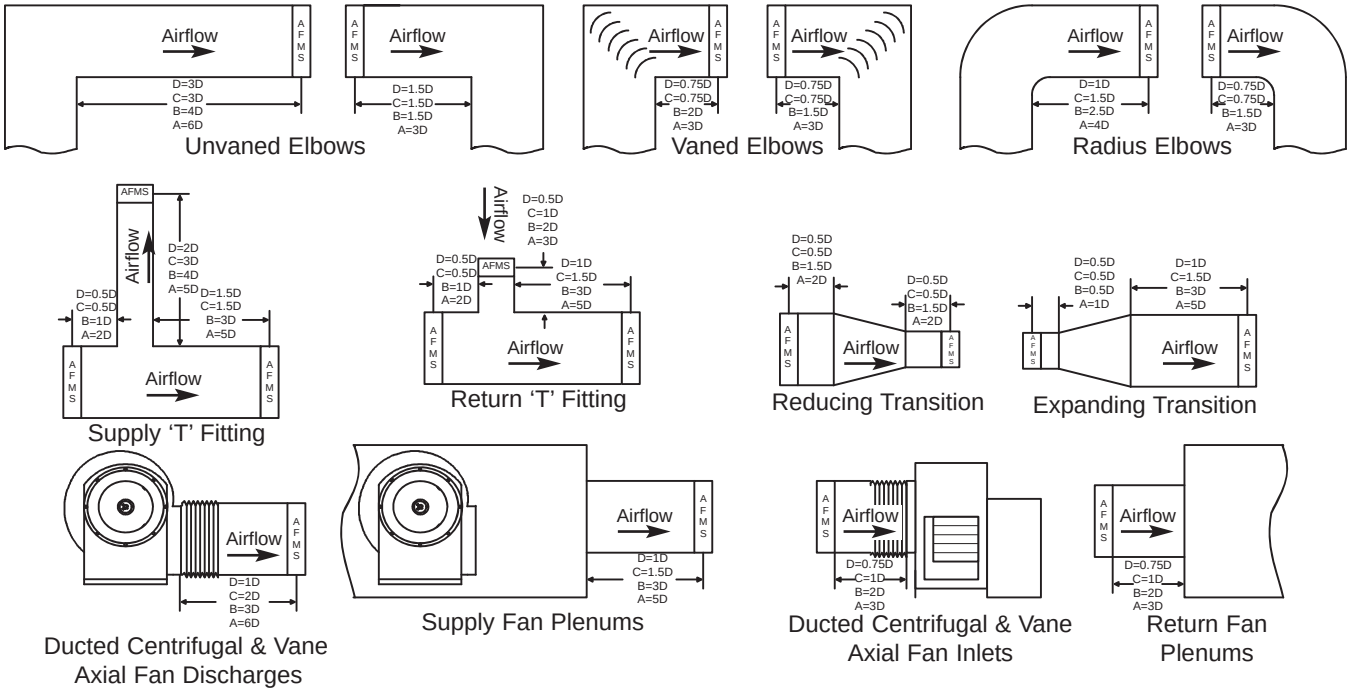
Contact *EBTRON* if minimum guidelines cannot be achieved.

If other devices are used to verify performance, make sure that measurements are taken at locations that meet the minimum placement and flow requirements of the verification device (pitot tubes require greater distances).

Avoid locating the airflow measurement station immediately downstream of a modulating or partially closed damper. Contact *EBTRON* for assistance if a modulating damper is upstream of the flow station, regardless of the distance.

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

MINIMUM PLACEMENT GUIDE ('D', 'C', 'B' and 'A' Sensor Density Probes)



TM_GP1_R3A

D = Simple Equivalent Diameter = (width + height)/2

Consult the application data sheet on outdoor air intakes for guidelines on placement in or near louvers or dampers.

Figure 7. GP1 Minimum Placement Guide

OUTSIDE AIR (OA) INTAKE APPLICATIONS

EBTRON thermal dispersion devices are well suited for outside air intakes that generally have flow rates less than 500 fpm *(2.54 m/s)*. Unlike other technologies, ***EBTRON*** sensors do not require a developed velocity profile to accurately measure airflow rates and are not subject to fouling in most outside air environments. Each sensor is independent and can accurately average a variable velocity profile without the addition of straight duct or flow straighteners.

OA Intake Probe Placement Procedure

EBTRON offers free software, ***EBTRON Auto-Select Tool***, to assist in optimizing the placement of ***EBTRON*** airflow measuring probes in ducts or plenums. The selection tool uses a Microsoft® Excel® spreadsheet to create a schedule for printing or e-mailing to ***EBTRON***. The latest version of the software can be downloaded at ***www.ebtron.com/autoselecttool***.

To manually perform the calculations for sensor location and placement manually, please use the following procedure:

1. Locate the airflow measuring device upstream of the outside air damper (between the louver and the damper). Determine minimum airflow rate, fpm_{min} at the desired location that you wish to place the airflow measuring device as follows:

   $fpm_{min}=cfm_{min}$/Cross Sectional Area (sq ft).

   If the airflow measuring device is located within 10 ft of the intake louver or hood and the airflow rate is less than 200 fpm *(1.02 m/s)* consider relocating the airflow measuring device, resizing the opening or adding a separate damper for the minimum outside air intake. Installations that do not meet this guideline have been successfully installed and operated. However, ***EBTRON*** cannot recommend or approve installations not meeting this guideline. This guideline is based upon the following laboratory and field experience:

   a. Systems designed with outside air dampers sized for 200 fpm *(1.02 m/s)* or less may not provide adequate control to maintain the desired minimum airflow setpoint.

   b. Transient wind gusts can result in airflow indications of 100 fpm *(0.51 m/s)* or more on outside air intakes, even when the intake damper is closed. A 'low-limit' cutoff has been implemented on all GTx116 transmitters (beginning with firmware version 4.0), to force the output below a specified airflow value to 0. 'False' readings are strictly a result of air movement induced by winds near the airflow station on outside air intakes. DO NOT ENABLE AND ADJUST THE OUTPUT SIGNAL OFFSET TO COMPENSATE FOR THIS EFFECT. All ***EBTRON*** airflow measuring devices will indicate 0 fpm (0 m/s) when there is no airflow across the sensors. Adding a filter or moisture eliminator upstream of the airflow measuring device may dampen the wind effect on some installations.

Figure 8. Typical OA Damper Installation

2. Locate the application diagram in Figure 9 that best fits your application. Verify that minimum placement distances can be achieved to ensure proper performance. Minimum distance requirements may necessitate relocating dampers or adding an extension 'sleeve'. A standoff mounting option is available for applications where ductwork is unavailable. Follow the placement procedure described in LOCATING PROBES when the distance exceeds minimum requirements.
3. The diagrams were developed to achieve an installed accuracy of 3% of reading ('C' density probes) at less than or equal to the louver manufacturer's maximum free area velocity (i.e. the louver is applied properly).
4. Select a mounting style, insertion, internal or standoff, that best suits the installation requirements of the application. Mounting styles do not need to be specified until the product is ordered.
5. The best results can be achieved using one of ***EBTRON***'s sequencing control strategies which are described in the APPLICATIONS section of the ***EBTRON'S*** Engineer's Catalog for Airflow Measurement Devices.

TM_GP1_R3A

NOTE

Outside Air intake standoff mounting may result in greater measurement uncertainty since the effective area may be larger than the area used to determine the volumetric flow rate. Therefore, the use of the Field Adjustable Gain and Offset feature may be required for acceptable accuracy performance.

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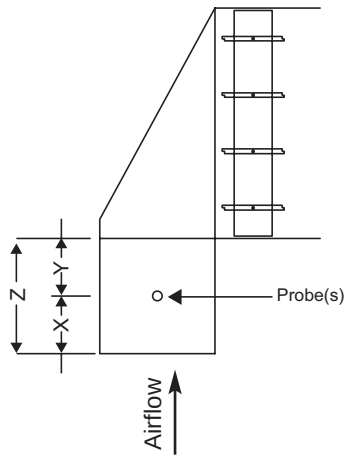
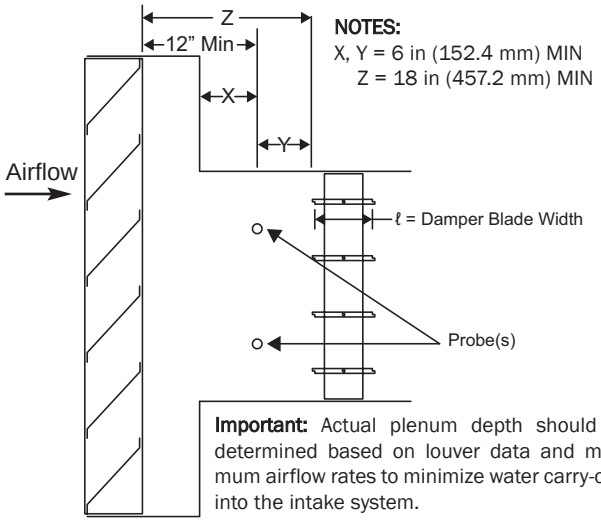
OUTSIDE AIR INTAKE DAMPER/PLENUM APPLICATION EXAMPLES SHOWING MINIMUM DISTANCE REQUIREMENTS

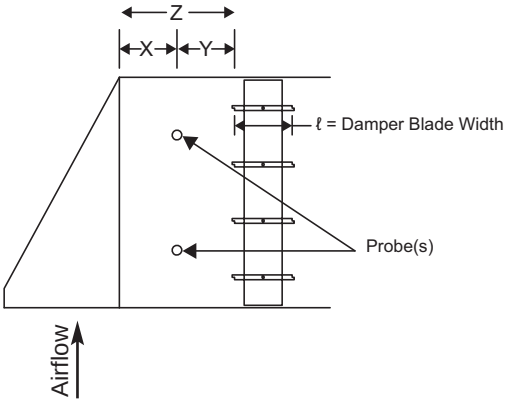


NOTES: X, Y = 6 in (152.4 mm) MINIMUM
Z = 12 in (304.8 mm) MINIMUM

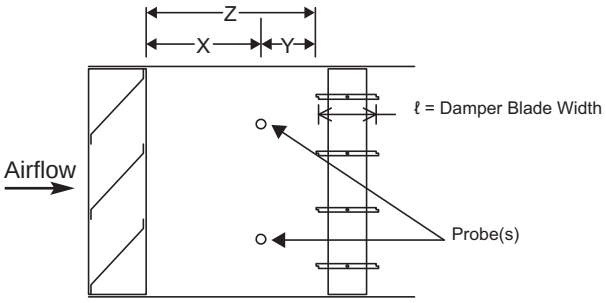


NOTES:
X, Y = 6 in (152.4 mm) MIN
Z = 18 in (457.2 mm) MIN

Important: Actual plenum depth should be determined based on louver data and maximum airflow rates to minimize water carry-over into the intake system.



NOTES: X, Y = 6 in (152.4 mm) MINIMUM
Z = 12 in (304.8 mm) MINIMUM



NOTES: X = 12 in (304.8 mm) MINIMUM
Y = 6 in (152.4 mm) MINIMUM
Z = 18 in (457.2 mm) MINIMUM

KEY:
X = Distance to upstream disturbance
Y = Distance to downstream disturbance
Z = Distance between disturbances
ℓ = Damper blade width

Consult your ***EBTRON*** Sales Rep for assistance with probe placement in critical Outside Air and Damper applications.

TM_GP1_R3A

Figure 9. GP1 Outside Air Applications - Minimum Placement Guide

MINIMUM PLACEMENT GUIDELINES FOR AIR FILTER AND FILTER MEDIA BANK APPLICATIONS

Laboratory tests conducted in wind tunnels at the ***EBTRON*** Loris, SC engineering facility have resulted in the development of additional minimum recommended airflow sensor probe placement guidelines for applications where pleated air filters or filter media banks are located directly upstream of airflow sensor probes. When these additional minimum placement guidelines can be met, ***EBTRON*** airflow stations will operate normally, and all other standard guidelines apply. Non uniform velocity profiles develop downstream (within 18 to 24 inches) of pleated filter media installed in ducts and plenums in "push through" and "pull-through" airflow measurement applications as shown in Figure 10. Placement of ***EBTRON*** airflow measurement sensor probes in these applications must be in accordance with the following guidelines to ensure optimum performance of the airflow stations.

"Push-through" Filter Applications

In "push-through" filter applications where airflow is pushed through the media (Figure 10 upper detail), ***EBTRON*** recommends that airflow sensor probes be placed a minimum of 24 inches downstream of pleated filters. For CFM readings in these recommended applications, free area is defined by the simple duct dimensions.

"Pull-through" Filter Applications

In "pull-through" filter applications where airflow is pulled through the media (Figure 10 center detail), ***EBTRON*** recommends that airflow sensor probes be placed a minimum of 18 inches downstream of pleated filters. For CFM readings in these recommended applications, free area is defined by the simple duct dimensions.

Probe Placement at Less than Minimum Recommended "Push-through" and "Pull-through" Distances

When probe to filter "push-through" or "pull-through" distances are less than the recommended minimums, airflow readings will be higher than actual flow. In these applications, the airflow station shall be adjusted to reliable test and balance values, AND the actual free area of the filter (or frame – whichever is less) shall be entered into the airflow station to determine CFM. Figure 10 (lower detail) illustrates the filter free area measurement for filter applications at less than the minimum recommended placement.

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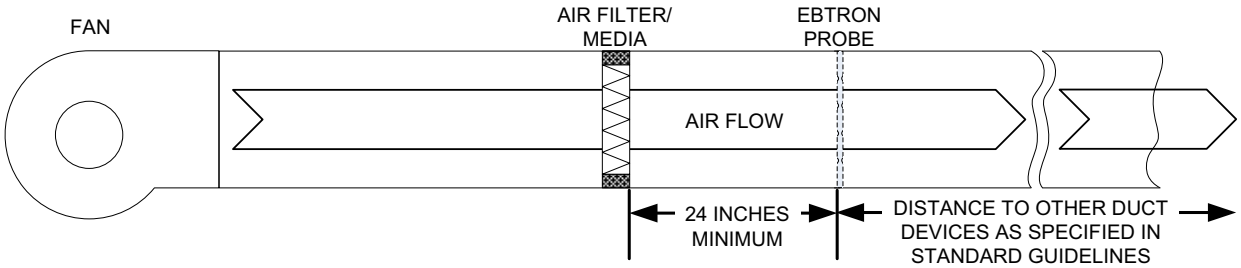
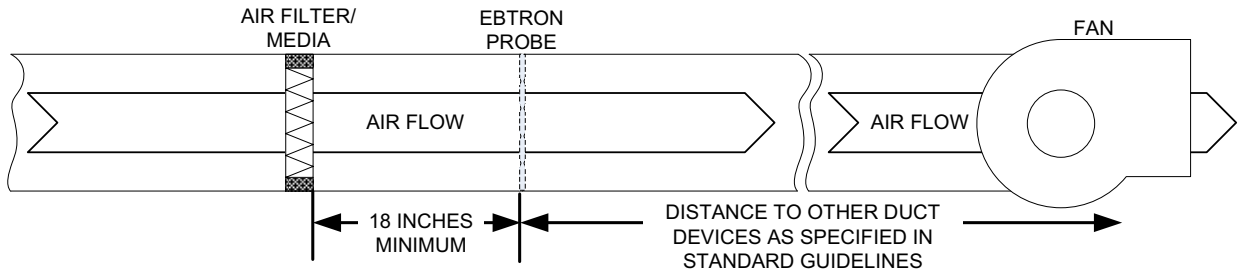
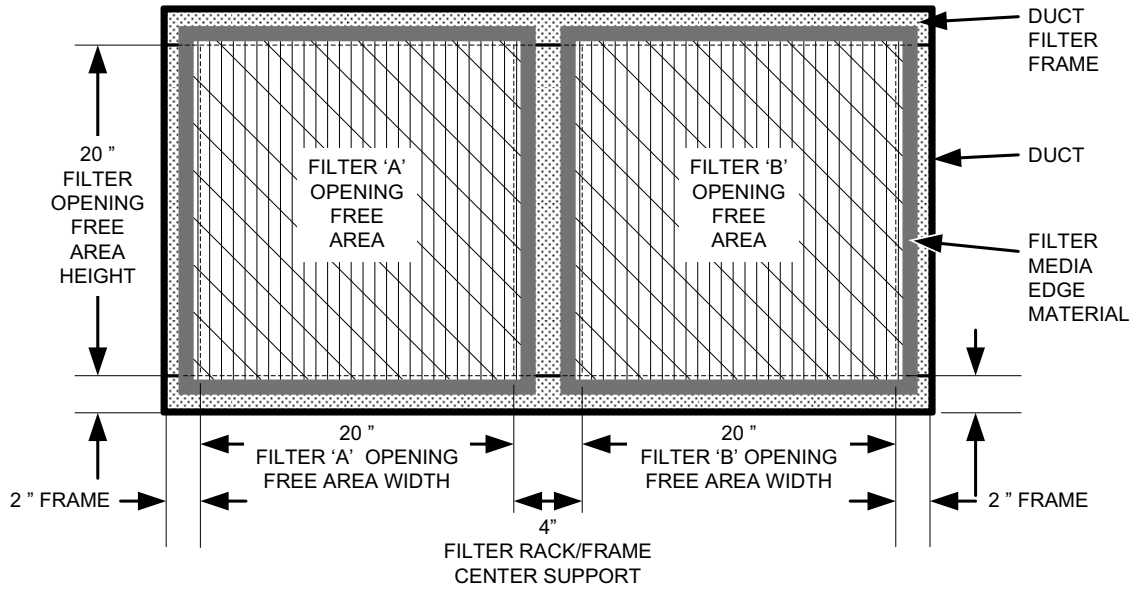


Push-Through Filter Airflow Applications



Pull-Through Filter Airflow Applications



NOTE!
FOR APPLICATIONS WHERE MINIMUM FILTER TO PROBE DISTANCES CANNOT BE ACHIEVED, THE AIRFLOW STATION SHOULD BE ADJUSTED TO RELIABLE TEST AND BALANCE VALUES, AND FILTER FREE AREA AS SHOWN ABOVE MUST BE ENTERED INTO THE FLOW STATION TO DETERMINE CFM.

TOTAL FREE AREA = (FILTER 'A' OPEN AREA) + (FILTER 'B' OPEN AREA)
= **(20 X 20) + (20 X 20)**
= **(400) + (400)**
= **800** SQUARE INCHES

Calculation of Free Filter Area for Applications at Less Than Minimum Recommended Probe to Filter Distances

Figure 10. Minimum Placement Guidelines for Air Filter/Filter Media Bank Applications

TM_GP1_R3A

GP1-'D' SENSOR DENSITY TABLES

The 'D' sensor density is ***EBTRON***'s highest sensor density and has been developed for applications that do not meet the minimum placement requirements of the 'C' sensor density, for test laboratories, continuous commissioning and other applications where over-sampling of sensing points is desired or required. The 'D' sensor density is generally not required for most HVAC control applications.

Table 1. 'D' Sensor Density Table

Rectangular Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PD

ADJACENT SIDE LENGTH \ PROBE LENGTH - RECTANGULAR DUCTS	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120	
12	2/2	2/2	2/3	2/3	1/6	1/6	1/8	1/8	1/8	1/8	1/8	1/8	2/6	2/6	2/6	
18	2/2	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/4	2/6	2/6	2/6	2/8	2/8	2/8	
24	3/2	3/2	3/3	3/3	2/4	2/4	2/6	2/6	2/6	2/6	2/8	2/8	2/8	2/8	2/8	C ⇓
30	4/2	3/2	3/3	3/3	3/3	3/4	3/4	3/4	4/4	4/4	4/4	2/8	2/8	2/8	2/8	
36	4/2	4/2	3/3	3/3	3/4	3/4	4/4	4/4	4/4	4/4	4/4	4/4	2/8	2/8	2/8	
42	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	2/8	2/8	
48	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
54	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
60	4/2	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
66	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
72	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
84	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	B ⇓
96	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
108	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
120	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
144	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
168	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
192	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	
	C ⇒						B ⇒									

Round-Oval Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PD

ADJACENT SIDE LENGTH \ PROBE LENGTH - ROUND-OVAL DUCTS	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120	
12	2b/2	1a/4	1a/4	2b/2	2c/3	2c/3	2c/3	3c/3	3c/3	3c/3	3c/3	3c/3	3c/3	4c/3	4c/3	
18		2b/2	2b/2	2b/2	2b/2	2b/2	2c/3	2c/3	2c/3	2c/3	3c/3	3c/3	4c/3	4c/3	4c/3	B
24			2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	4c/4	
30				2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	
36					3b/4	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6	
42						2b/6	2b/6	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	C ⇓
48							4b/4	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	
54								4b/4	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	
60									4b/4	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	
66										4b/4	2b/8	2b/8	2b/8	2b/8	2b/8	
72											4b/4	2b/8	2b/8	2b/8	2b/8	
84												4b/4	2b/8	2b/8	2b/8	
96													4b/4	2b/8	2b/8	
108														4b/4	2b/8	
120															4b/4	C ⇑

Lowercase letter suffix indicates oval probe mounting configuration as shown in Figures 13 and 16.

Notes: 1. When adjacent side measurement is less than 12 inches, a custom airflow measurement station may be required. Consult factory for additional information.

2. Bold lines indicate areas where probe densities are greater or less than D density. Arrows indicate recommend ed installation placement criteria (D,C,B or A).

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GP1-'C' SENSOR DENSITY TABLES

The 'C' sensor density is ***EBTRON***'s recommended density for applications requiring accurate airflow measurement without field adjustment. To maximize installed performance and approach individual sensor accuracy, follow the minimum placement guidelines for the 'C' density.

Table 2. 'C' Sensor Density Table

Rectangular Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PC

ADJACENT SIDE LENGTH \ PROBE LENGTH - RECTANGULAR DUCTS	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120
12	1/2	2/2	1/4	1/4	1/4	1/4	1/6	1/6	1/6	1/6	1/6	1/6	2/4	2/4	2/4
18	2/2	2/2	2/2	2/2	2/3	2/3	2/3	1/6	1/6	1/8	1/8	1/8	2/6	2/6	2/6
24	3/1	2/2	2/3	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/6	2/6	2/8	2/8	2/8
30	3/1	3/1	3/2	2/3	2/3	2/4	2/4	2/4	2/6	2/6	2/6	2/8	2/8	2/8	2/8
36	3/1	3/2	3/2	3/2	3/3	3/3	3/4	3/4	3/4	4/4	4/4	4/4	2/8	2/8	2/8
42	4/1	4/2	3/2	3/3	3/3	3/4	3/4	3/4	4/4	4/4	4/4	4/4	4/4	2/8	2/8
48	4/2	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
54	4/2	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
60	4/2	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
66	4/2	4/2	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
72	4/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
84	4/2	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
96	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
108	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
120	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
144	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
168	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
192	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4

B ⇓ B ⇒ D

Round-Oval Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PC

ADJACENT SIDE LENGTH \ PROBE LENGTH - ROUND-OVAL DUCTS	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120
12	1a/2	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	1a/6	1a/8	1a/8
18		2b/2	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	1a/6	1a/8	1a/8	1a/8	4c/3	4c/3
24			2b/2	1a/6	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	3c/4	3c/4	4c/4
30				2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	3c/4	3c/4
36					2b/4	2b/4	2b/4	2b/4	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6	2b/6
42						2b/4	2b/4	2b/6	2b/6	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8
48							3b/4	2b/6	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8
54								3b/4	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8
60									4b/4	2b/8	2b/8	2b/8	2b/8	2b/8	2b/8
66										4b/4	2b/8	2b/8	2b/8	2b/8	2b/8
72											4b/4	2b/8	2b/8	2b/8	2b/8
84												4b/4	2b/8	2b/8	2b/8
96													4b/4	2b/8	2b/8
108														4b/4	2b/8
120															4b/4

B

Lowercase letter suffix indicates oval probe mounting configuration as shown in Figures 13 and 16.

Notes: 1. When adjacent side measurement is less than 12 inches, a custom airflow measurement station may be required. Consult factory for additional information.

2. Bold lines indicate areas where probe densities are greater or less than C density. Arrows indicate recommend ed installation placement criteria (D,C,B or A).

GP1-'B' SENSOR DENSITY TABLES

The 'B' sensor density is an intermediate sensor density between ***EBTRON***'s economy 'A' density and standard 'C' density. When the distance between disturbances can be met using the 'B' density minimum placement guidelines, 'B' performance can approach and often equal that of 'C' density.

Table 3. 'B' Sensor Density Table

Rectangular Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PB

C

ADJACENT SIDE LENGTH ↓ / PROBE LENGTH - RECTANGULAR DUCTS →	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120
12	1/2	1/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/6	1/6	1/6
18	2/1	2/2	2/2	2/2	1/4	1/4	1/4	1/4	1/4	1/6	1/6	1/6	1/6	1/6	1/6
24	3/1	2/2	2/2	2/2	2/2	2/2	2/3	2/3	2/3	1/6	1/6	1/6	1/8	1/8	1/8
30	3/1	3/1	2/2	2/2	2/2	2/3	2/3	2/3	2/3	2/3	2/3	2/4	2/4	1/8	1/8
36	3/1	3/1	2/2	2/2	2/3	2/3	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/4	2/4
42	4/1	3/1	3/1	3/2	3/2	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/4	2/4	2/6
48	4/1	3/1	3/2	3/2	3/2	3/2	3/3	3/3	3/3	2/4	2/4	2/4	2/6	2/6	2/6
54	4/1	3/1	4/2	3/2	3/2	3/2	3/3	3/3	3/3	3/3	2/4	2/4	3/4	2/6	2/6
60	4/1	4/1	4/2	3/2	3/2	3/3	3/3	3/3	3/3	3/3	3/3	3/4	3/4	3/4	2/6
66	4/1	4/2	4/2	4/2	4/2	4/2	3/3	3/3	3/3	3/3	3/4	3/4	3/4	3/4	3/4
72	4/1	4/2	4/2	4/2	4/2	4/2	3/3	3/3	3/3	4/3	3/4	3/4	3/4	3/4	3/4
84	4/1	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/3	4/3	4/3	3/4	3/4	3/4	4/4
96	4/2	4/2	4/2	4/2	4/2	4/2	4/3	4/3	4/3	4/3	4/3	4/3	4/4	4/4	4/4
108	4/2	4/2	4/2	4/2	4/2	4/2	4/3	4/3	4/3	4/3	4/3	4/3	4/4	4/4	4/4
120	4/2	4/2	4/2	4/2	4/2	4/3	4/3	4/3	4/3	4/3	4/3	4/4	4/4	4/4	4/4
144	4/2	4/2	4/2	4/2	4/3	4/3	4/3	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4
168	4/2	4/2	4/2	4/3	4/3	4/3	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4
192	4/2	4/2	4/3	4/3	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4

Round-Oval Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PB

C

ADJACENT SIDE LENGTH ↓ / PROBE LENGTH - ROUND-OVAL DUCTS →	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120	
12	1a/2	1a/2	1a/2	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/6	1a/6	
18		1a/2	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	
24			1a/4	1a/4	1a/4	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	1a/6	1a/8	1a/8	
30				2b/2	2b/2	2b/2	1a/6	1a/6	1a/6	1a/6	1a/6	2b/4	2b/4	2b/4	2b/4	
36					2b/2	1a/6	1a/6	1a/6	1a/6	1a/6	2b/4	2b/4	2b/4	2b/4	2b/4	
42						2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/6	
48							2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/6	2b/6	
54								2b/4	2b/4	2b/4	2b/4	2b/4	2b/4	2b/6	2b/6	
60									2b/4	2b/4	2b/4	2b/4	2b/6	2b/6	2b/6	
66										2b/4	2b/4	2b/4	2b/6	2b/6	2b/6	
72											2b/4	2b/6	2b/6	2b/6	2b/6	
84												2b/6	2b/6	2b/6	2b/6	
96													2b/6	2b/6	2b/8	C ⇓
108														2b/6	2b/8	C ⇑
120															2b/8	

Lowercase letter suffix indicates oval probe mounting configuration as shown in Figures 13 and 16.

Notes: 1. When adjacent side measurement is less than 12 inches, a custom airflow measurement station may be required. Consult factory for additional information.
2. Bold lines indicate areas where probe densities are greater or less than B density. Arrows indicate recommend ed installation placement criteria (D,C,B or A).

TM_GP1_R3A

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GP1-'A' SENSOR DENSITY TABLES

The 'A' sensor density has been designed for economy applications as a competitive upgrade to averaging pitot arrays. Performance will exceed that of pitot arrays with respect to averaging and turn down when placed in similar locations. To maximize installed performance and approach individual sensor accuracy, follow the minimum placement guidelines for the 'A' density.

Table 4. 'A' Sensor Density Table

Rectangular Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PA

ADJACENT SIDE LENGTH \ PROBE LENGTH - RECTANGULAR DUCTS	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120
12	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/3	1/3	1/3
18	2/1	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/3	1/3	1/3	1/4	1/4	1/4
24	2/1	2/1	1/2	1/2	1/2	1/2	1/3	1/3	1/3	1/3	1/4	1/4	1/6	1/6	1/6
30	2/1	2/1	2/1	1/2	1/2	1/3	1/3	1/3	1/4	1/4	1/4	1/6	1/6	1/6	1/6
36	2/1	2/1	2/1	2/1	2/2	2/2	2/2	2/2	2/2	2/3	2/3	2/3	2/3	1/6	1/6
42	3/1	2/1	2/1	2/2	2/2	2/2	2/2	2/2	2/3	2/3	2/3	2/3	2/3	2/3	2/4
48	3/1	2/1	2/2	2/2	2/2	2/2	2/3	2/3	2/3	2/3	2/3	2/3	2/4	2/4	2/4
54	3/1	2/1	3/1	2/2	2/2	2/2	3/2	2/3	2/3	2/3	2/3	2/3	2/4	2/4	2/4
60	3/1	3/1	3/1	3/1	3/1	3/2	3/2	3/2	2/3	2/3	2/3	2/4	2/4	2/4	2/4
66	3/1	3/1	3/1	3/1	3/2	3/2	3/2	3/2	3/2	2/3	3/3	3/3	2/4	2/4	2/4
72	3/1	3/1	3/1	3/1	3/2	3/2	3/2	3/2	3/2	3/3	3/3	3/3	2/4	2/4	2/4
84	4/1	4/1	4/1	4/2	4/2	3/2	3/2	3/2	3/3	3/3	3/3	3/3	3/3	2/4	2/4
96	4/1	4/1	4/2	4/2	4/2	4/2	4/2	4/2	4/2	3/3	3/3	3/3	3/3	3/3	3/3
108	4/1	4/1	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	3/3	3/3	3/3	3/3	3/3
120	4/1	4/1	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	3/3	3/3	3/3	3/3
144	4/1	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	3/3	3/3	3/3
168	4/1	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	3/3
192	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2	4/2

Round-Oval Probe Sensor Density (# Probes / # Sensors per Probe)

GTx116-PA

ADJACENT SIDE LENGTH \ PROBE LENGTH - ROUND-OVAL DUCTS	12	18	24	30	36	42	48	54	60	66	72	84	96	108	120
12	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/3	1a/3
18		1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/2	1a/3	1a/3	1a/3	1a/4	1a/4
24			1a/2	1a/2	1a/2	1a/2	1a/2	1a/3	1a/3	1a/3	1a/3	1a/4	1a/4	1a/6	1a/6
30				1a/2	1a/2	1a/2	1a/3	1a/3	1a/3	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6
36					1a/2	1a/3	1a/3	1a/3	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6
42						1a/3	1a/3	1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	1a/8
48							1a/4	1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	1a/8	1a/8
54								1a/4	1a/6	1a/6	1a/6	1a/6	1a/6	1a/8	1a/8
60									1a/6	1a/6	1a/6	1a/6	1a/8	1a/8	1a/8
66										1a/6	1a/6	1a/6	1a/8	1a/8	1a/8
72											1a/6	1a/8	1a/8	1a/8	1a/8
84												1a/8	1a/8	1a/8	1a/8
96													1a/8	1a/8	1a/8
108														1a/8	1a/8
120															1a/8

Lowercase letter suffix indicates oval probe mounting configuration as shown in Figures 13 and 16.

Notes: 1. When adjacent side measurement is less than 12 inches, a custom airflow measurement station may be required. Consult factory for additional information.
2. Bold lines indicate areas where probe densities are greater or less than A density. Arrows indicate recommend ed installation placement criteria (D,C,B or A).

GP1 INSTALLATION OPTIONS

GP1 probes are supplied in 3 mounting styles.

- Insertion Mount - externally through the duct/plenum
- Internal Mount - internal to the duct or plenum
- Standoff Mount - mounted on standoff brackets, typically for damper applications.

Refer to the appropriate installation section section that follows for installation instructions for each mounting style, and observe the following precautions:

CAUTIONS/WARNINGS

⚠ Location of the sensor probes is critical for proper performance of the airflow station. Refer to Minimum Placement Guidelines section of this document for recommended probe placement.

⚠ Ensure that adequate clearance exists at the installation site to permit installation of the probe.

⚠ If traverse data is desired, place the lowest numbered probe at the top of the duct for horizontal mounting. For vertical mounting, place the lowest numbered probe on the left side of duct when viewed from the upstream side of the mounting location.

⚠ For applications where multiple probes are necessary at a single measurement location, install probes in accordance with Figures 13, 16 or 20 (recommended Probe Spacing/Configuration).

⚠ Insulation that interferes with mounting should be temporarily removed prior to installation.

⚠ In vertical probe installations (particularly on OA applications), probes should be placed with the cable exit on the higher side to prevent any potential moisture from accumulating on the heated sensor.

GP1 Insertion Mount Installation

Figures 11 and 12 show a typical Insertion Mount GP1 Probe and the required installation dimensions. Insertion mounting is ***EBTRON***'s most common style for installation through one side of the duct. Probes less than 18 inches (457.2 mm) overall do not require an end stud (or terminal bracket), and are fabricated 0.25 inches (6.3 mm) less than the overall duct size. Insertion mounting requires a 1.25 inches (31.7 mm) hole on the insertion side of the duct. Probes of 18 inches or greater include a terminal stud (and for rectangular ducts, a terminal bracket plate) for additional support at the far end of the probe. On these longer probes, an additional hole is required on the other side of the duct (opposite the insertion side). Install each probe as follows:

1. Each GP1 sensor probe package is factory labeled for the specific location and duct size for which it is designed. Orders for locations having more than one probe will generally have individually packaged probes banded together. Determine the specific duct location for the GP1 sensor probe as indicated on the engineer's plans showing where the airflow measuring station probe is to be located. Refer to Figure 13 for probe spacing and orientation.
2. Carefully open the package and inspect for damage. Proceed to the specific instructions in this section for rectangular (step 3), round (step 6) and flat oval duct applications (step9).

For Rectangular Ducts

3. The first dimension of the probe size indicates the length of the probe. The second dimension indicates the specific duct insertion side dimension 'X'. Mark a point at the center of the insertion side of the duct at 'X'. Draw a line on the insertion side of the duct at this point that is perpendicular to the edge of the duct. This line will be used to locate the position of the hole(s) to be drilled for probe insertion. The number of probes for the specific measurement site determines the probe installation locations as shown in in Figure 13.
4. Using Figures 12 and 13, locate and mark the location(s) on the insertion side of the duct (where the probes will be inserted through) at the line drawn in step 3.
5. For rectangular ducts greater than 18 inches (457.2 mm), probes are supplied with a terminal end bracket and stud opposite the insertion side bracket. For these probes, mark the corresponding terminal end bracket installation location(s) for each probe on the opposite side of the duct. **Probes under 18 inches(457.2 mm) do not have the terminal end bracket and stud and do not require marking or drilling holes on the opposite side of the duct.** Prepare a 1.25 inch insertion hole at each of the points marked for the probes. Proceed to step 12, For All Ducts.

TM_GP1_R3A

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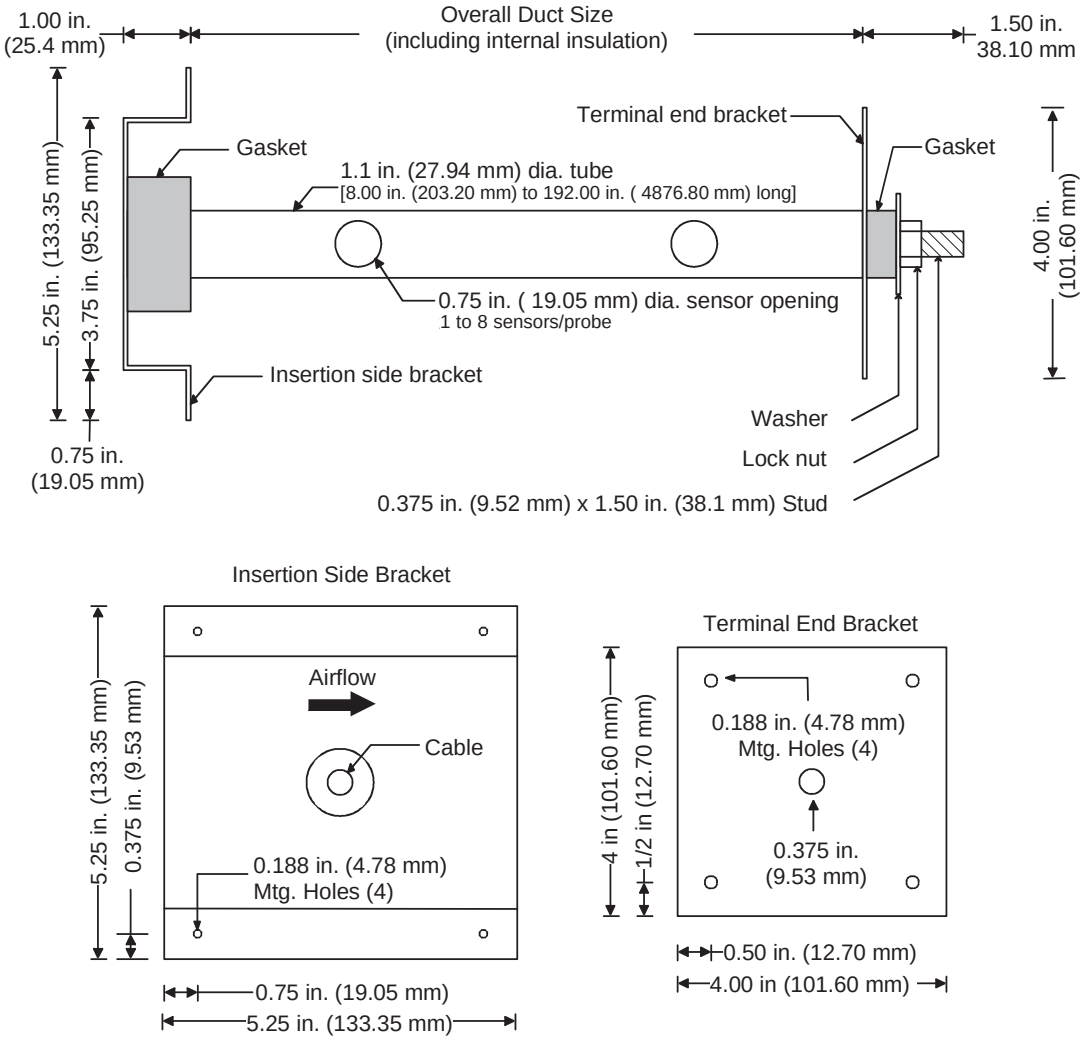
Figure 11. GP1 Insertion Mount Probe Style



NOTE: Probes under 18 inches(457.2 mm) are not equipped with the terminal end bracket, and therefore do not require a mounting hole on the opposite side of the duct.

Figure 12. GP1 Insertion Mount Probe Mechanical Dimensions

For Round Ducts

6. Mark and draw a line around the circumference of the duct at the point where the probes are to be installed. The number of probes for this specific measurement site determines the probe installation locations and orientation as shown in Figure 13. **Multiple probes must be staggered 1.5 to 2 inches (38.1 to 50.8 mm) from each other to avoid intersecting at the center of the duct.**
7. Using Figure 13, locate and mark the probe installation location(s) on the circumference line drawn in step 6 where each of the probe(s) will be inserted.
8. Probes 18 inches (457.2 mm) and longer are supplied with a terminal stud located at the probe end opposite the insertion side bracket. For these probes, mark the corresponding stud location(s) for each probe on the opposite side of the duct. **Probes under 18 inches (457.2 mm) do not have a terminal stud and do not require marking or drilling on the opposite side of the duct.** Prepare a 1.25 inch insertion hole on the side of the duct where the probe will be inserted. For probes 18 inches or longer, also prepare a 0.5 inch hole for the terminal stud on the opposite side of the duct for each probe location marked. Proceed to step 12, For All Ducts.

For Flat Oval Ducts

9. Mark and draw a line around the circumference of the duct at the point where the probes are to be installed. Probes supplied for flat oval duct applications are marked with a configuration suffix, letters 'a' to 'c' for installation and orientation as shown in Figure 13. **Configuration 'b' probes must be staggered 1-1/2 to 2 in (38.1 to 50.8 mm) from each other to avoid intersecting at the center of the duct.**
10. Using Figure 13, locate and mark the probe installation location(s) on the circumference line drawn in step 9 where each of the probe(s) will be inserted..
11. Probes 18 inches (457.2 mm) and longer are supplied with a terminal stud located at the probe end opposite the insertion side bracket. For these probes, mark the corresponding terminal stud location(s) for each probe on the opposite side of the duct. **Probes under 18 inches (457.2 mm) do not have a terminal stud and do not require marking or drilling on the opposite side of the duct.** Prepare a 1.25 inch insertion hole on the side of the duct where the probe will be inserted. For probes 18 inches or longer, also prepare a 0.5 inch hole for the terminal stud at the opposite side of the duct for each probe location marked. Proceed to step 12, For All Ducts.

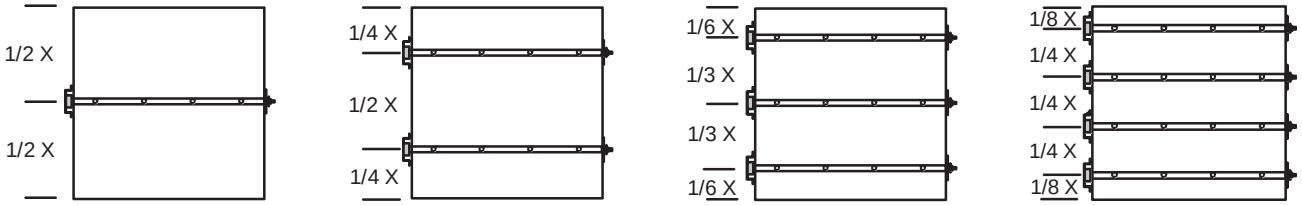
For All Ducts

12. Carefully place each probe assembly through the insertion side mounting hole, making sure that the larger insertion side gasket is firmly seated against the insertion side bracket. On probes with terminal studs, make sure that the terminal stud passes through the hole prepared for it on the opposite side of the duct. Fasten the insertion side mounting plate to the duct at four places with appropriate sheet metal screws, making sure that the edge of the plate, which mounts to the duct, is parallel to the edge of the duct and that the printed airflow arrow points in the direction of duct air flow. On probes under 18 inches without terminal studs, proceed to step 16.
13. Probes for rectangular duct applications of 18 inches or greater are equipped with a terminal stud and a terminal end bracket plate. Place the terminal end bracket plate onto the terminal stud that is protruding through the opposite side of the duct. Fasten the terminal end bracket plate to the duct with at four places using appropriate sheet metal screws, while keeping the stud as close as possible to the center of the drilled hole.
14. Probes for round and oval duct applications of 18 inches or greater are equipped with a terminal stud only (without a terminal bracket).
15. Place the smaller foam shock absorber/gasket over the terminal mounting stud, then place the large flat washer against the shock absorber/gasket. Tighten the lock nut onto the terminal mounting bolt until snug. A tight fit is not required. This will limit probe movement and air leakage when the duct is pressurized.
16. Connect sensor probes to the GTx116 transmitter. Refer to the Transmitter Installation, Operation and Maintenance Technical Manual (under separate cover) for set up instructions.

TM_GP1_R3A

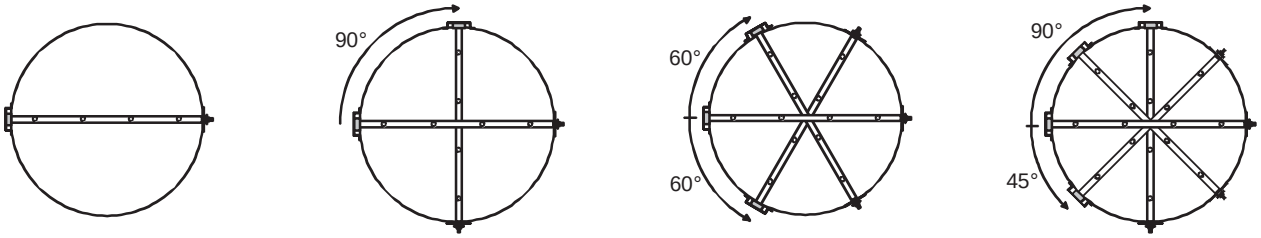
INSERTION MOUNT RECTANGULAR DUCT SPACING

☐ One Probe ☐ Two Probes ☐ Three Probes ☐ Four Probes



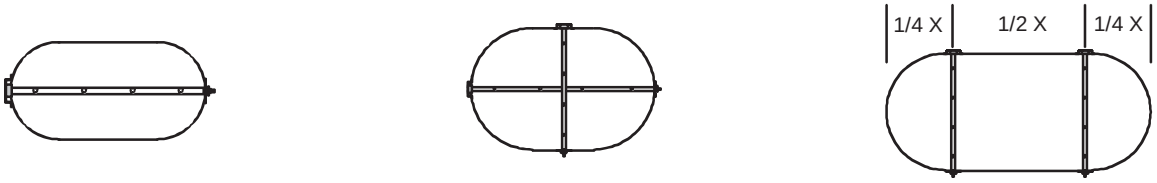
INSERTION MOUNT ROUND DUCT SPACING

☐ One Probe ☐ Two Probes ☐ Three Probes ☐ Four Probes



INSERTION MOUNT OVAL DUCT SPACING

☐ One Probe (configuration ‘a’) ☐ Two Probes (configuration ‘b’) ☐ Two Probes (configuration ‘c’)



☐ Three Probes (configuration ‘c’) ☐ Four Probes (configuration ‘c’)

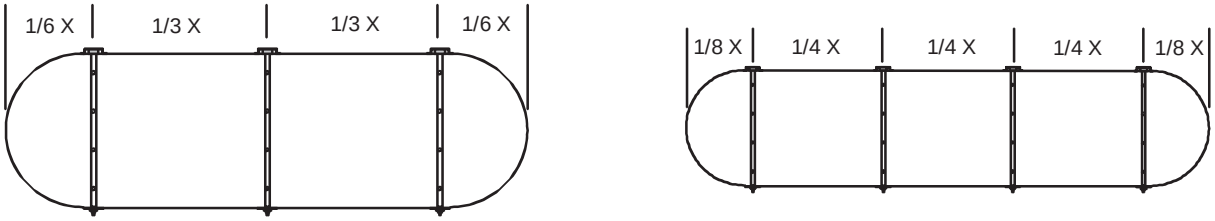


Figure 13. GP1 Insertion Mount Probe Spacing/Configuration

GP1 Internal Mount Installation

Internal mount probes are ideal for applications where access through the outside of the duct is limited or not possible. This mounting style is also well suited for installation in air handling units and plenums. Figure 14 shows a typical internal mount probe.

Probes are installed inside of the duct or plenum. Internal insulation that interferes with mounting should be removed prior to installation. There is approximately ± 0.75 inches (19 mm) of adjustment from the nominal probe length ordered.

Figure 15 shows the installation dimensions for the internal mount probe. Observe the following precautions, and Install probes as follows:

CAUTIONS/WARNINGS

Location of the GP1 sensor probe is critical for proper performance of the airflow station. Refer to Minimum Placement Guidelines section of this document for information on recommended location of GP1 probes.

If traverse data is desired, place the lowest numbered probe at the top of the duct for horizontal mounting. For vertical mounting, place the lowest numbered probe on the left side of duct when viewed from the upstream side of the mounting location. See REAL-TIME DUCT TRAVERSES for more information.

1. Each GP1 sensor probe package is factory labeled for the specific location and duct size it is designed for. Orders for locations having more than one probe will generally have individually packaged probes banded together. Determine the specific duct location for the GP1 sensor probe as indicated on the engineer's plans showing where the airflow measuring station probe is to be located. Refer to illustrations of Figures 15 and 16 to determine the proper probe spacing and orientation.
2. Carefully open the package and inspect for damage. Proceed to the specific instructions in this section for rectangular (step 3), round (step 6) and flat oval duct applications (step9).

For Rectangular Ducts

3. The first dimension of the probe size indicates the length of the probe. The second dimension indicates the specific duct internal mounting inside dimension 'X' (including internal insulation). On ducts with internal insulation that cannot be removed, adjust ‘X’ to equal the internal mounting inside dimension, minus two times the thickness of the insulation. Mark a point on the center of the inside of the duct at ‘X’. Draw a line on the inside of the duct at this point that is perpendicular to the edge of the duct. This line will be used to locate the position of the hole(s) to be drilled for probe insertion. The number of probes for the specific measurement site determines the probe installation locations as shown in Figure 16.
4. Using Figures 15 and 16, locate and mark the individual probe installation location(s) on the line drawn in step 3, where each of the probe(s) will be installed.
5. Mark the corresponding end bracket installation location(s) for each probe on the opposite side of the duct. Proceed to step 12, For All Ducts.

For Round Ducts

6. Mark and draw a line around the inside circumference of the duct at the point where the probes are to be installed. The number of probes for this specific measurement site determines the probe installation locations and orientation as shown in Figure 16. **Multiple probes must be staggered 1-1/2 to 2 in (38.1 to 50.8 mm) from each other to avoid intersecting at the center of the duct.**
7. Using Figure 16, locate and mark the probe installation location(s) on the circumference line drawn in step 6 where each of the probe(s) will be inserted.
8. Mark the corresponding end bracket installation location(s) for each probe on the opposite side of the duct. Proceed to step 12, For All Ducts.

Figure 14. GP1 Internal Mount Probe Style

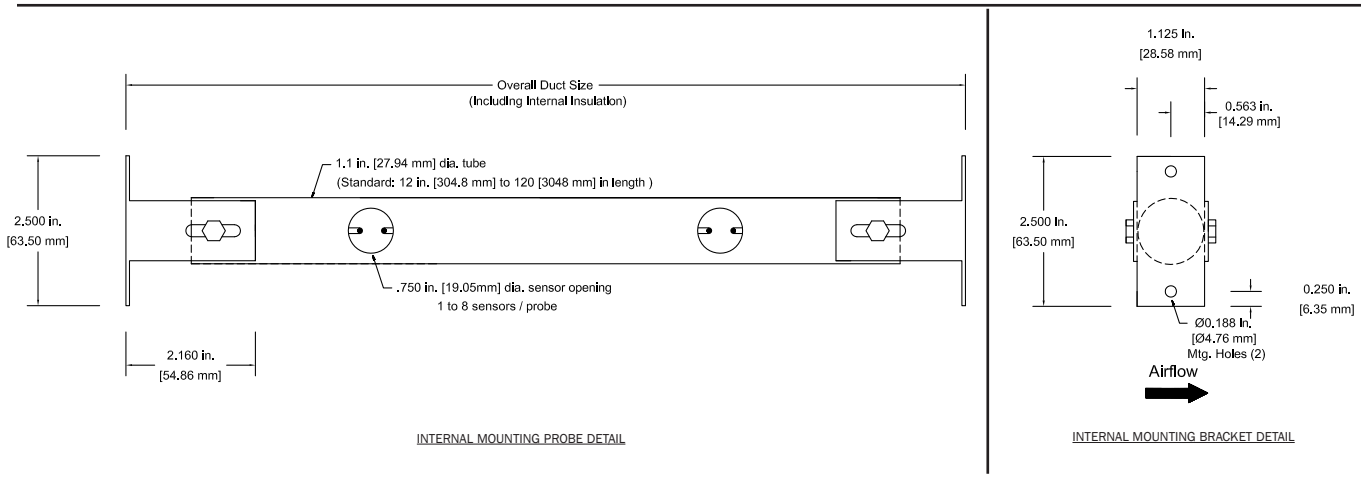


Figure 15. GP1 Internal Mount Probe Mechanical Dimensions

For Flat Oval Ducts

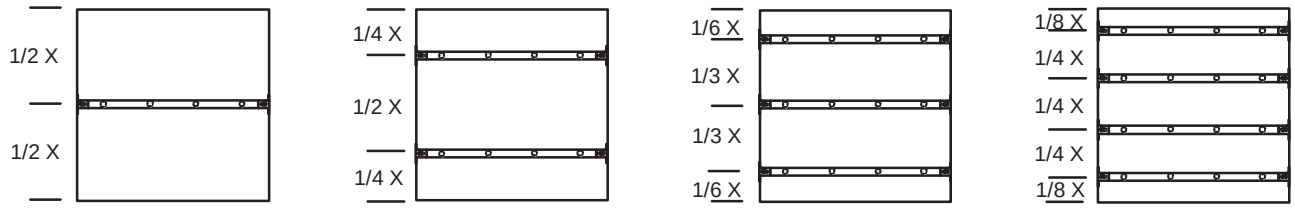
9. For flat oval ducts, the Sensor Density tables (Tables 1 through 4) indicate the required probe installation locations and orientation by a lowercase letter suffix (a, b, or c). This letter corresponds to the installation detail for oval probes as shown in Figure 16. The number of probes for the specific measurement site determines the probe installation locations and orientation as shown in Figure 16. Mark and draw a line around the inside circumference of the duct at the point where the probes are to be installed. **Configuration 'b' probes must be staggered 1-1/2 to 2 in (38.1 to 50.8 mm) from each other to avoid intersecting at the center of the duct.**
10. Using Figure 16, locate and mark the probe installation location(s) on the circumference line drawn in step 9 where each of the probe(s) will be inserted.
11. Mark the corresponding end bracket installation location(s) for each probe on the opposite side of the duct. Proceed to step 12, For All Ducts.

For All Ducts

12. Remove any internal insulation where the probe will be mounted. The insulation should be reinstalled after the probe is mounted.
13 Fasten each of the probe brackets to the duct with suitable hardware. Ensure that the sensors are oriented properly as shown in Figure 16, and installed in the direction of duct airflow as indicated by the airflow arrow on the probe.
14. Route the connecting cables from each probe out of the duct and seal with suitable hardware and/or gasketing material.
15. Connect sensor probes to the GTx116 transmitter. Refer to the separate technical manual, document TM GTx116, for transmitter set up and operation.

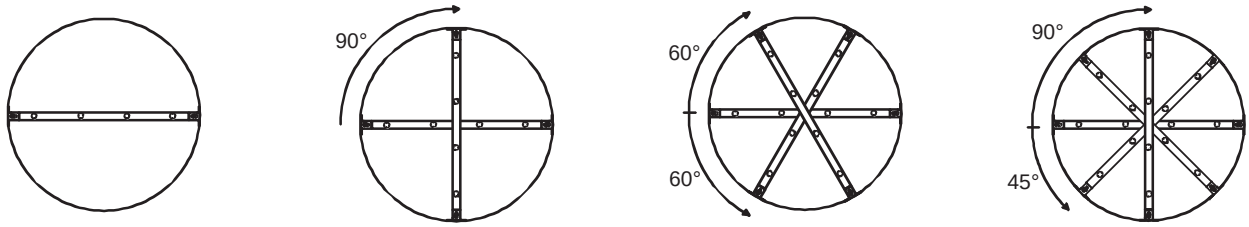
INTERNAL MOUNT RECTANGULAR DUCT SPACING

☐ One Probe ☐ Two Probes ☐ Three Probes ☐ Four Probes



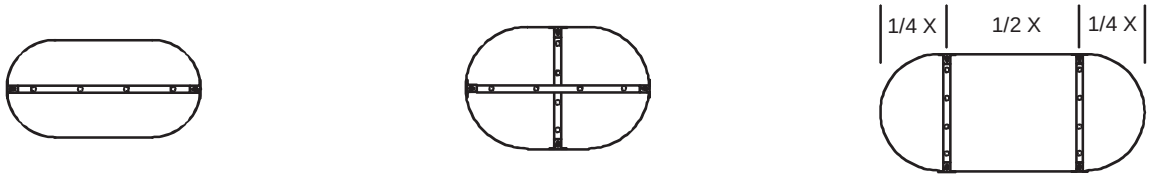
INTERNAL MOUNT ROUND DUCT SPACING

☐ One Probe ☐ Two Probes ☐ Three Probes ☐ Four Probes



INTERNAL MOUNT OVAL DUCT SPACING

☐ One Probe (configuration 'a') ☐ Two Probes (configuration 'b') ☐ Two Probes (configuration 'c')



☐ Three Probes (configuration 'c') ☐ Four Probes (configuration 'c')

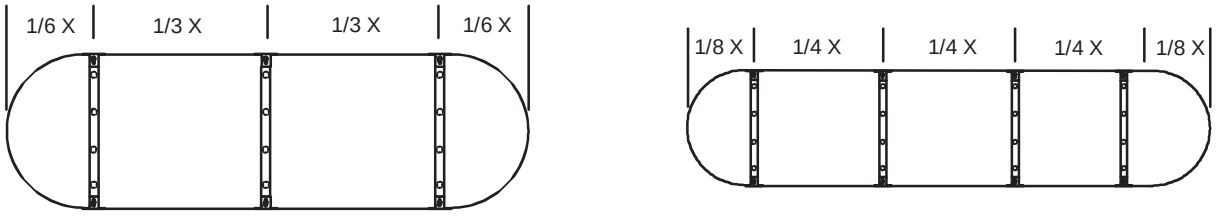


Figure 16. GP1 Internal Mount Probe Spacing/Configuration

TM_GP1_R3A

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GP1 Standoff Mount Installation

The standoff mounting option is designed for applications where duct extension sleeves cannot be added before outside air intake dampers. Unducted standoff mounting can add additional uncertainty to the system installed accuracy. The uncertainty decreases as the damper size increases.

Install directly in an outside air intake plenum or on an intake damper frame. The sensor probe should be mounted 2 in (50.8 mm) from the full open blade position.

Figure 17 shows a typical standoff mount GP1 probe. Figure 18 shows dimensions for the GP1 standoff mount probe. Note that for standoff mounting, probes supplied include an additional 2 in. [50.8 mm] of tube length (which is 2 in. longer than the specified opening size) to allow for bracket installation and damper blade clearance.

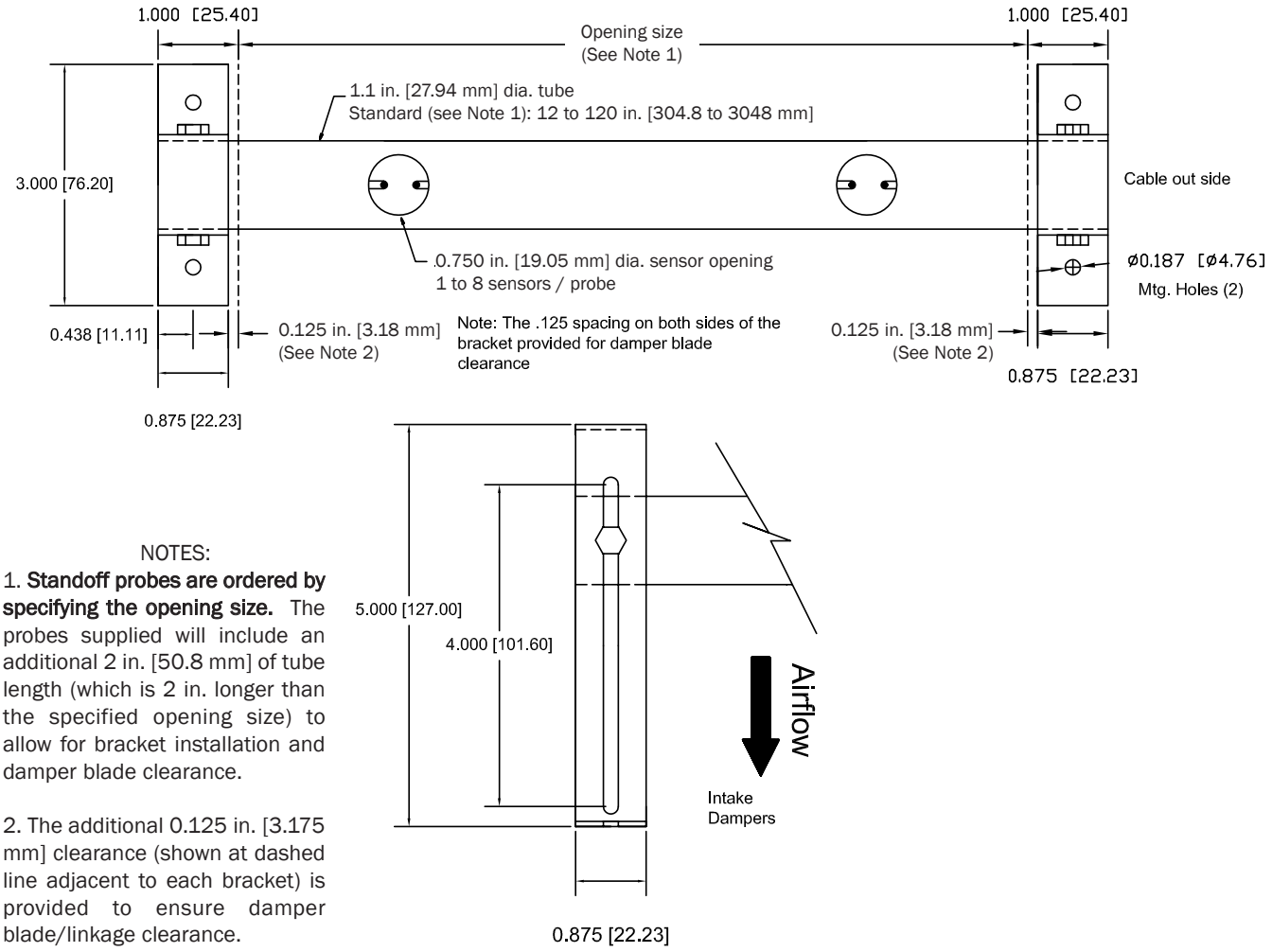
Figure 19 shows a typical outside air intake damper frame installation using the standoff mount option. Observe the following precautions and note when using the standoff mount installation:

Figure 17. GP1 Standoff Mount Probe Style

CAUTIONS/WARNINGS

- Location of the sensor probes is critical for proper performance of the airflow station. Refer to Minimum Placement Guidelines section of this document for recommended probe placement.
- Ensure that adequate clearance exists at the installation site to permit installation of the probe.
- For applications where multiple probes are necessary at a single measurement location, install probes in accordance with Figures 20 and 21 (recommended Probe Spacing/Configuration).
- Insulation that interferes with mounting should be temporarily removed prior to installation.
- In vertical probe installations (particularly on OA applications), probes should be placed with the cable exit on the higher side to prevent any potential moisture from accumulating on the heated sensor.
- Standoff mounting may yield additional measurement uncertainty compared to duct mounted configuration and should only be used when additional duct sleeves cannot be added to the intake damper.

1. Each GP1 sensor probe package is factory labeled for the specific location and duct size it is designed for. Orders for locations having more than one probe will generally have individually packaged probes banded together. Locate the position on the plenum or damper frame indicated by the engineer's plans where the airflow measuring station is to be located and refer to Figure 20 to determine the proper spacing and orientation of the probes.
2. Carefully open the package and inspect for damage.
3. The first dimension of the probe size for standoff mount models corresponds to the damper opening, and the probes supplied will be 2" longer in length to permit installation of the mounting brackets, and provide for damper blade clearance - see Figures 18 and 19). The second dimension indicates the mounting bracket side dimension 'X'.
4. Install directly into an outside air intake plenum or directly on the upstream side of an unducted intake damper as shown in Figure 19. Ensure that adequate mounting surface exists for the brackets when installing them on the damper. The brackets are 0.875 in (22.23 mm) wide, and an additional clearance of 0.125 in (3.175 mm) is provided between each inside bracket edge and the outside frame opening edge for mechanical clearance of damper blades/linkages, etc. The sensor probe should be mounted 2 in (50.8 mm) from the full open blade position. Unducted standoff mounting can add additional uncertainty to the system installed accuracy.
5. Refer to Figure 20 to determine the location of the mounting brackets from the edge of the plenum or damper opening. For approved vertical probe installations,orient the probe to ensure that the probe cable exits at the top.
6. Fasten the mounting brackets to the opening with the appropriate sheet metal screws making sure that the edge of the bracket is parallel to the edge of the opening, and that the printed airflow arrow is oriented in the same direction as the airflow.
7. For multiple probes repeat Step 6.
8. Connect sensor probes to the GTx116 transmitter. Refer to the separate technical manual, document TM GTx116, for transmitter set up and operation.



NOTES:

1. **Standoff probes are ordered by specifying the opening size.** The probes supplied will include an additional 2 in. [50.8 mm] of tube length (which is 2 in. longer than the specified opening size) to allow for bracket installation and damper blade clearance.

2. The additional 0.125 in. [3.175 mm] clearance (shown at dashed line adjacent to each bracket) is provided to ensure damper blade/linkage clearance.

Figure 18. GP1 Standoff Mount Probe Mechanical Dimensions

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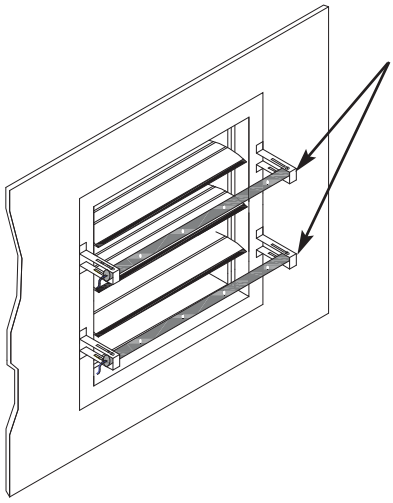

Probes supplied are 2 in. [50.8 mm] longer than the specified opening size to allow for bracket installation and damper blade clearance.

Install probes upstream of the outside air intake damper when extension sleeves cannot be added.

Figure 19. GP1 Standoff Mount Upstream Air Intake Damper Detail

STANDOFF MOUNT RECTANGULAR OPENING SPACING

☐ One Probe ☐ Two Probes ☐ Three Probes ☐ Four Probes

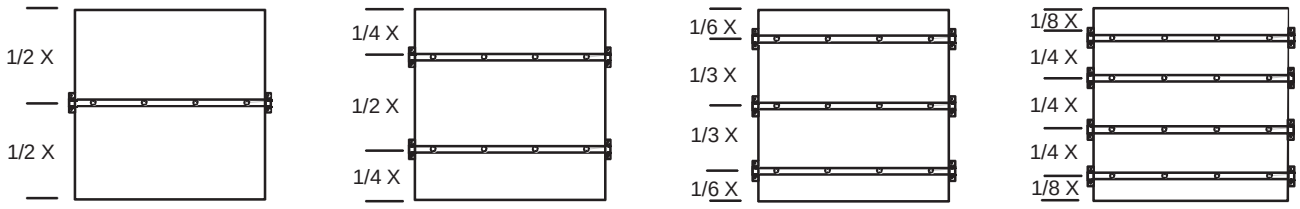

Figure 20. GP1 Standoff Mount Probe Spacing/Configuration

REAL TIME DUCT TRAVERSES

Real-time duct traverses of GP1 probes and sensors can be accomplished quickly and easily using the GTx116 transmitter. Individual airflow and temperature data can be returned over BACnet® or Modbus networks when probes are connected to a GTC116 RS-485 transmitter, or wirelessly to a PDA (using Palm® or Microsoft® Windows Mobile® operating system) with GTx116 transmitters equipped with the ***EB-Link*** option.

This invaluable feature is ideal for balancers and commissioning agents that desire 'on-the-fly' airflow and temperature traverses. The advantages of using permanently installed GP1 probes include nearly instantaneous traverse data (no sampling error over time), accurate and repeatable measurement and ease of report creation using the Microsoft® Excel® spreadsheet solution provided by ***EBTRON***. In addition, traverses do not require additional holes in the duct. Permanently mounted devices also eliminate cumbersome equipment and ladders that must normally be carried around the job site.

In order to standardize on probe and sensor locations on the display and generated spreadsheet reports, ***EBTRON*** recommends that probes be installed as described in the following paragraph and as shown in Figure 21. This will ensure that specific probes and sensors as reported by the GTx116 transmitter can be easily identified and located in the future.

Sensor Addressing and Probe Positioning

Sensors are automatically addressed by the GTx116 transmitter after power is applied to the transmitter. The probe that is connected to the left-most **used** receptacle (labeled **C1-C4**) on the transmitter is addressed as **probe 1**. The individual **sensors** within each probe are addressed with the lowest number at the probe end that is **opposite its connecting cable**. Up to 16 sensors can be individually viewed. Although any probe mounting style can be used, side mounted insertion is the easiest to verify the position of in the field. To standardize and simplify decoding of the data, ***EBTRON*** recommends the following mounting convention:

Horizontal Mounting of Probes: place the lowest numbered probe at the top of the duct and connect to receptacle C1 (left most) on the transmitter.
Vertical Mounting of Probes: place the lowest numbered probe on the left side of duct when viewed from the upstream side of the mounting location, and connect it to receptacle C1 (left most) on the transmitter. (Note: if only average data is desired, the mounting position of the probes is not critical.)

GP1 POWER AND SIGNAL WIRING NOTES

Power Requirements

GP1 probes are powered by the GTx116 transmitter. The GTx116-P transmitter requires 24 VAC at 12 to 20 VA maximum (depending on the number of sensor probes). An isolated 24 VAC power source is NOT required on analog output transmitters to ensure a 'floating' output signal to the host controls, since the analog outputs are isolated. Refer to the separate Technical Manual TM_GTx116 for complete transmitter interconnection and set up details.

GETTING MORE INFORMATION

For additional information on this product, or for assistance in your specific application, refer to ***EBTRON*** Application Design Guides available in your 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 800.2*EBTRON* (800. 232-8766).

TM_GP1_R3C

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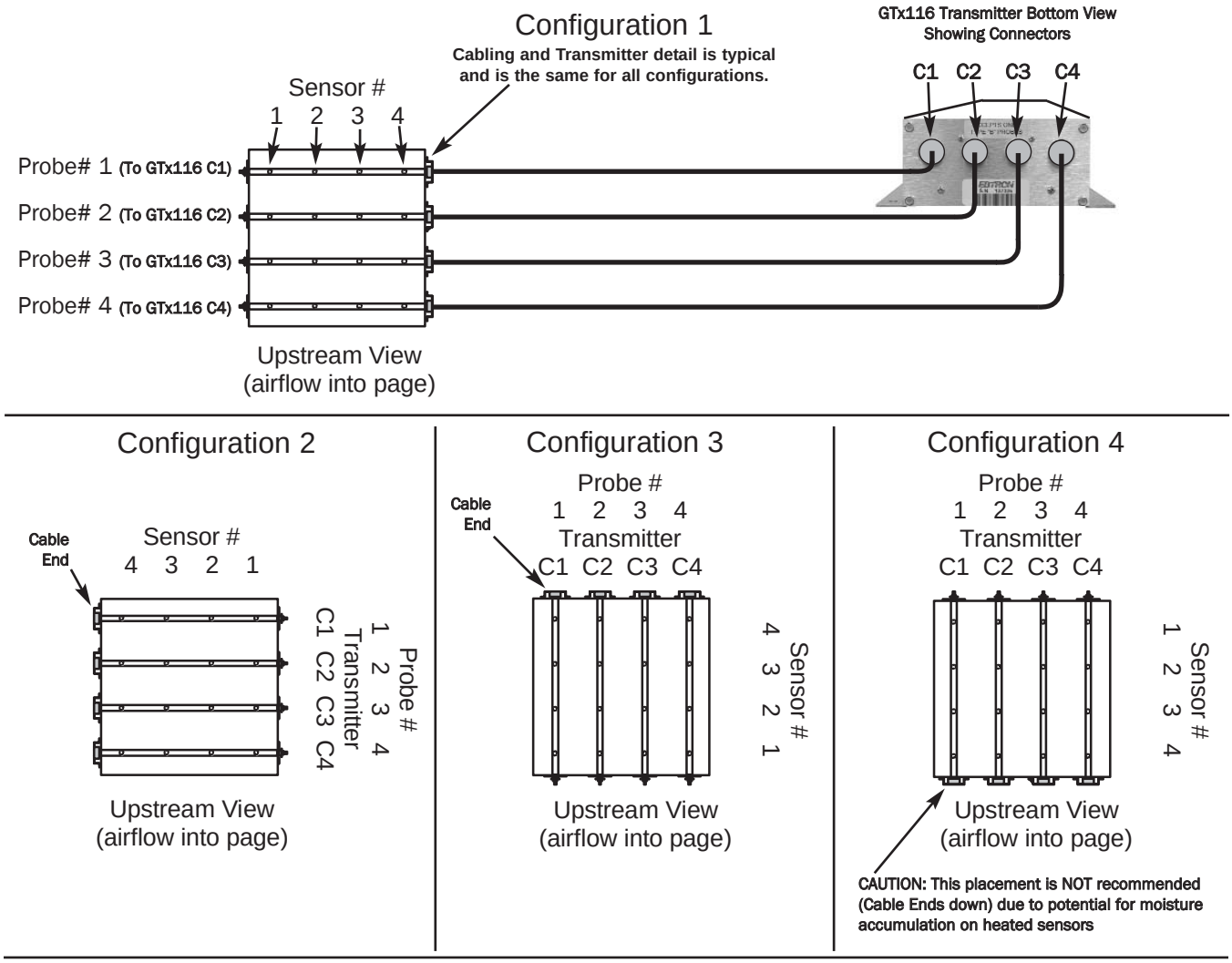

Figure 21. Probe Mounting Configuration for Duct Traverse and *EB-Link* Data Acquisition

MAINTENANCE

In most HVAC environments, periodic maintenance and calibration is neither required or recommended[1].

STANDARD LIMITED PARTS WARRANTY

If any ***EBTRON*** product 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.

TM_GP1_R3A

[1] In certain applications where a large amount of airborne particulate is present, especially fibrous material such as lint, pre-filtering of the return air may be required to ensure optimum instrument performance. If no pre-filtering is provided, periodic inspection and cleaning of sensors may be required using compressed air or a small soft tipped 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.

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