

Measurement for High-Performance Buildings

EBTRON Measurement Technologies

David S. Dougan, President



Loris, South Carolina



TECHNICAL AIR SYSTEMS, INC.
A Comfortable Choice



EBTRON Thermal Dispersion Technology

AIRFLOW MEASUREMENT



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

Bead-in-glass
thermistor probe

Individual
Sensor
Node

“B-I-G” Thermistor Probes

- Oven-aged for stability!
- Hermetically sealed!
- Designed to survive extreme temperatures!
- Individually calibrated to extreme temperatures to determine the precise resistance/temperature characteristics!
- Potted with an advanced epoxy to protect sensor and leads from water and atmospheric acids!

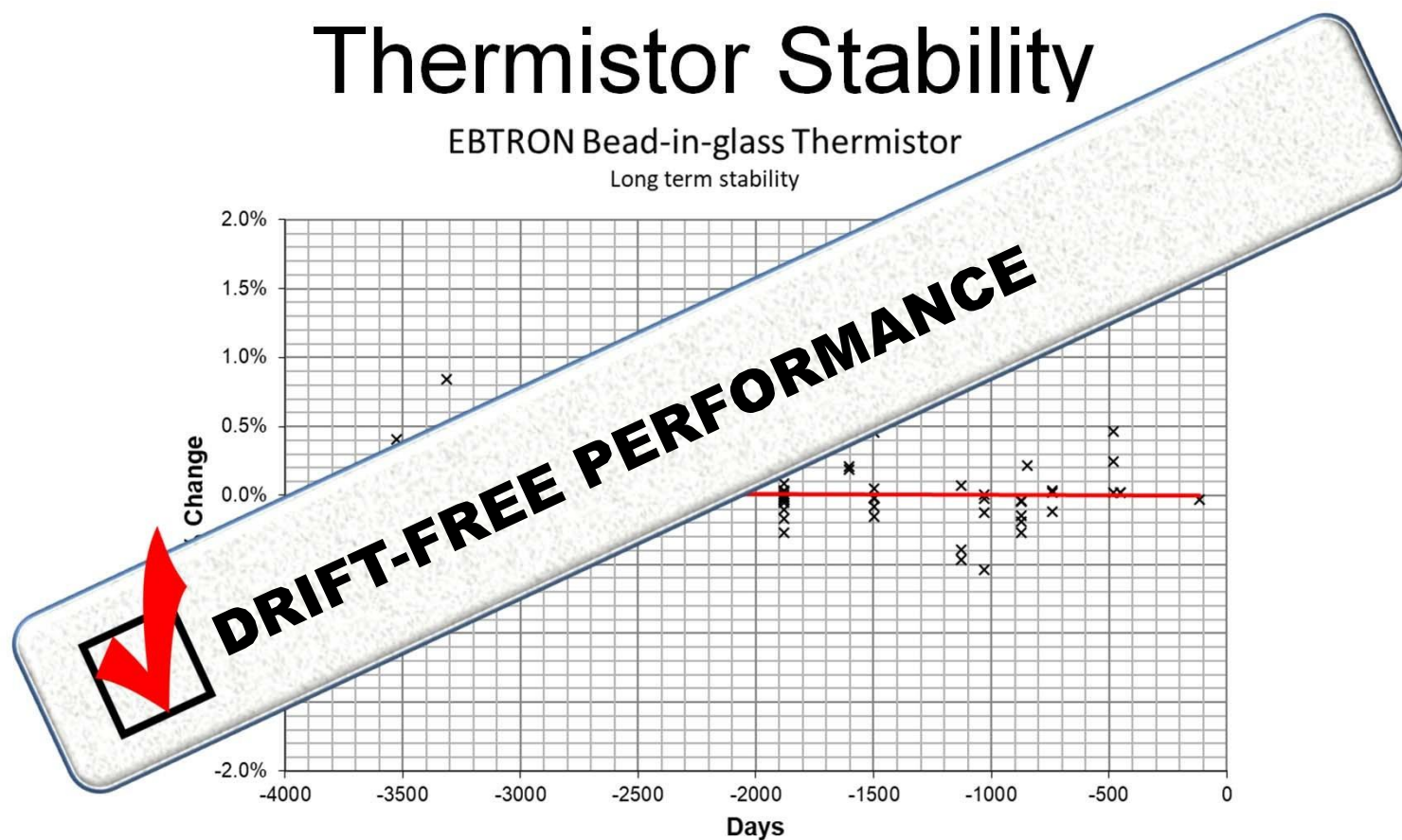
BEAD-IN-GLASS THERMISTORS

Self-heated
thermistor

Thermistor Stability

EBTRON Bead-in-glass Thermistor

Long term stability



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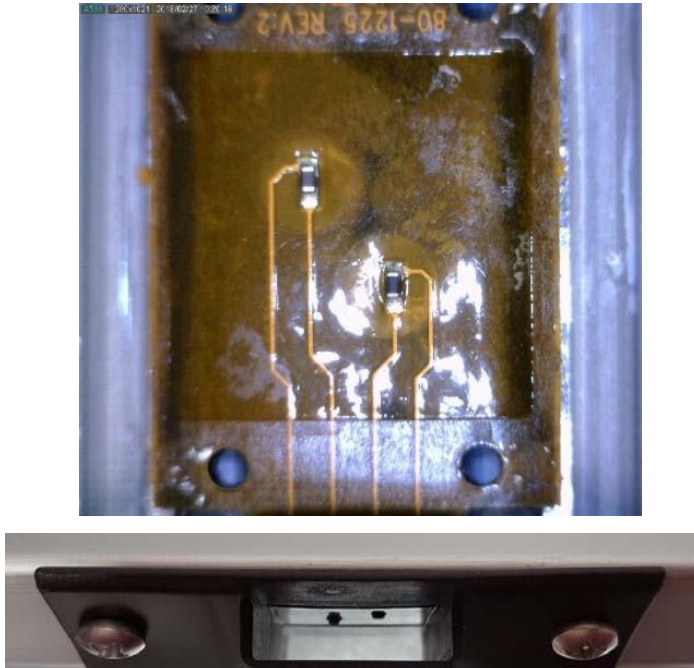
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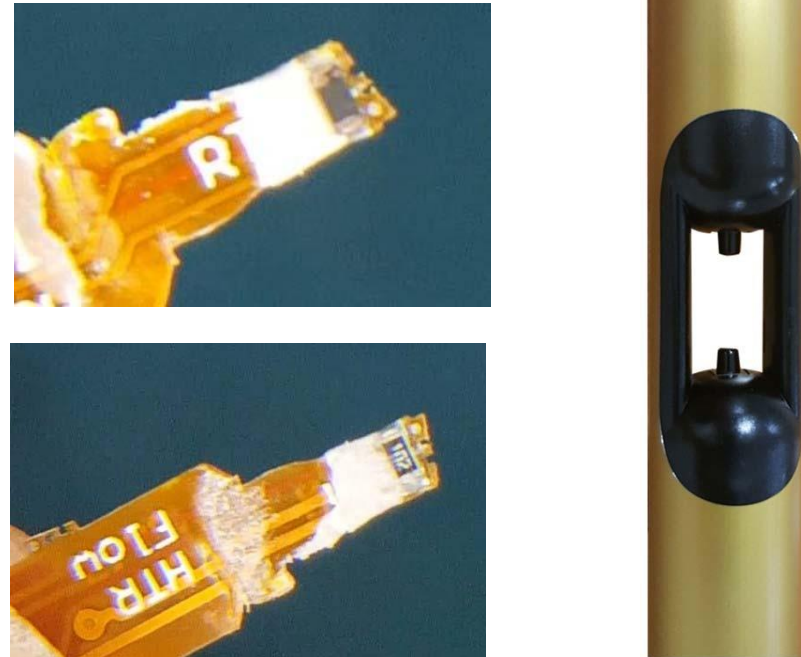
Competitors Use Chip Thermistors

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)




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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 Highway 101
Long Beach, CA 90801

The calibration was performed using the NIST LDA (Laser Doppler Anemometer) at the NIST Calibration Services Laboratory. The NIST LDA is a primary standard for air speed measurement. The instrument under test was calibrated against the NIST LDA. The calibration results are shown in Table 1. The expanded uncertainty values for the air speed ratio (V_{NIST}/V_{INST}) are shown in Table 1. 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.

DOCUMENTED ACCURACY

16.32	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

EBTRON®

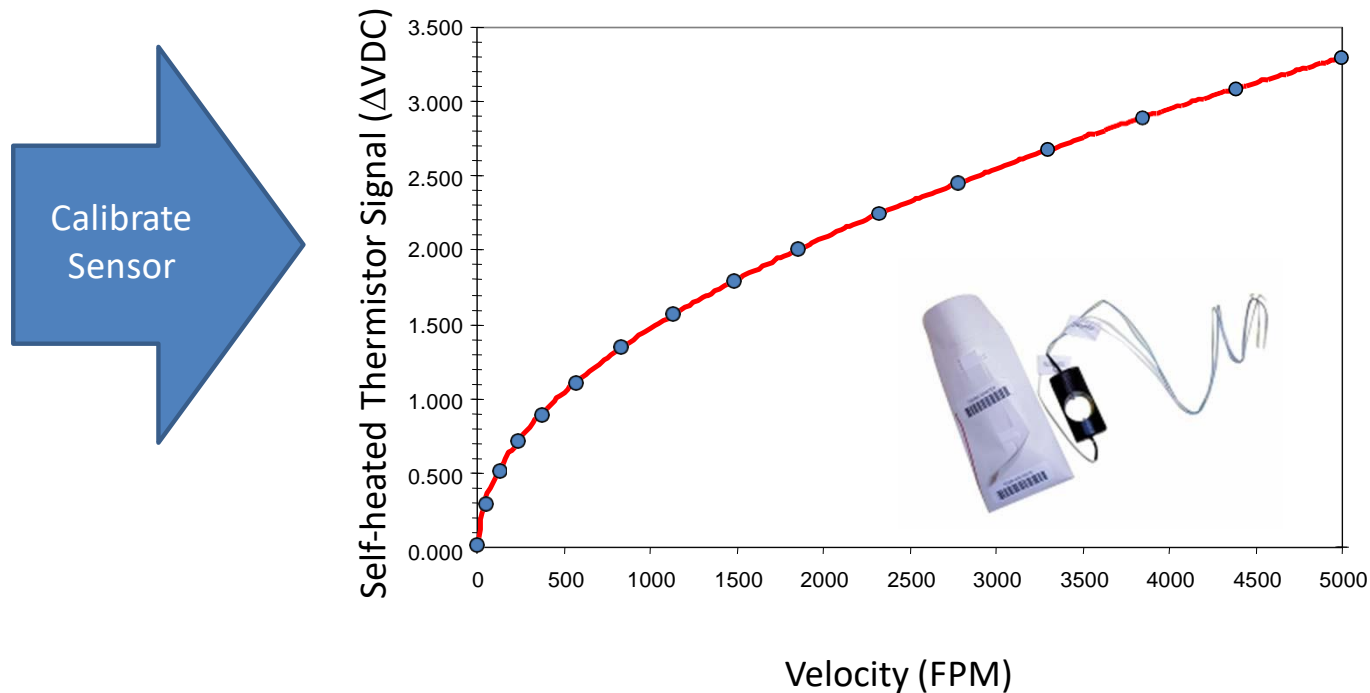
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Transfer
NIST
Calibration



Multi-flow Calibration of Individual Sensor Nodes



Documented Accuracy

Each sensor node shall be installed and calibrated at 16 points to NIST traceable airflow standards and the average error shall be less than 0.2% over the entire operating range.



%-of-reading MEASUREMENT

Run Number	Tunnel	Flow (ft ³ /min)	Flow (m ³ /min)	Flow (L/min)	Flow (m ³ /hr)
1	1	33.0	447.9	-5.1	-1.1%
2	1	577.7	575.0	-2.7	-0.5%
3	1	740.8	737.9	-2.9	-0.4%
4	1	943.7	940.3	-3.4	-0.4%
5	1	1153.8	1165.3	11.5	1.0%
6	1	1414.6	1402.5	-12.1	-0.9%
7	1	1678.6	1687.9	9.3	0.6%
8	1	2024.9	2008.1	-16.8	-0.8%
9	1	2409.4	2399.5	-9.9	-0.4%
10	1	3342.6	3340.5	-2.1	-0.1%
11	1	4941.2	4923.3	-17.9	-0.4%
Avg. Error >				-0.2%	



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Competitors AMCA “Certify”

NIST TRACEABLE

- Internationally accepted test standards administered by metrology specialists with no in

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

- Airflow measurement third-party NIST traceable labs are not acceptable. Devices claiming AMCA certification are not acceptable. can be

- Report is created and provided by NIST.
- EBTRON calibrates each sensor node so performance of product is assured unit to unit.

AMCA CERTIFIED

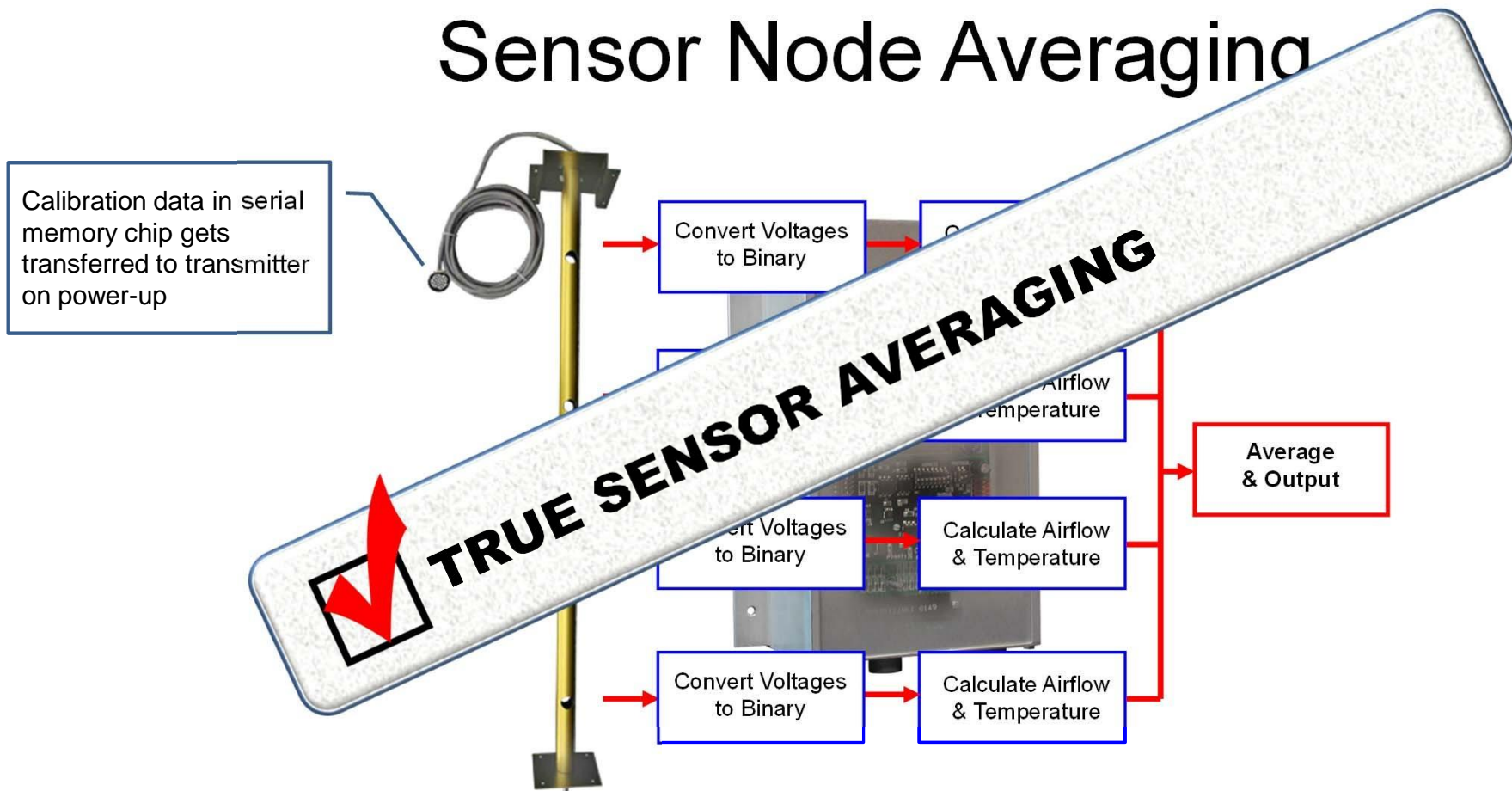
- Industry organization that has member companies developing test standards product as long as test tunnel is certified.
- A single product can be calibrated and tested to satisfy AMCA requirements (false performance).
- The AMCA tested unit may not actually represent the product sold.



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Sensor Node Averaging



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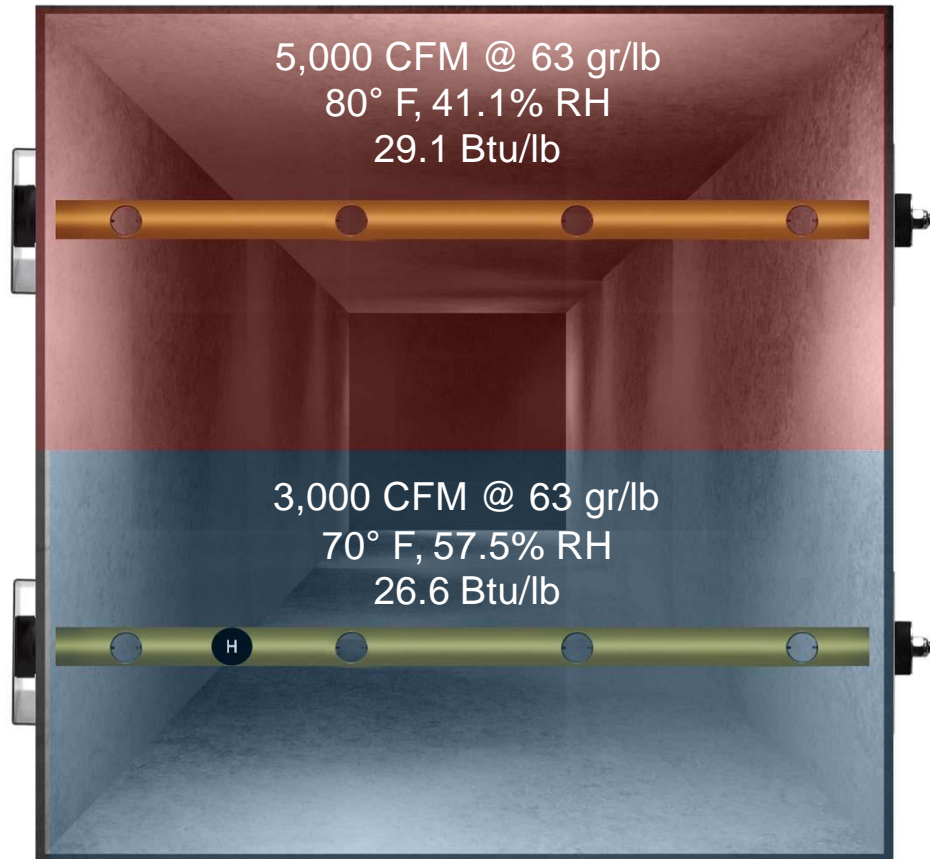
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Velocity-weighted Measurements

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

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Sensor Node Ruggedness



Testing of Exposed Sensors

TESTING SUMMARY FOR

Thermistors shall be potted in an engineering thermally conductive epoxy and shall not be damaged by moisture or exposure to atmospheric acids. Provide a copy of test results report to verify compliance with this requirement.

SCIENTIFIC SOLUTIONS

RELIABLE RESULTS

IDEAS TO INNOVATE



SALTWATER & CHEMICAL RESISTANT

		75.4°F		30 Days (71.0°F)		ΔVALUE		SERIAL NUMBERS	
PURPOSE	IDCJ	T (VDC)	H (VDC)	T (VDC)	ΔH (VDC)	ΔT (VDC)	H	T	
	123	3.851	6.862	3.746	+0.219	-0.105	11333850	21219579	
	160	3.905	6.775	3.860	+0.215	-0.103	11333851	21219580	
	170	3.790	7.104	3.680	+0.234	-0.110	11333852	21219581	
	199	3.656	6.721	3.541	+0.222	-0.115	11333853	21219582	
	189	3.727	7.221	3.621	+0.220	-0.115	11333854	21219583	
	125	3.754	7.160	3.639	+0.234	-0.115	11333845	21219574	
	138	3.610	6.733	3.485	+0.195	-0.125	11333846	21219575	
	8	6.872	3.810	7.109	3.698	+0.237	-0.112	11333847	21219576
	9	6.762	3.800	6.901	3.668	+0.189	-0.112	11333848	21219577
10	6.750	3.746	6.980	3.632	+0.230	-0.114	11333849	21219578	

2470 METRO BOULEVARD | HARTLAND HEIGHTS, MISSOURI 63043 (P: 314.281.8622) WWW.CHEMIR.COM

VJPR879

96.70	0.98	110.00	+0.09	+13.30	11333860	21219589
95.90	1.02	110.90	+0.10	+15.00	11333858	21219587
104.00	1.03	120.60	+0.11	+16.60	11333861	21219590
110.30	1.04	125.30	+0.05	+15.00	11333856	21219585
93.60	1.12	109.00	+0.13	+15.40	11333864	21219593
95.90	1.08	108.00	+0.10	+12.10	11333859	21219588
96.90	1.03	97.70	+0.10	+10.80	11333857	21219583
92.40	1.03	105.00	+0.11	+12.50	11333863	21219592
96.70	1.30	114.00	+0.14	+16.10	11333862	21219595

Robert Moore

Robert Moore,
Coatings Specialist

S. W. Uffman

Eric W. Uffman, Ph.D for Ben Paulson, M.S.
Senior Technical Specialist

and receive a gift of appreciation.

DESCRIPTION	
1A	Sensors for Salt Test—5 Sensors (PN 610-1665) per Cable 1
	Sensors for Salt Test—5 Sensors (PN 610-1665) per Cable 2
	GTC116 Type "A"
	Sensors (PN 610-1665) for Acid Test
	10 each

Dispose of samples 30 days after the date of this Executive Summary unless instructed otherwise.

os of Exposure setup

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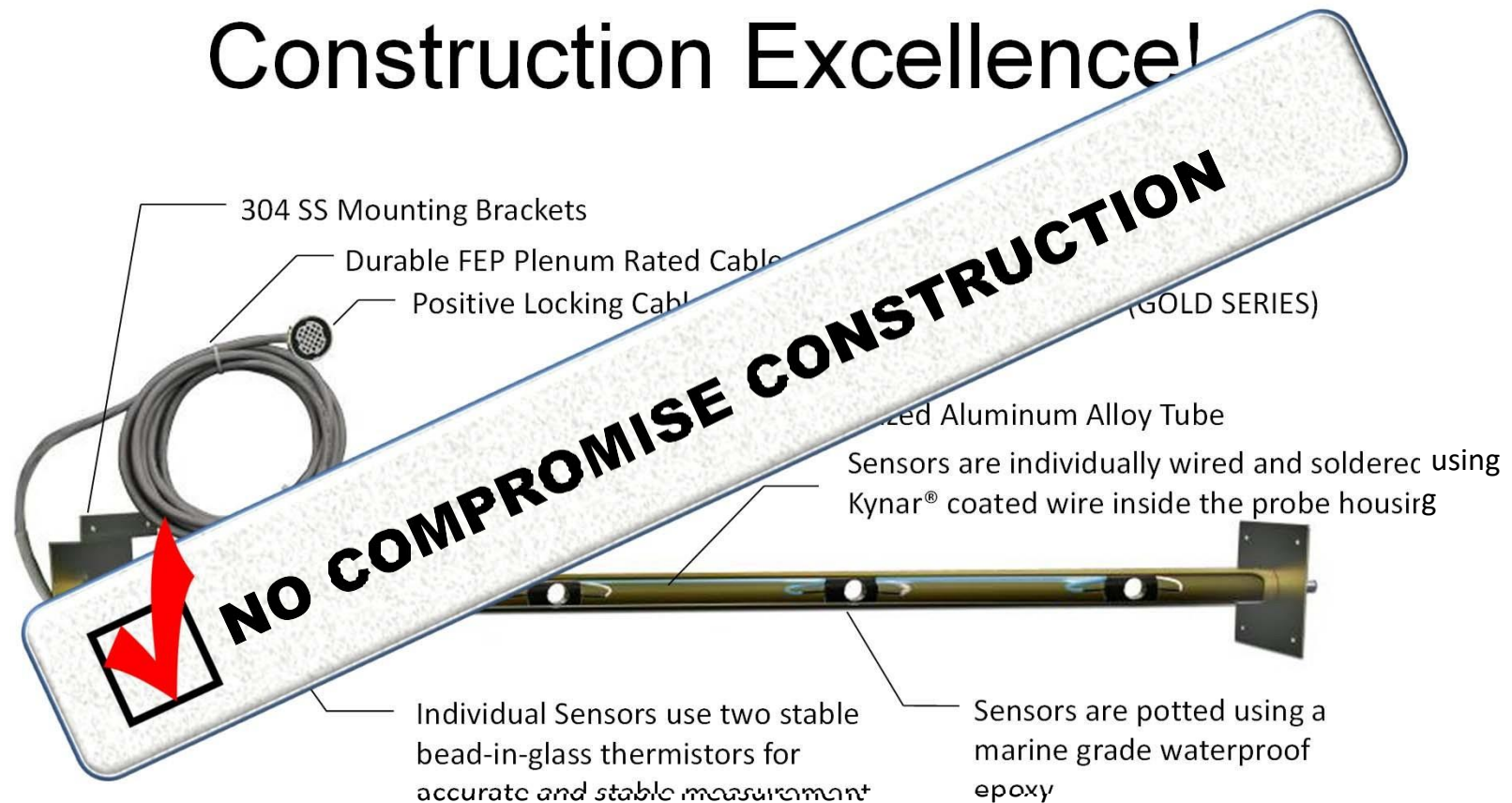
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Salt Water Exposure Test



Construction Excellence



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Warranty and Service



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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!

Hinged cover
replaces slide up
cover.



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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.



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Advantage IV Product Line



FCC-Part 15

Duct Mounted



GTx116e-PC HTx104-PE
GTx116e-P+

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Advantage IV Product Line



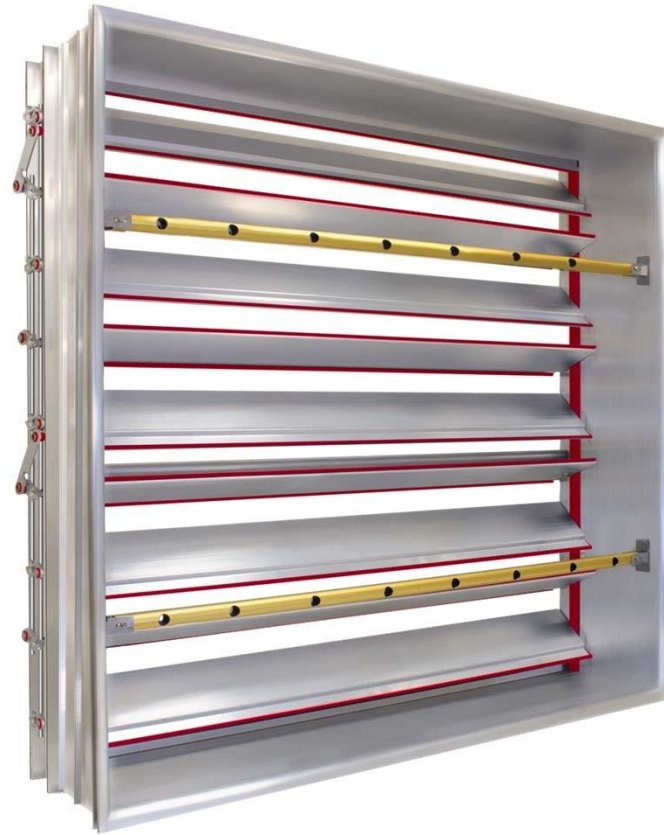
FCC-Part 15

Outdoor Air Intakes



AIR-IQ2

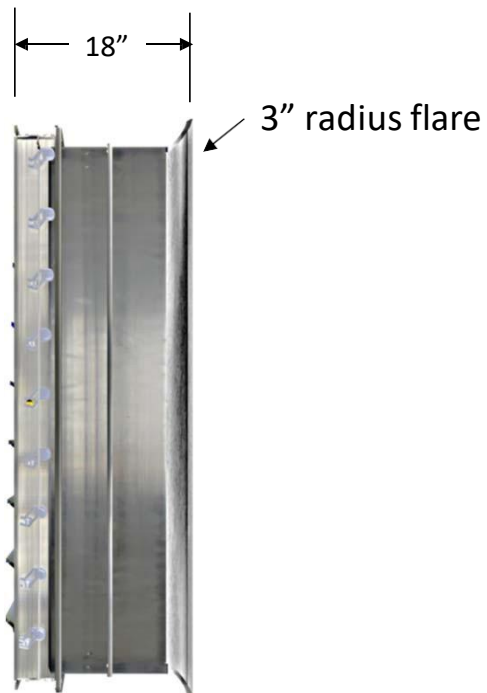
- Designed specifically for outdoor air intakes
- 35% narrower sleeve than AIR-IQ (original)
- 1" radius flare improves measurement performance
- GTx116-P+ with modified log-Tchebycheff sensor placement
- High performance TAMCO damper



TAMCO EBTRON

AIR-IQ AIR FLOW MEASUREMENT SOLUTION

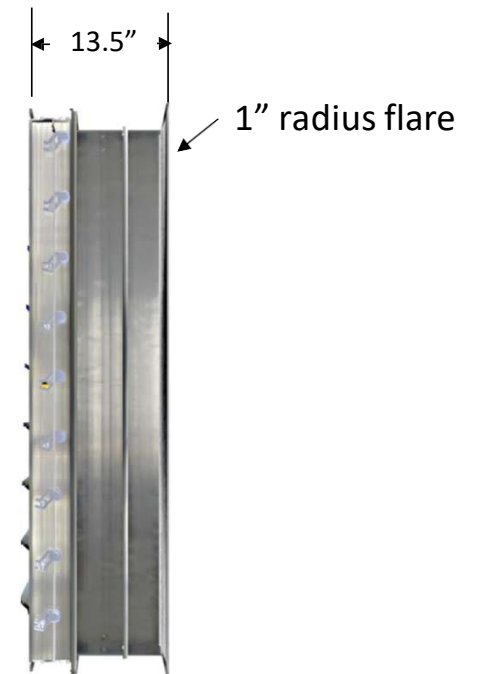
AIR-IQ



AIR-IQ
Damper/AMD Combo



AIR-IQ2



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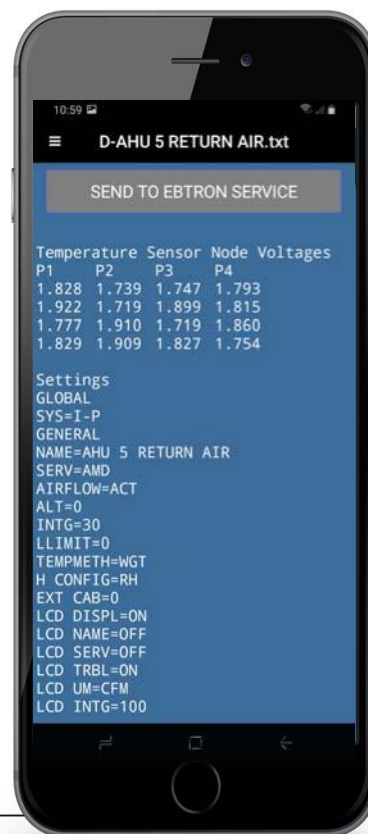


A4-Gold Series *EB-Link*

Standard with all GOLD SERIES -P measuring devices!



Disable field
adjustment
on screen



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EB-Flow2 Product Line



FCC-Part 15

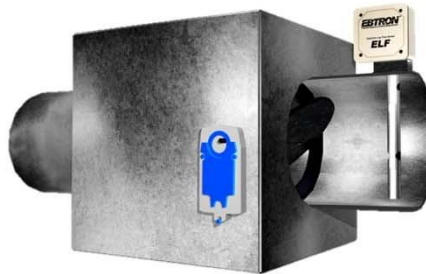
Application Specific



EF-x2000-U



EF-x2000-T
EF-x1000-T
ELF



EF-x2000-U

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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.



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Advantage IV Product Line



FCC-Part 15

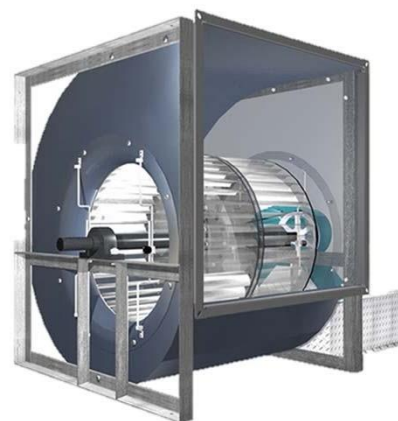
SWSI DWDI Fans



GTx108e-F
/SI & /DI



HTx104-F
/SI & /DI



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Advantage IV Product Line

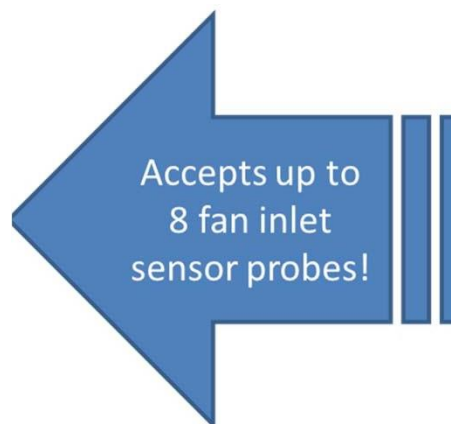


FCC-Part 15

Fan Arrays



GTx108e-F/An



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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



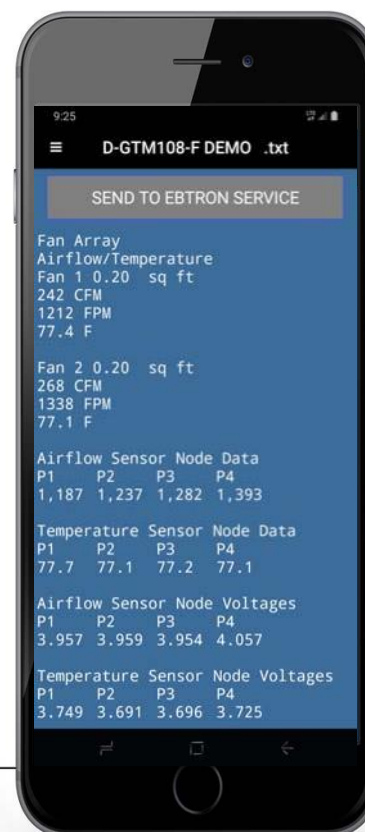
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A4-Gold Series *EB-Link*

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 door¹.
- ✓ 5% typical counting accuracy on interior, operable doors up to 42 inches wide¹

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?

Contact Technical Air Systems, Inc.

NY/NJ EBTRON Representative

pscheele@technicalair.com

NY: 212-946-4935

NJ: 973-285-0333

The EBTRON logo features the word "EBTRON" in a bold, red, italicized sans-serif font. A registered trademark symbol (®) is located at the top right of the word.

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