# Measurement for High-Performance Buildings

## EBTRON Measurement Technologies

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EBTRON®

Loris, South Carolina

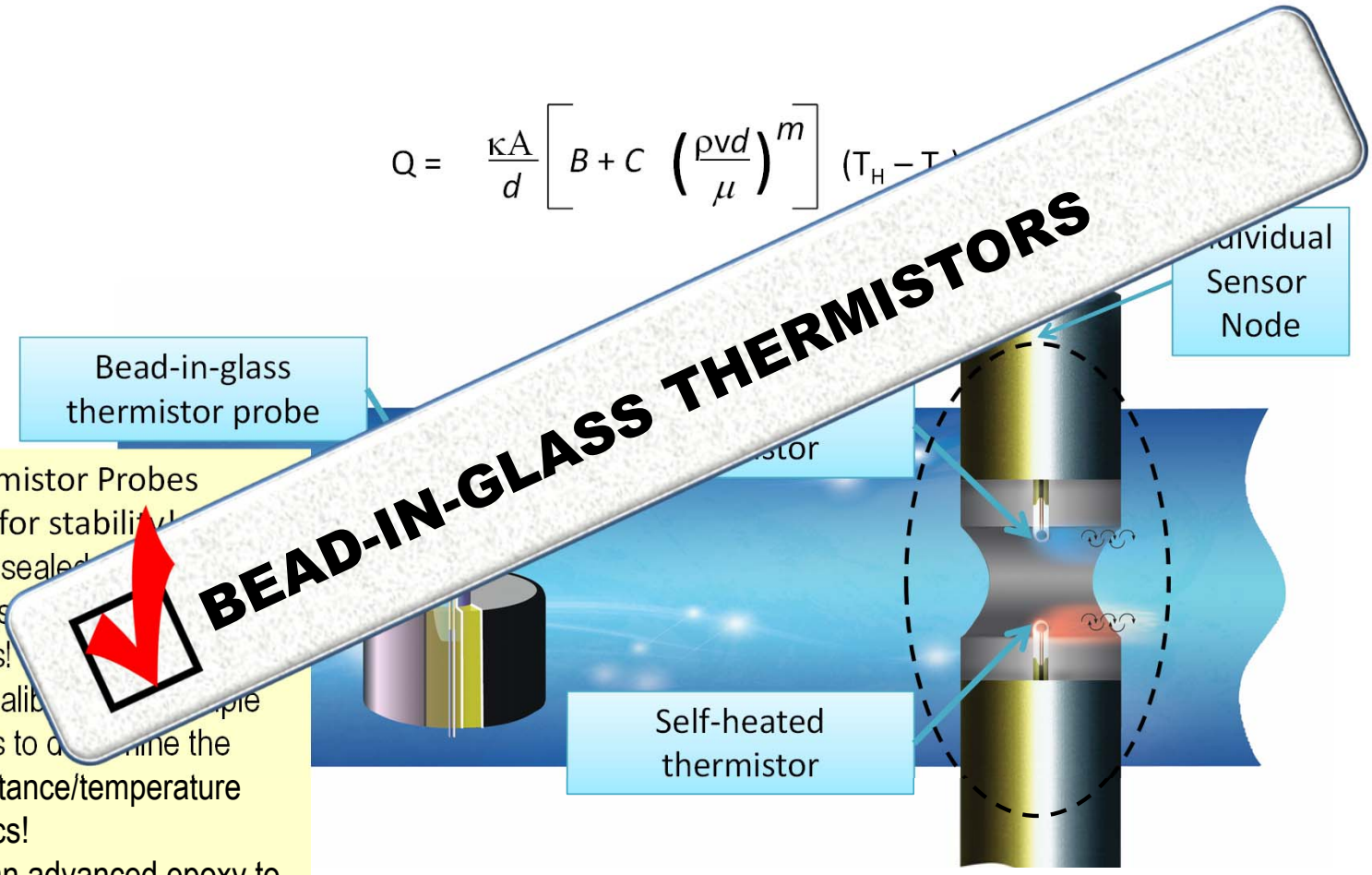
EBTRON Thermal Dispersion Technology

# AIRFLOW MEASUREMENT

EBTRON®

$$Q = \frac{\kappa A}{d}\left[B + C\left(\frac{\rho v d}{\mu}\right)^{m}\right](T_H - T_\infty)$$

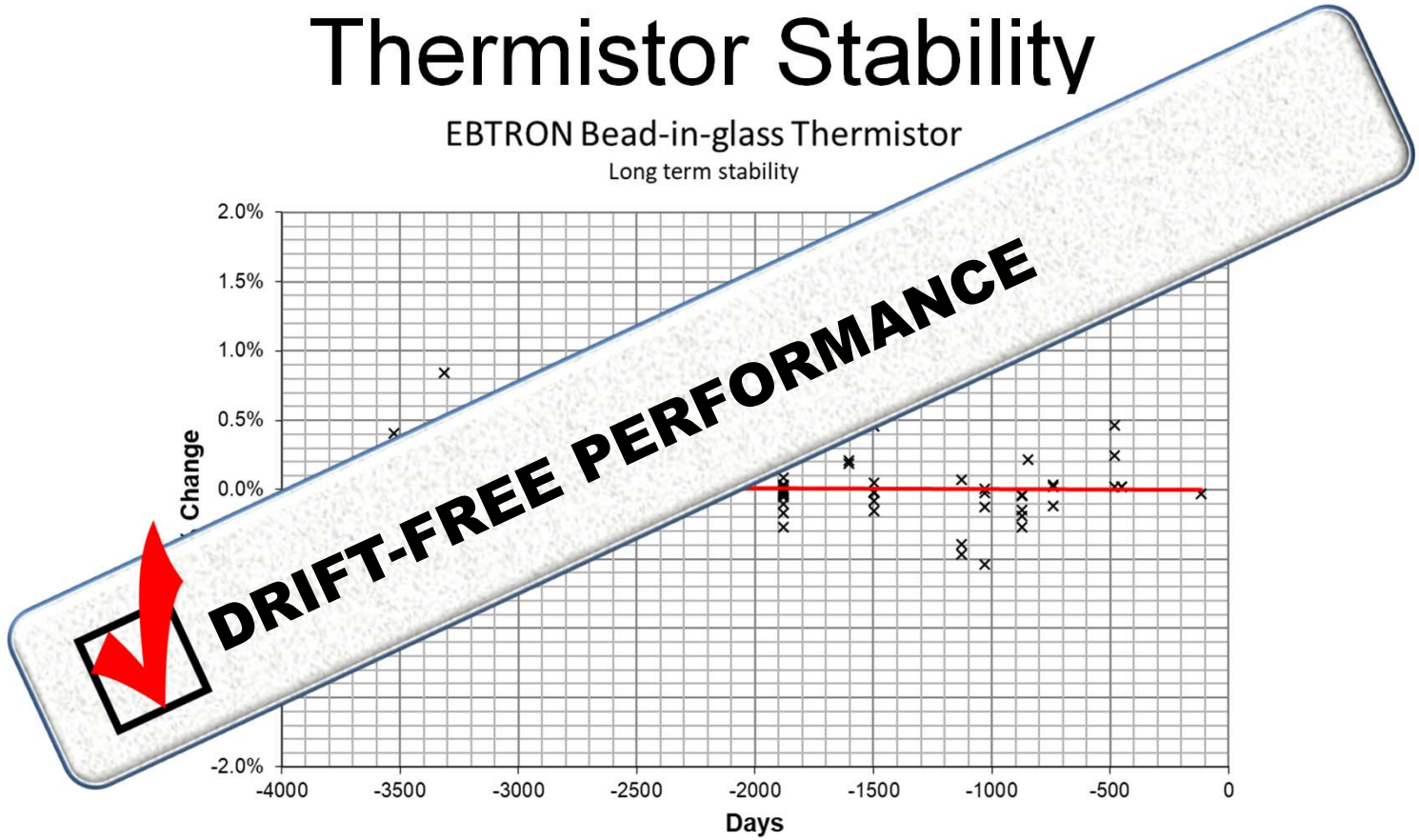
# BEAD-IN-GLASS THERMISTORS




"B-I-G" Thermistor Probes

- Oven-aged for stabili[ty]!
- Hermetically seale[d]
- Designed to s[urvive] temperatures!
- Individually calib[rated] temperatures to d[etermi]ne the precise resistance/temperature characteristics!
- Potted with an advanced epoxy to protect sensor and leads from water and atmospheric acids!

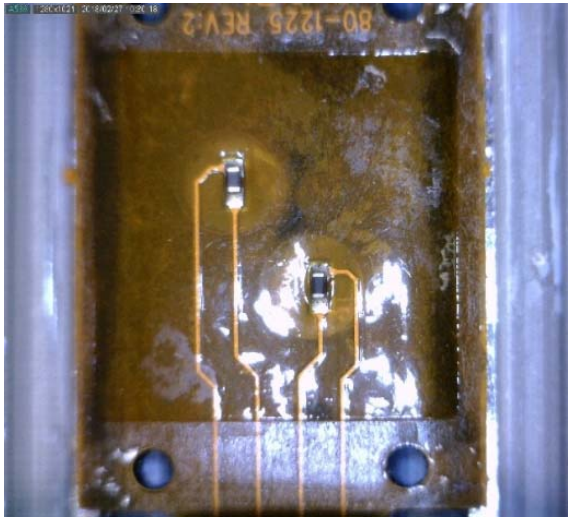
# Thermistor Stability



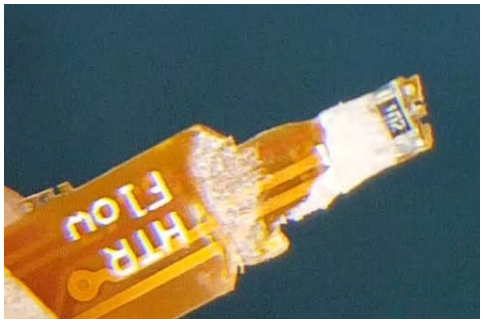
# Competitors Use Chip Thermistors

Each sensor node shall consist of two hermetically sealed bead-in-glass thermistors. Devices using chip thermistors of any type or packaging are not acceptable. Devices uses platinum wire RTDs or similar “hot wire” devices are not acceptable.

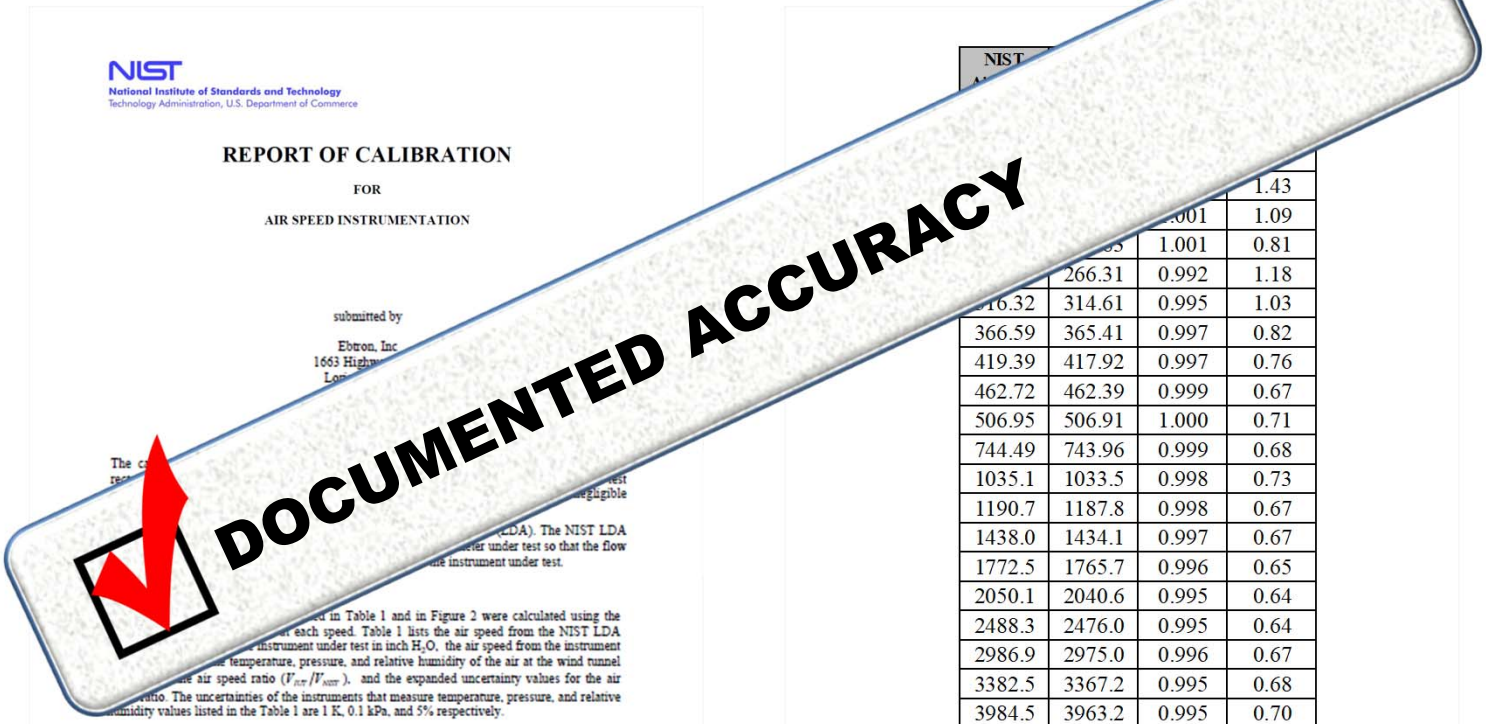
Ruskin TDP05K




Air Monitor Electra-Flow (Gen 5)


# NIST Traceable Calibration




NIST
National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

**REPORT OF CALIBRATION**

**FOR**

**AIR SPEED INSTRUMENTATION**

submitted by

Ebtron, Inc
1663 Highw
Lor

The c
rec
test
negligible

(LDA). The NIST LDA
meter under test so that the flow
the instrument under test.

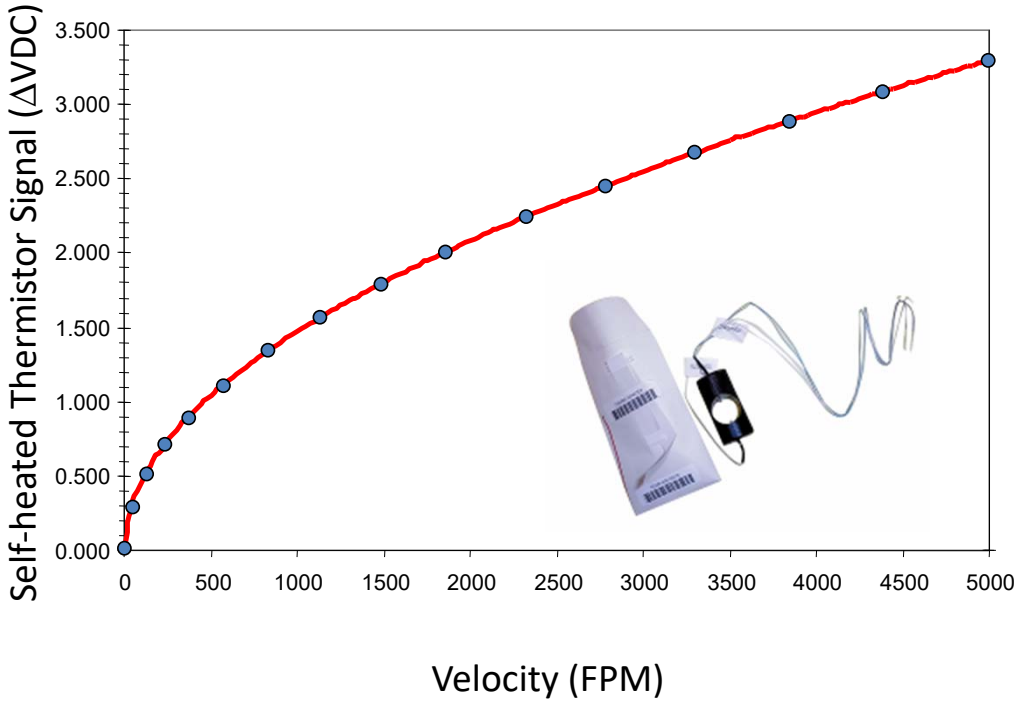
ed in Table 1 and in Figure 2 were calculated using the
at each speed. Table 1 lists the air speed from the NIST LDA
instrument under test in inch $H_2O$, the air speed from the instrument
temperature, pressure, and relative humidity of the air at the wind runnel
air speed ratio ($V_{INST}/V_{NIST}$), and the expanded uncertainty values for the air
ratio. The uncertainties of the instruments that measure temperature, pressure, and relative
humidity values listed in the Table 1 are 1 K, 0.1 kPa, and 5% respectively.

| NIST | | | |
|---|---|---|---|
| | | | 1.43 |
| | | .001 | 1.09 |
| | | 1.001 | 0.81 |
| | 266.31 | 0.992 | 1.18 |
| 316.32 | 314.61 | 0.995 | 1.03 |
| 366.59 | 365.41 | 0.997 | 0.82 |
| 419.39 | 417.92 | 0.997 | 0.76 |
| 462.72 | 462.39 | 0.999 | 0.67 |
| 506.95 | 506.91 | 1.000 | 0.71 |
| 744.49 | 743.96 | 0.999 | 0.68 |
| 1035.1 | 1033.5 | 0.998 | 0.73 |
| 1190.7 | 1187.8 | 0.998 | 0.67 |
| 1438.0 | 1434.1 | 0.997 | 0.67 |
| 1772.5 | 1765.7 | 0.996 | 0.65 |
| 2050.1 | 2040.6 | 0.995 | 0.64 |
| 2488.3 | 2476.0 | 0.995 | 0.64 |
| 2986.9 | 2975.0 | 0.996 | 0.67 |
| 3382.5 | 3367.2 | 0.995 | 0.68 |
| 3984.5 | 3963.2 | 0.995 | 0.70 |
| 4988.1 | 4959.6 | 0.994 | 0.67 |
| 5990.8 | 5965.3 | 0.996 | 0.88 |
| 6979.2 | 6941.6 | 0.995 | 0.87 |
| 7993.3 | 7937.7 | 0.993 | 0.65 |

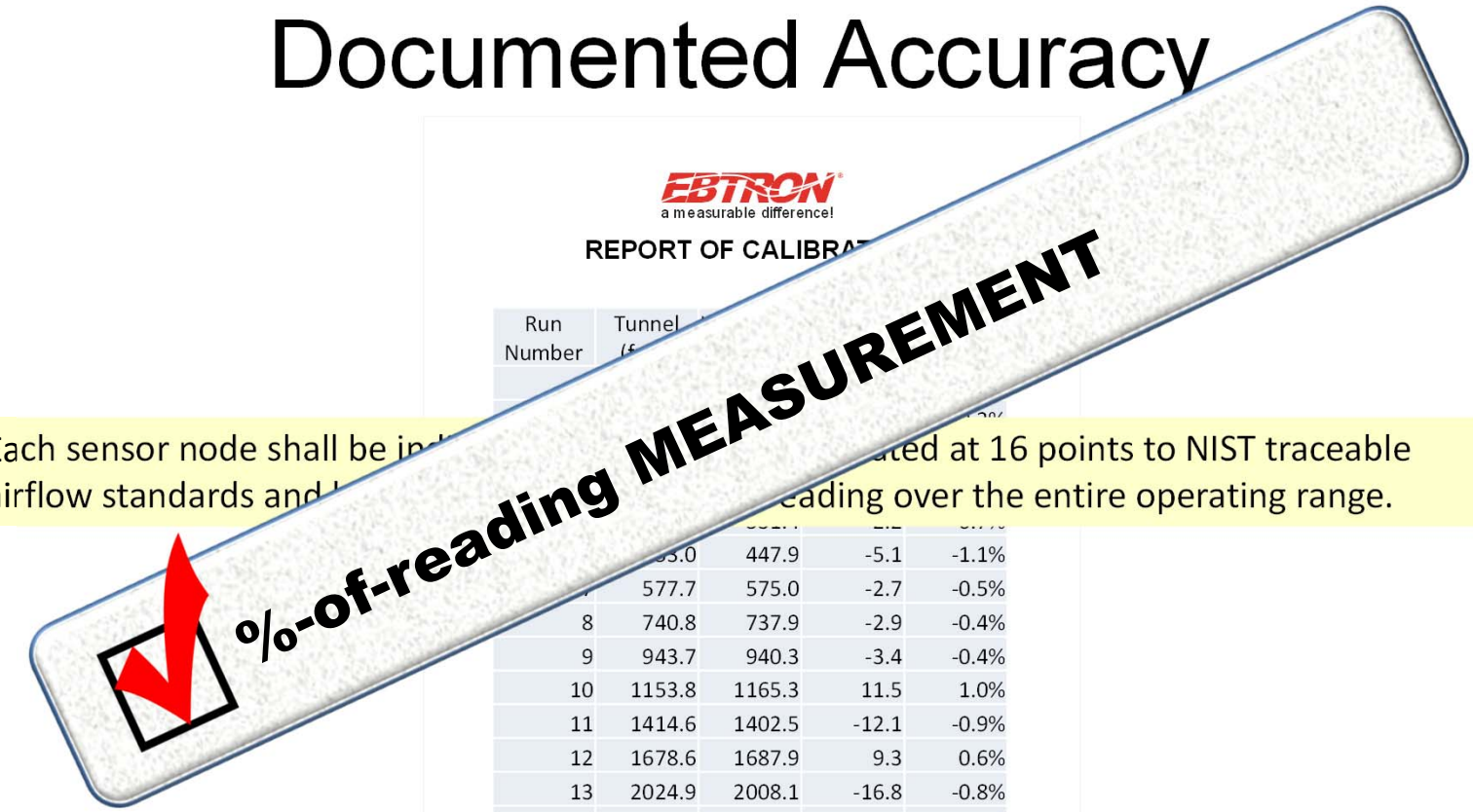
Transfer
NIST
Calibration

# Multi-flow Calibration of Individual Sensor Nodes

Calibrate Sensor



# Documented Accuracy




EBTRON
a measurable difference!

REPORT OF CALIBRA

| Run Number | Tunnel (f | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | 3.0 | 447.9 | -5.1 | -1.1% |
| | 577.7 | 575.0 | -2.7 | -0.5% |
| 8 | 740.8 | 737.9 | -2.9 | -0.4% |
| 9 | 943.7 | 940.3 | -3.4 | -0.4% |
| 10 | 1153.8 | 1165.3 | 11.5 | 1.0% |
| 11 | 1414.6 | 1402.5 | -12.1 | -0.9% |
| 12 | 1678.6 | 1687.9 | 9.3 | 0.6% |
| 13 | 2024.9 | 2008.1 | -16.8 | -0.8% |
| 14 | 2409.4 | 2399.5 | -9.9 | -0.4% |
| 15 | 3342.6 | 3340.5 | -2.1 | -0.1% |
| 16 | 4941.2 | 4923.3 | -17.9 | -0.4% |
| | | | Avg. Error > | -0.2% |

Each sensor node shall be in
ated at 16 points to NIST traceable airflow standards and
eading over the entire operating range.

# Competitors AMCA “Certify”

NIST TRACEABLE

- Internationally accepted test standards adm
no ir
- Airflo
mea
- Report is created and provided by NIST.
- EBTRON calibrates each sensor node so performance of product is assured unit to unit.

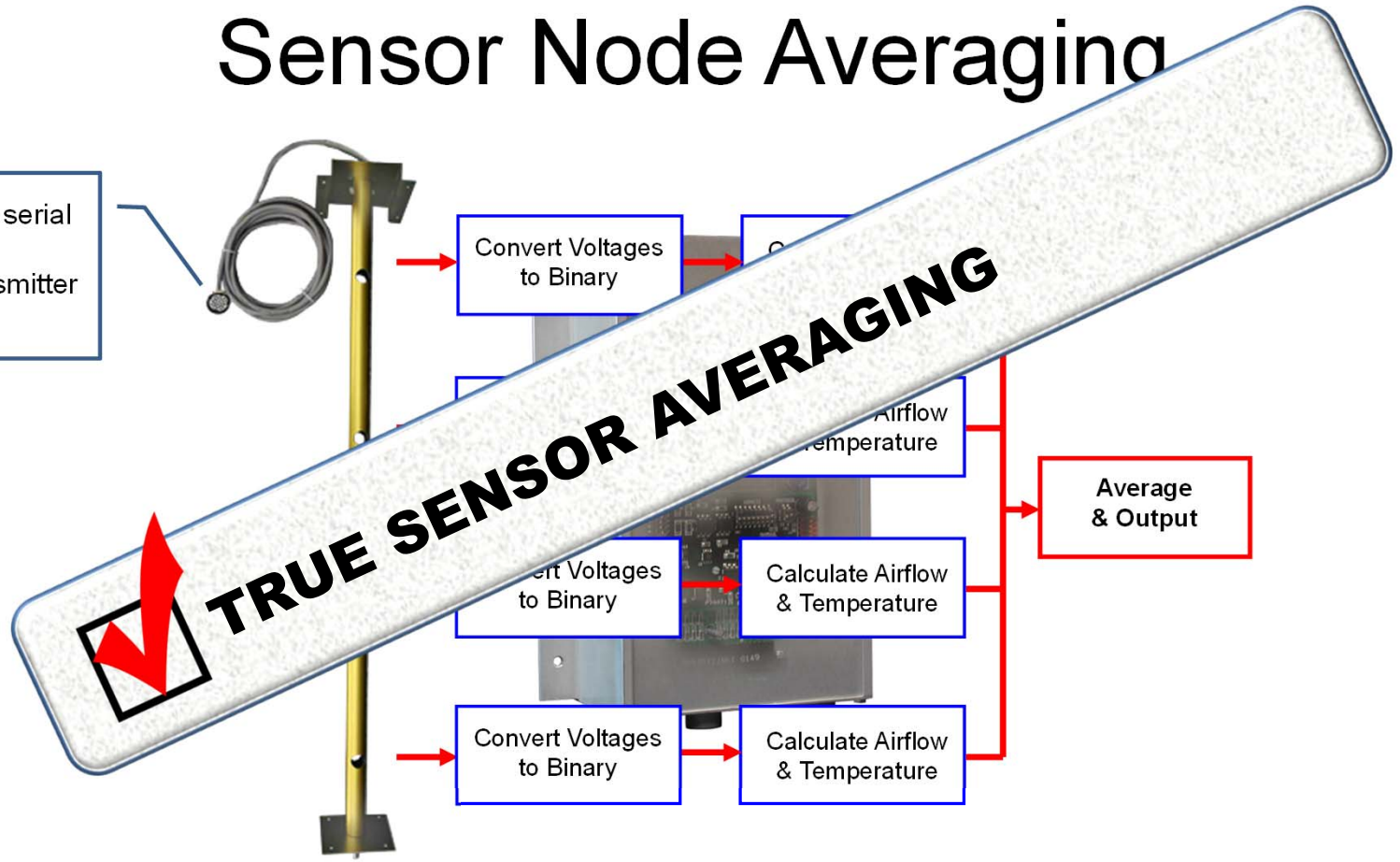
AMCA CERTIFIED

- Industry organization that has member
s
an be
product as long as test tunnel is certified.
- A single product can be calibrated and tested to satisfy AMCA requirements (false performance).
- The AMCA tested unit may not actually represent the product sold.

Provide a copy of the NIST calibration report for the reference standard used to calibrate the production tunnels used to calibrate individual sensor nodes. Reference standards calibrated to third-party NIST traceable labs are not acceptable. Devices claiming AMCA certification are not acceptable.

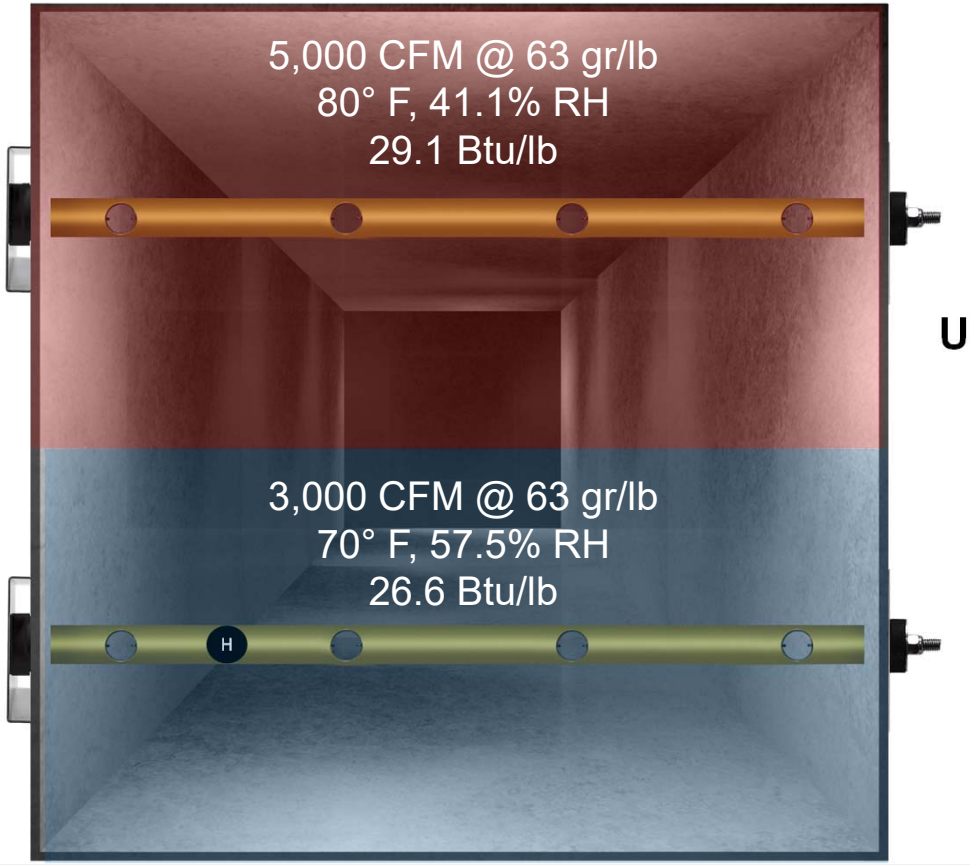
# Sensor Node Averaging

Calibration data in serial memory chip gets transferred to transmitter on power-up



# Velocity-weighted Measurements

**Using Averages**
(Incorrect)
Temperature = 75 °F
RH = 48.5%
Enthalpy = 27.8 Btu/lb

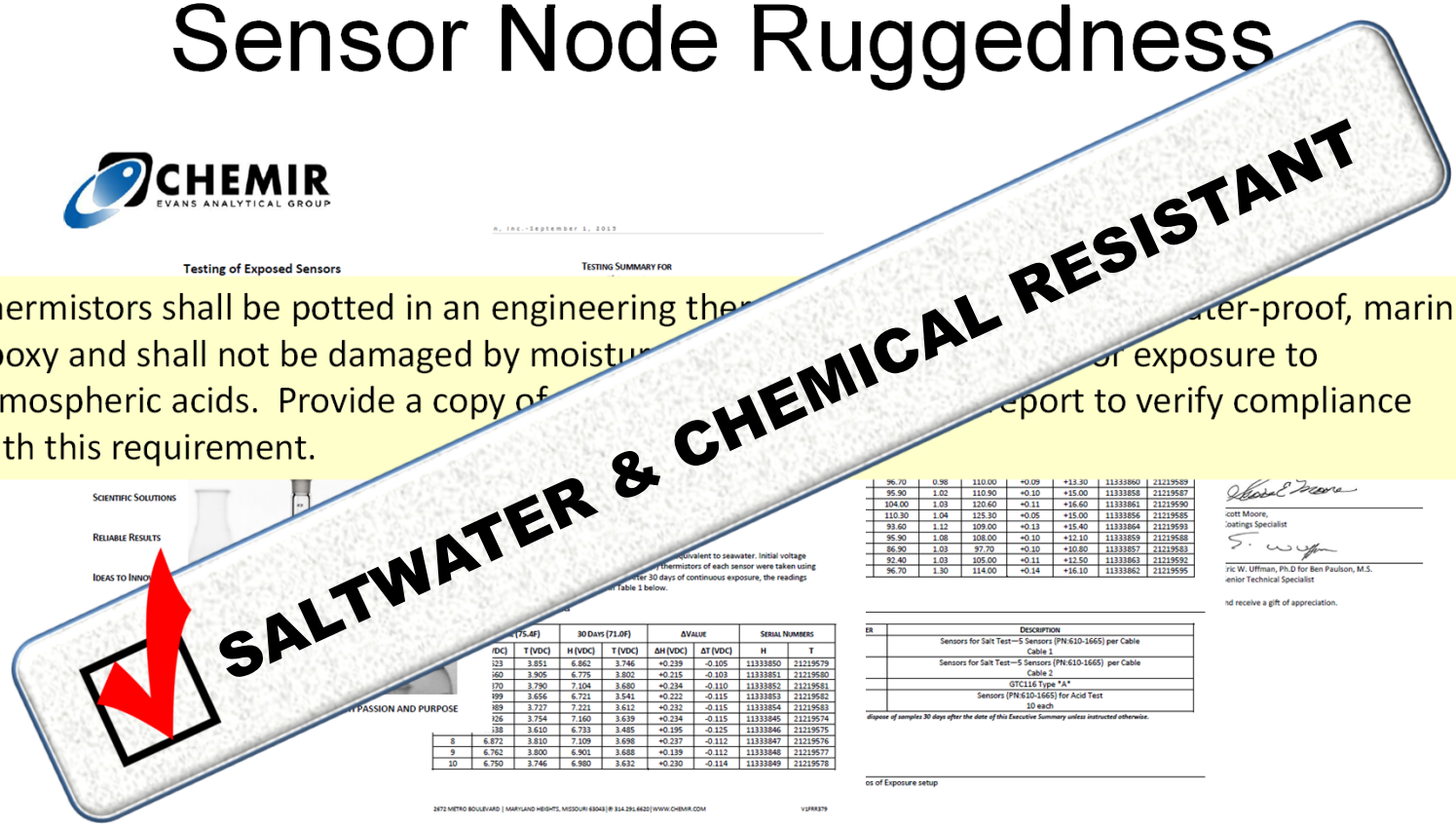



**Using Velocity-weighted**
(Actual)
Temperature = 76.3° F
RH = 46.5%
Enthalpy = 28.2 Btu/lb

# Sensor Node Ruggedness

Thermistors shall be potted in an engineering ther… …ter-proof, marine epoxy and shall not be damaged by moistu… …of exposure to atmospheric acids. Provide a copy of … …eport to verify compliance with this requirement.

**SALTWATER & CHEMICAL RESISTANT**



# Salt Water Exposure Test

# Construction Excellence!

# Warranty and Service

# EBTRON Product Solutions

# New GOLD Series GTx116e Transmitter

2-line backlit display with on board barometric pressure sensor!

-PC probe types can be provided with RH, Dewpoint and Enthalpy measurements!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# Advantage IV Duct & Plenum Probes

## Gold Series

- ✓ High sensor density results in the best installed accuracy without field adjustment.
- ✓ Easy to read dual line, backlit, display.
- ✓ Unsurpassed connectivity options provide isolated analog outputs with RS-485 BACnet/Modbus, Ethernet and Lon network solutions.
- ✓ FREE *EB-Link* Low Energy Bluetooth interface for Android and iOS devices.
- ✓ Relative humidity sensor option provides velocity-weighted RH and enthalpy plus dewpoint.
- ✓ Gold plated cable plug/receptacle connector pins.

## Hybrid Series

- Lower sensor density reduces first-cost but may require field adjustment.
- Single line, non-backlit, display.
- Analog or RS-485 connectivity option.
- *EB-Link* is not available.
- RH option is not available.

Advantage IV Product Line

FCC-Part 15

# Duct Mounted

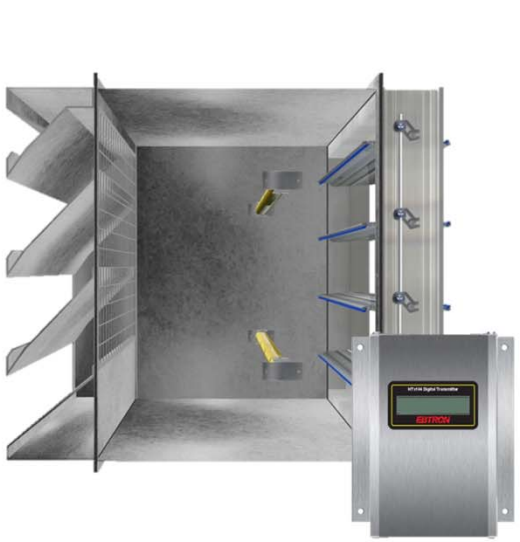
GTx116e-PC
GTx116e-P+

HTx104-PE

Advantage IV Product Line

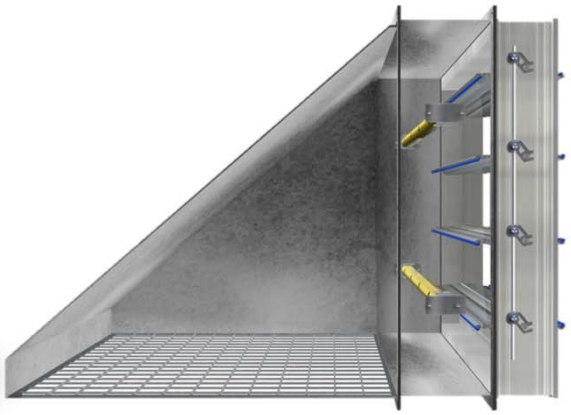
FCC-Part 15

# Outdoor Air Intakes



HTx104-PE

GTx116e-PC
GTx116e-P+



AIR-IQ
AIR-IQ2

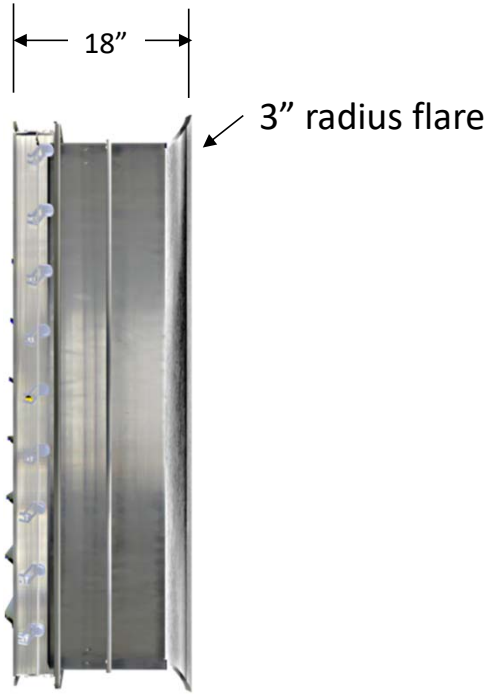
# AIR-IQ2

- Designed specifically for outdoor air intakes
- 35% narrower sleeve than AIR-IQ (original)
- 1” radius flare improves measurement performance
- GTx116-P+ with modified log-Tchebycheff sensor placement
- High performance TAMCO damper

TAMCO EBTRON

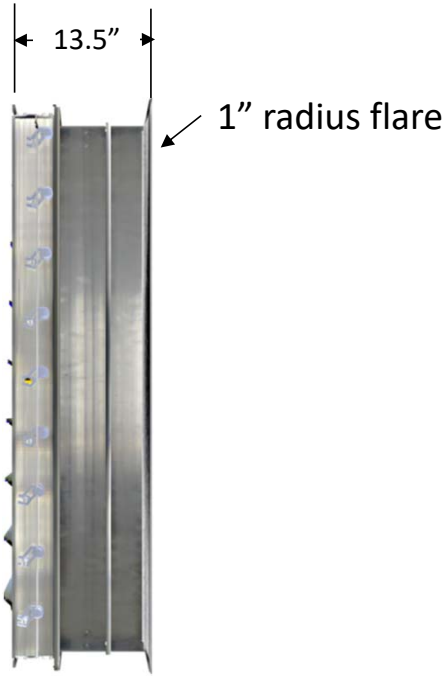
# AIR-IQ AIR FLOW MEASUREMENT SOLUTION

## AIR-IQ




## AIR-IQ
## Damper/AMD Combo


## AIR-IQ2



# A4-Gold Series *EB-Link*

Standard with all GOLD SERIES -P measuring devices!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Download on the App Store

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*EB-Flow2* Product Line

FCC-Part 15

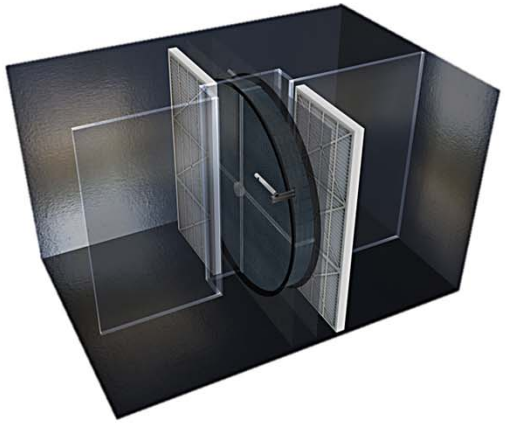
# Application Specific

EF-x2000-U

EF-x2000-T

EF-x1000-T

ELF



EF-x2000-U

# Advantage IV Fan Inlet Sensors

## Gold Series

- ✓ Does not affect fan performance like other fan inlet technologies.
- ✓ Fan array model supports up to eight individual fans.
- ✓ Easy to read dual line, backlit, display.
- ✓ Unsurpassed connectivity options provide isolated analog outputs with RS-485 BACnet/Modbus, Ethernet and Lon network solutions.
- ✓ FREE *EB-Link* Low Energy Bluetooth interface for Android and iOS devices.
- ✓ Gold plated cable plug/receptacle connector pins.

## Hybrid Series

- Same sensor options and performance for SWSI and DWDI fans as Gold Series.
- Slightly lower cost than Gold Series.
- Single line, non-backlit, display.
- Analog or RS-485 connectivity option.
- *EB-Link* is not available.

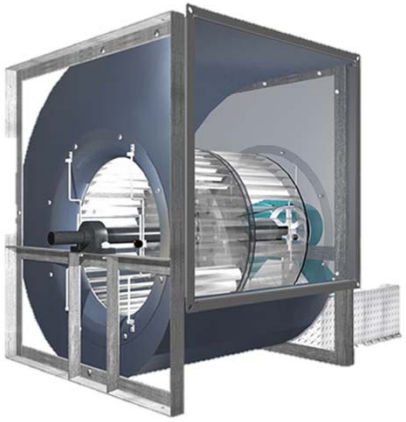
Advantage IV Product Line

FCC-Part 15

# SWSI DWDI Fans

GTx108e-F
/SI & /DI

HTx104-F
/SI & /DI

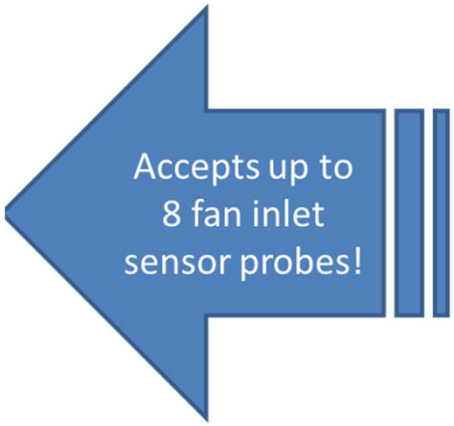


Advantage IV Product Line

FCC-Part 15

# Fan Arrays


GTx108e-F/An

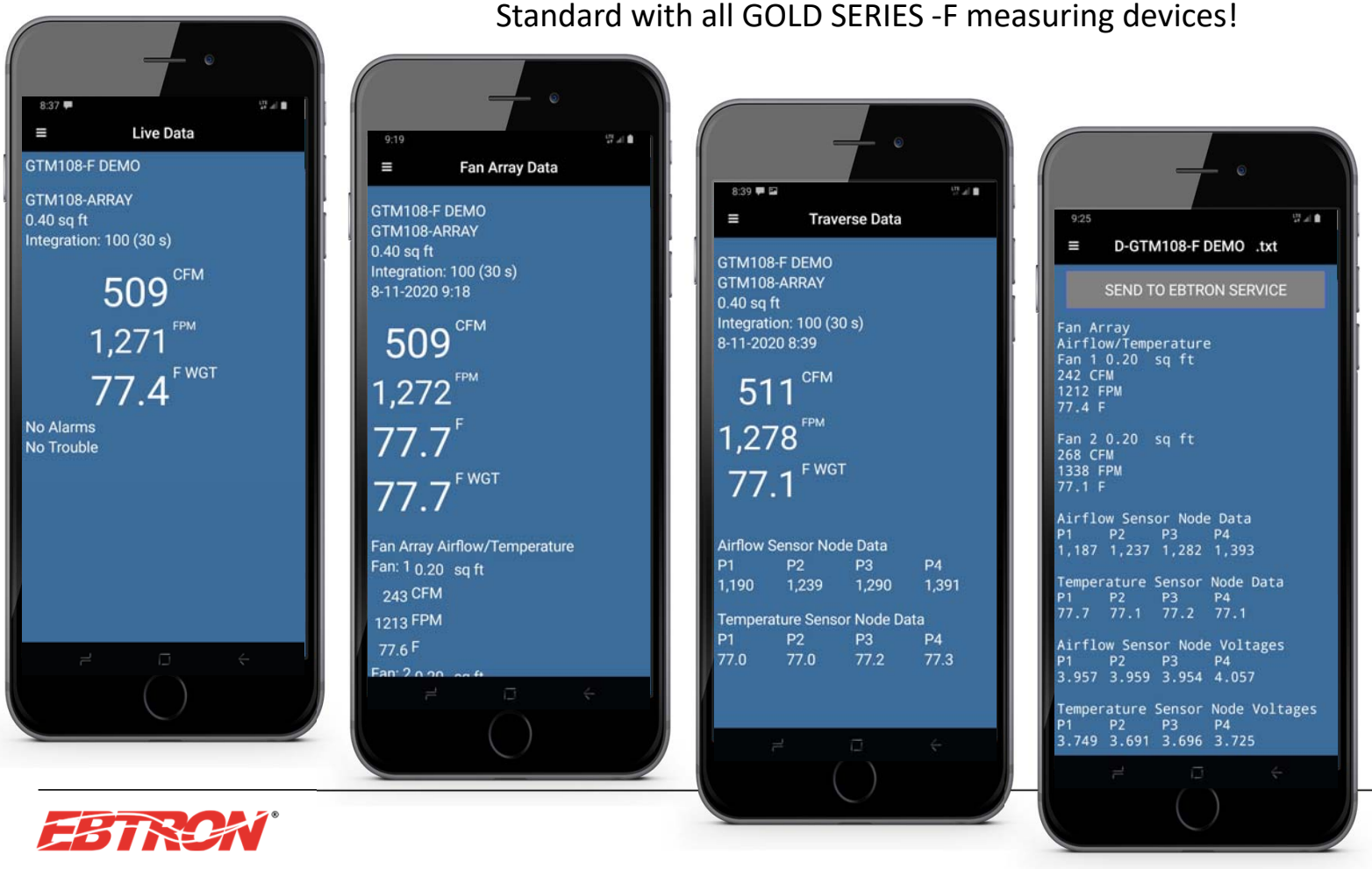



# FAN-IQ

- Ideal for fan arrays
- GTx108-F/An supports up to 8 fans
- Airflow measurement device does not affect fan performance
- Individual fan airflow measurement with fan alarm capability
- High performance TAMCO backdraft damper

# A4-Gold Series *EB-Link*

Standard with all GOLD SERIES -F measuring devices!

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# Occupancy


- ✓ Bidirectional occupancy counter for interior openings.
- ✓ Analog and RS-485 BACnet/Modbus connectivity (CENSUS-C100).
- ✓ "Auto-zero" non-activity reset feature.
- ✓ "No-negatives" measurement feature for single entry applications.
- ✓ Better than 2% counting accuracy on openings up to 42 inches wide without an operable door[1].
- ✓ 5% typical counting accuracy on interior, operable doors up to 42 inches wide[1]

[1] Accuracy may decrease on dual door applications if more than one person passes through the door at one time.

# Thank You!

Questions?  More information?

AskDave@EngineeredSalesCorp.com