AD-1252 Thermal Dispersion Probe Airflow Measuring System

Product Bulletin

Code No. LIT-12011535
Issued July 25, 2016

AD-1252 Thermal Dispersion Probe Airflow Measuring System averages velocity and temperature from up to four probes and sixteen sensing points in a duct or plenum, providing accurate, dependable airflow measurement from 40 to 4,000 Feet Per Minute (FPM) (12 to 1,219 Meters Per Minute [MPM]) within ±2% accuracy.

At each sensing point, a microprocessor calculates flow and temperature, sending this information to an Integral Multiplexing Unit (IMU). The IMU collects data from each sensor circuit and sends a digital output to the control transmitter. The control transmitter provides air velocity and temperature information on an LCD screen and to a Building Automation System (BAS) through analog outputs (2 to 10 VDC or 4 to 20 mA).

The factory-assembled AD-1252 Thermal Dispersion Probe Airflow Measuring System incorporates up to four thermal dispersion probes, a shielded CAT5e communications cable and a DMPR-RA002 Electronic Controller.



Figure 1: AD-1252 Thermal Dispersion Probe Airflow Measuring System

Table 1: Features and Benefits

Features	Benefits
Airfoil-Shaped Aluminum Probes	Reduce noise and pressure drop to almost negligible levels and provide longer service life.
Digital Controller Display	Provides visual readout of flow, temperature, and diagnostics.
CAT5e Cable with RJ-45 Connectors	Reduces installation and commissioning time.
Multiple Microprocessor-Based Circuits	Allow independent sensor readings or single calculated average.
LCD Screen	Shows Cubic Feet Per Minute (CFM) or velocity and temperature.
4 to 20 mA or 2 to 10 VDC Analog Outputs	Allow communication with any Building Automation System.
Wind Gust Filter	Provides consistent readings in outdoor air applications compensating for occasional high wind gusts.
NIST Traceable Calibration	Allows accurate, repeatable measurement from zero to maximum airflow using Johnson Controls® thermal dispersion measurement technology.

Application

The AD-1252 Thermal Dispersion Probe Airflow Measuring System meets the requirements for minimum outside air according to several agency specifications:

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62.1, 62.2 and ASHRAE 90.1
- California Title 24
- International Mechanical Code (IMC)
- International Energy Conservation Code (IECC)

The AD-1252 Thermal Dispersion Probe Airflow Measuring System contributes to earning required Indoor Environmental Quality (EQ) and Energy and Atmosphere (EA) credits for U.S. Green Building Council™ Leadership in Energy and Environmental Design (LEED) prerequisites for construction and operation.

Operation

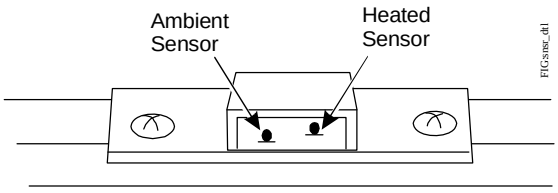


Figure 2: Typical Sensing Point

The AD-1252 probe uses thermal dispersion technology to measure the airflow in the most demanding applications.

The mathematical relationship between heat transfer rate and airflow velocity makes it possible to accurately measure flow by elevating a thermal temperature sensor as a reference. The heated sensor (a bead-in-glass thermistor) is elevated to a stipulated temperature differential above the reference point. The velocity is calculated using the reference point (ambient), the known heat transfer characteristics of the heated sensor, and the power expenditure necessary to maintain the delta between the heated sensor and the ambient reference sensor.

The airfoil shape of the probe, geometry of the sensor shroud, and placement of the sensors (quantity and location) are all based on results from computational fluid dynamics and extensive lab testing. This unique design provides lower pressure drop and accurate measurement of flow and temperature.

Using the velocity information provided from the probe, the DMPR-RA002 Electronic Controller calculates a Cubic Feet per Minute (CFM) value. This value can then be compared to the design CFM setpoint as determined by the particular mode of operation of the HVAC system. In normal operation, this setpoint corresponds to the minimum outside air ventilation required by the system design to meet ASHRAE Standard 62.1 or 62.2.

Each IMU collects temperature data reported by each sensor, averages the data, and transmits this information to the Electronic Controller, which provides an average from all sensors.

Outputs

LCD screen is 16x2 alphanumeric character display showing actual velocity and temperature in either Inch-Pound (I-P) or International System (SI) units.

The DMPR-RA002 Electronic Controller uses two 4 to 20 mA outputs - one for airflow velocity and one for air temperature - to provide input to a Building Automation System.

The AD-1252 probe provides a linear 4 to 20 mA output signal proportional to the airflow velocity. The DMPR-RA002 Electronic Controller automatically adjusts the airflow calculation based on the current air temperature. The linear output signal for velocity is repeatable and not affected by temperature changes.

The high and low limit is scalable from the menu on the device. For example, the contractor can set the 4 mA value to any airflow velocity between 40 and 4,000 FPM (12 and 1,219 MPM). The 20 mA value can be scaled anywhere between 4,000 and 40 FPM (1,219 and 12 MPM). Once the contractor sets the 4 mA and 20 mA values in the controller, the transmitter displays the coefficients to calculate the CFM and Temperature based on the values selected for 4 to 20 mA output signals.

Sample Specifications

Furnish and install, at locations shown on plans or in accordance with schedules, an electronic thermal dispersion type airflow temperature measuring station.

The station shall be capable of monitoring and reporting the airflow and temperature at each measuring location through one or more measuring probes containing multiple sensor points and a control transmitter that communicates with the BAS.

Probes shall be constructed of an airfoil shaped aluminum extrusion containing the sensor. Each sensor point shall consist of thermistors for temperature and velocity.

Factory calibration of thermal dispersion sensors shall be at 16 airflow rates between 0 and 4,000 FPM using NIST traceable calibration standards.

Probe multiplexer circuits shall include a microprocessor that collects data from each sensing point and digitally communicates the average airflow and temperature of each sensor to the microprocessor-based control transmitter.

Multiplexer board shall be completely encased in electrical potting material to prevent moisture damage.

Shielded CAT5e communications cable shall be straight-through-type Underwriters Laboratories Inc.® (UL) plenum-rated with RJ45 terminal connectors. Dust boot covers and gold-plated contacts shall link probes to electronic controller.

Shielded CAT5e communications cable shall be a minimum of 10 feet (6.1 m) in length and shall be available up to 50 feet (15.2 m) when specified.

Control transmitter shall be capable of processing up to 16 independent sensing points per airflow measuring location and shall operate on a fused 24 VAC supply.

Control transmitter shall feature a 16 x 2 character alphanumeric LCD screen, digital offset/gain adjustment, continuous performing sensor/transmitter diagnostics, and a visual alarm to detect malfunctions. LCD screen shall be field-adjustable to display either I-P or SI units. Transmitter output shall be 4 to 20 mA or 2 to10 V across a 500 ohm resistor. (Resistor not included)

All electronic components of the assembly shall be Restriction of Hazardous Substances (RoHS) Directive compliant.

Standard Materials and Construction

Probe is airfoil shaped 2 x 3/4 in. (51 x 19 mm) 6063T6 extruded aluminum (mill finish).

Mounting brackets are 0.080 in. aluminum (mill finish).

Sensor distribution is equal area.

Thermistor flow hood is UL 94 flame-rated, high-impact Acrylonitrile Butadiene Styrene (ABS) plastic.

Sensor circuit (up to four per probe assembly) is:

- one hermetically sealed, heated bead-in-glass thermistor
- one hermetically sealed, ambient bead-in-glass thermistor
- one microprocessor based multiplexer circuit

Shielded CAT5e communications cable (10 foot standard) is UL plenum-rated with RJ-45 connectors with dust boot cover and gold-plated pins, and digital interface between probe multiplexer and electronic controller.

Control transmitter is microprocessor-based within a 6 x 11-3/8 in. (152 x 289 mm) nominal control enclosure and has seamless plug-and-play connectivity of 1 to 4 thermal dispersion probes.

Control transmitter includes 16 x 2 character LCD screen (airflow, temperature, and diagnostics) and requires a 24 VAC power supply.

Dimensions

See Table 2 for minimum and maximum duct sizes for use with the AD-1252 System.

Table 2: Duct Dimensions

Size Limits	Width x Height, inches (mm)[1]
Minimum	12 x 12 (305 x 305)
Maximum	120 x 120 (3,048 x 3,048)

1. Actual size is 1/4-inch less than nominal.

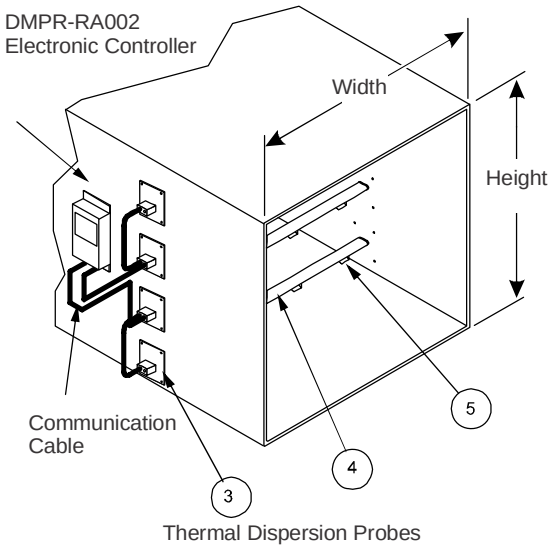


Figure 3: AD-1252 System (Installed View)

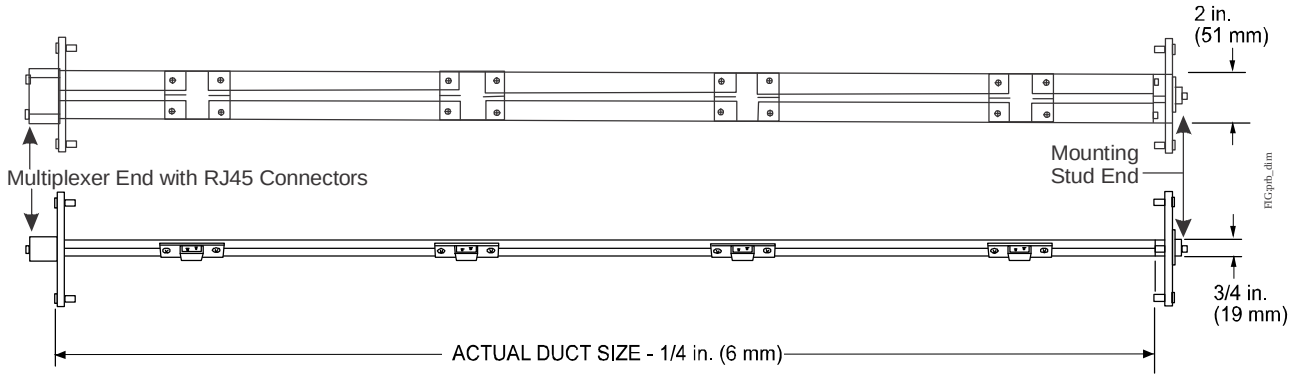


Figure 4: Thermal Dispersion Probe Dimensions, in. (mm)

Square Duct Mounting

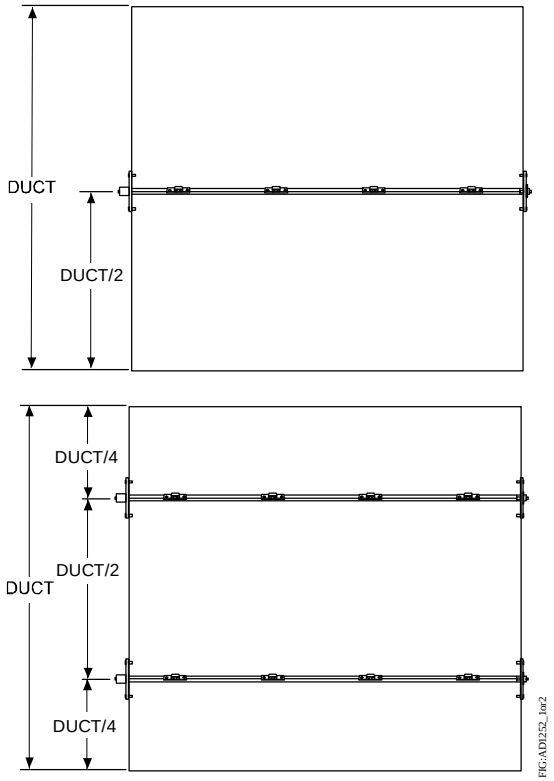


Figure 5: Rectangular Duct Mounting - One and Two Probe Configurations

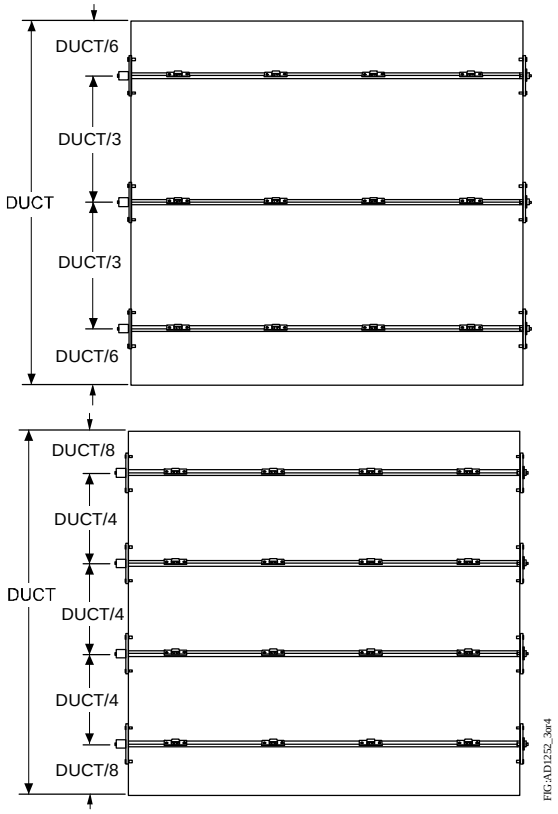


Figure 6: Rectangular Duct Mounting - Three and Four Probe Configurations

Table 3: Number of Probes/Sensors per Probe for Rectangular Duct Applications[1]

Duct Height, in. (mm)	Duct Width, in.														
	12 (305)	18 (457)	24 (610)	30 (762)	36 (914)	42 (1067)	48 (1219)	54 (1372)	60 (1524)	66 (1676)	72 (1829)	84 (2134)	96 (2438)	108 (2743)	120 (3048)
12 (305)	2/2	2/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
18 (457)	2/2	2/2	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
24 (610)	2/2	2/2	2/3	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4
30 (762)	2/2	3/2	3/2	2/3	2/3	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4
36 (914)	2/2	3/2	3/2	3/2	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4
42 (1067)	3/2	3/2	3/2	3/3	4/2	3/4	3/4	3/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
48 (1219)	3/2	3/2	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 (1372)	3/2	3/2	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 (1524)	3/2	3/2	4/3	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 (1676)	3/2	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
72 (1829)	3/2	4/2	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 (2134)	4/2	4/2	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
96 (2438)	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 (2743)	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 (3048)	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

1. The minimum size for rectangular duct applications is 12 x 12 in. (305 x 305 mm). For smaller duct applications, use the RA-1252V.

Round Duct Mounting

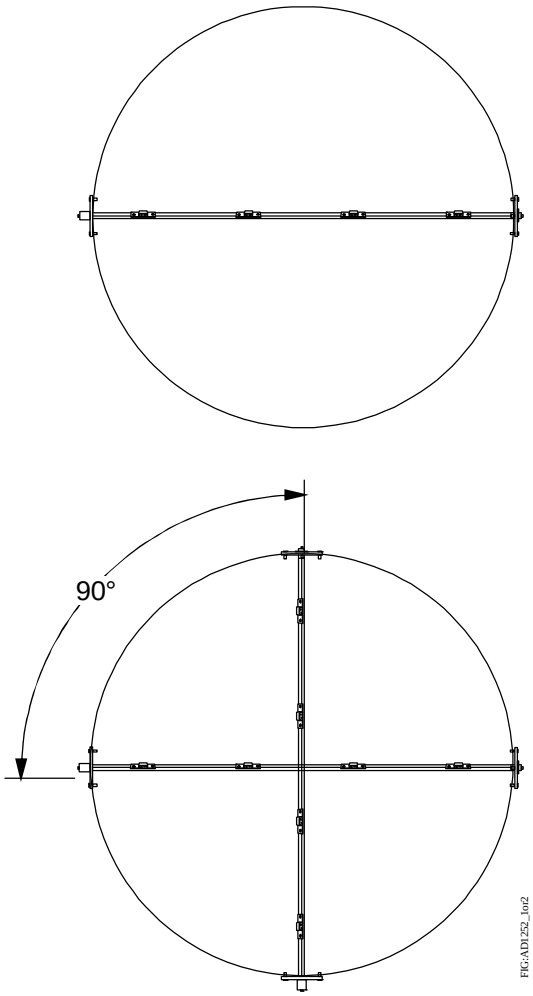


Figure 7: Round Duct Mounting - One or Two Probe Configurations

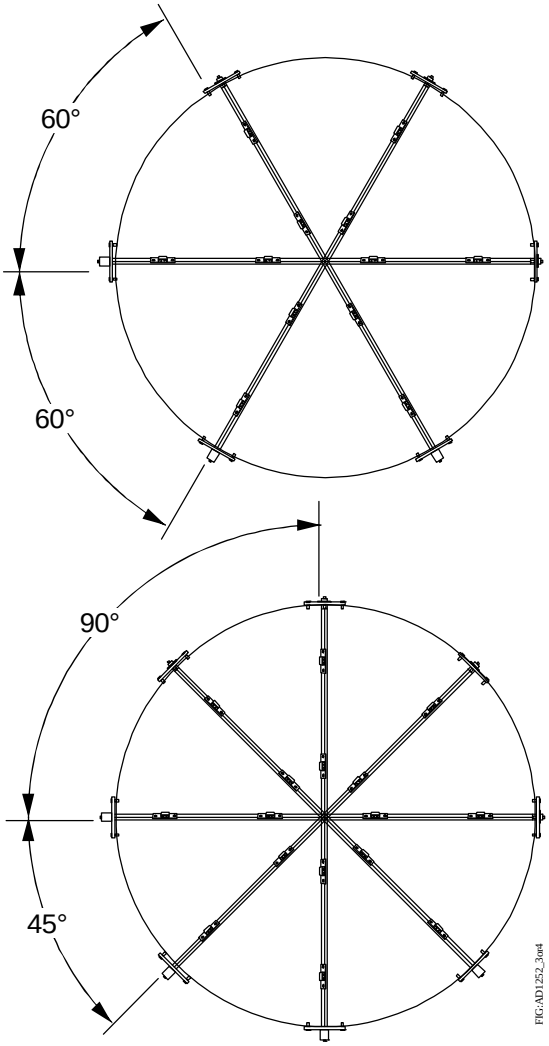


Figure 8: Round Duct Mounting - Three or Four Probe Configurations

Table 4: Round Duct Applications - Number of Probes/Sensors per Probe[1]

Duct Diameter, In.	No. of Probes/No. of Sensors per Probe
12	2/2
18	2/2
24	2/2
36	2/4
42	2/4
48	3/4
60	4/4
72	4/4
96	3/4
120	4/4

1. The minimum diameter size is 12 inches for round duct applications. For smaller duct applications, use RA-1252V.

Selection Information

Use the following to select the product:

1. Determine the required number of air measurement stations from system drawings. Field verify duct size and installation locations. See *Square Duct Mounting* and *Round Duct Mounting* for more information.
2. Select the product code number required.

Table 5: AD-1252 Product Code Numbers

Product Code Number	Description
ASTNN-wwwxhhh	Thermal Dispersion Airflow Measuring System
ARTNN-wwwxhhh	Replacement Probes only - use if the original order size is changed or incorrect

3. Enter width and height of duct, where:

   www = width of duct (sets the length of the probe)

   hhh = height of duct (sets the number of probes)

Note: Actual probe size is 1/4 in. (6 mm) less than nominal.

Enter options required (maximum 2).

Table 6: Factory Options

Letter	Option
C	Clear/Anodized Finish
I	Aluminum Internal Duct Mounting Brackets
J	SS Internal Duct Mounting Brackets
M	Aluminum Damper Stand-off Mounting Bracket
N	NEMA 4 Electronic Controller Enclosure
O	Shielded CAT5e communications cable, 20 ft (6.1 m)
P	Shielded CAT5e communications cable, 30 ft (9.1 m)
Q	Shielded CAT5e communications cable, 40 ft (12.2 m)
R	Shielded CAT5e communications cable, 50 ft (15.2 m)
S	SS Damper Stand-off Mounting Bracket
V	Round or Oval Duct (provides additional closed cell foam material to form a seal around the duct)

Example 1: ASTNN-020x020 is a thermal dispersion probe airflow measuring system with two standard (insertion-mounted) probes (see Figure 9), Shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.



Figure 9: Probe with Standard Insertion Mounting Hardware

Example 2: ASTNN-020x020V is a thermal dispersion probe airflow measuring system with additional closed cell foam material to form a seal around the duct, two probes fitted with Shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.



Figure 10: Probe with Damper Stand-off Mounting Bracket

Example 3: ASTNN-020x020I is a thermal dispersion probe airflow measuring system with two probes fitted with mounting hardware for inside-duct mounting (see Figure 11), Shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.



Figure 11: Probe with Internal Mounting Bracket

Example 4: ASTNN-020x020N is a thermal dispersion probe airflow measuring system with two standard (insertion-mounted) probes with NEMA 4 enclosures on the multiplexer ends (see Figure 12), Shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.

Note: Box provided may appear different than the example below.



Figure 12: Electronic Controller with NEMA 4 Enclosure

Maintenance

Johnson Controls AD-1252 Airflow Measuring Systems have no components that require routine scheduled maintenance.

Wiring

Whenever possible, use a transformer for each AD-1252 System. If you use a transformers for multiple AD-1252 Systems, ensure that the transformer is rated with sufficient capacity for the total load of the connected probes, sensors, and other devices.

Errors in the load calculations can lead to problems. Wiring multiple low-voltage devices from a common transformer can result in lower-than-expected voltage at the device and higher-than-expected current draw when devices are connected a great distance from the power source.

Transformers for the DMPR-RA002 are not required to be isolated from other devices. Isolation is only required to prevent electrical fluctuations due to intermittent high loads from causing problems with electronic devices.

Return Policy

All Johnson Controls AD-1252 Thermal Dispersion Probe Airflow Measuring Systems are built to order, just in time, and cannot be returned due to customer ordering errors. All AD-1252 System products are backed by a 3-year warranty, which covers defects in materials or workmanship. Refer to terms and conditions of sale for specifics.

Accessories

Table 7: Accessories

Code Number	Description
DMPR-KA001	Aluminum Damper Stand-off Mounting Brackets (2)
DMPR-KA002	SS Damper Stand-off Mounting Brackets (2)
DMPR-RA021	Shielded CAT5e communications cable, 10 ft (1.5 m)
DMPR-RA022	Shielded CAT5e communications cable, 20 ft (3.1 m)
DMPR-RA023	Shielded CAT5e communications cable, 30 ft (9.1 m)
DMPR-RA024	Shielded CAT5e communications cable, 40 ft (12.2 m)
DMPR-RA025	Shielded CAT5e communications cable, 50 ft (15.2 m)
DMPR-RA026	Shielded CAT5e communications cable, 15 ft (4.6 m)
DMPR-RA027	Shielded CAT5e communications cable, 25 ft (7.6 m)

Table 8: Repair Parts

Code Number	Description
DMPR-RA00-www	Single Replacement Probe Under Warranty
DMPR-RA002	AD-1252 Replacement Controller (Not for use on a RA-1250 product)

Technical Specifications

AD-1252 Thermal Dispersion Probe Airflow Measuring System

Probe	Airfoil shaped 2 x 3/4 in. 6063T6 aluminum
Thermistor	Bead-in-glass type
Size Range	12 x 12 in. to 120 x 120 in.
Brackets	0.080 Aluminum
Sensor Accuracy	±2% of reading
Repeatability	±0.25%
Measurement Units	Inch-Pound (I.P.) or International System (S.I.)
Sensor Distribution	Equal Area
Calibrated Range	40 to 4,000 FPM (12 to 1,219 MPM)
Temperature Sensor Accuracy	±0.10º F
Sensor Temperature Range	-25 to 140°F (-32 to 60°C)
Humidity Range	0 to 99% RH, noncondensing
Maximum Number Sensors	16
Power Requirement	24 VAC transformer of appropriate VA rating is required.
Power Consumption	4 probes with 4 sensors: 65 VA; 3 probes with 4 sensors: 48 VA; 2 probes with 4 sensors: 35 VA; 1 probe with 4 sensors: 17 VA
Transmitter Chassis	0.080 Aluminum
Output Signals	4 to 20 mA standard, 2 to 10 VDC requires 499 ohm resistor across output terminals.
Output Signal Adjustments	Field adjustable offset/gain
Display	16x2 character LCD (airflow, temperature and diagnostics)
Velocity Requirements	Minimum 40 FPM (12 MPM) Maximum 4,000 FPM (1,219 MPM)
Approximate Weight	Controller: 2.9 lb (1.32 kg) Sensor: 1 lb (0.45 kg)

Measuring stations are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Air flow Station Performance.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

United States Emissions Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is may cause harmful interference, in which case the users will be required to correct the interference at their own expense.

Canadian Emissions Compliance

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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