RUSKIN

Air Quality Solutions

Installation and Maintenance Manual

Model: AMS050

Airflow Measuring Station with Integral Control Damper

Differential Pressure Technology

Table of Contents

WARNING:
This unit is to be installed by a qualified service technician to avoid unsatisfactory operation or damage to the product and possible unsafe conditions. The installation instructions provided with this accessory must be strictly followed and the parts supplied used without substitution. Damage to the product resulting from not following the instructions, water damage or application of the incorrect voltage applied to the wrong points may be excluded from the manufacturer's warranty coverage.

WARNING:
Disconnect electrical power prior to servicing this unit. Failuer to do so can result in electrical shock resulting in personal injury or death.

AMS050
Airflow Measuring Station with Integral Control Damper
Installation Instructions

Refer to the Ruskin.com website for the most up-to-date version of this document.

PRODUCT APPLICATION

The airflow measuring station model AMS050 is designed to be used in any application that requires airflow monitoring at velocities between 300 FPM and 5000 FPM (1.5 m/s and 25 m/s). Unit may be installed in the duct or on air handling units and can be used to measure and control outside air, return air, discharge air, or supply air.

KEY FEATURES

- Licensed to bear the AMCA Certified Ratings Seal for Airflow Measurement Station Performance.
- Assembly meets AMCA Class 1a leakage requirement of 3 cfm per sq. ft. at 1" water gage.
- Factory assembled airflow measuring station and ultra-low leak damper provides effective setpoint monitoring and adjustment with tight shut-off for unoccupied hours.
- Combines Ruskin's exclusive anodized aluminum sensing blades with a 3" (76mm) deep 3000 series aluminum honeycomb air straightener to optimize performance and offer repeatable and accurate results.
- Output signal – See Transducer Documentation.

KEY BENEFITS

- Contributes to earning required Indoor Environmental Quality (EQ) and Energy and Atmosphere (EA) LEED prerequisites.
- Save energy dollars by measuring the minimum ventilation airflow to within +/- 5% or better.
- Control the amount of unconditioned air into the space.
- Meet international Building Code (IBC) and International Energy Conservation Code (IECC requirements)
- Maintain Proper "Minimum Ventilation Rates" per ASHRAE 62.1 to ensure a healthy indoor environment in occupied spaces and to dissipate dangerous indoor contaminants such as mold spores, viruses, bacteria and chemicals.
- Create a healthy indoor environment to reduce absenteeism, increase productivity, improve comfort and reduce the risk of litigation.

Ruskin Company certifies that the AMS050 Airflow Monitoring Station shown herein is licensed to bear the AMCA Certified Rating Seal – airflow Measuring Station Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 611 and comply with requirements of the AMCA Certified Rating Program. The AMCA Certified Ratings Seal applies to airflow measurement performance only.

PRODUCT INSPECTION

Unpacking and installing the AMS050 Airflow Measuring Station.

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's delivery receipt. A separate request for inspection by the carrier's agent should be made in writing.

Remove the AMS050 unit from its shipping container and immediately inspect for content, rust, corrosion, and further damage. Care must be taken in handling the unit. Always handle the AMS050 unit by its frame/casing. Do not lift unit by the damper blades, airflow measuring probes, jackshaft, or actuator (if applicable). Do not drop, drag, step on or apply excessive bending, twisting, or racking loads to the assembly. Improper handling or storage prior to installation of the unit will have adverse effects on the operation & performance of the unit and could result in cancellation of the warranty.

Inspect the adjacent ductwork and/or the opening where the AMS050 unit will be installed for any obstructions or irregularities that might interfere with the probes, damper blades, or actuator (if applicable). When mounted to adjoining ductwork, the ductwork should be supported in the area of the AMS050 unit to prevent sagging and to ensure proper functionality of the unit. The AMS050 must be installed with the frame square and without twisting or bending. Unless specifically designed for a vertical blade application, the unit must be mounted with its damper blade axis in the horizontal plane. The damper blades, axles and linkage must be able to operate freely without binding.

The best location for the extended shaft or jackshaft must be determined before installing the damper. After the damper is installed the shaft location cannot be changed without removing the damper. The jackshaft, when included, will always be downstream of the damper.

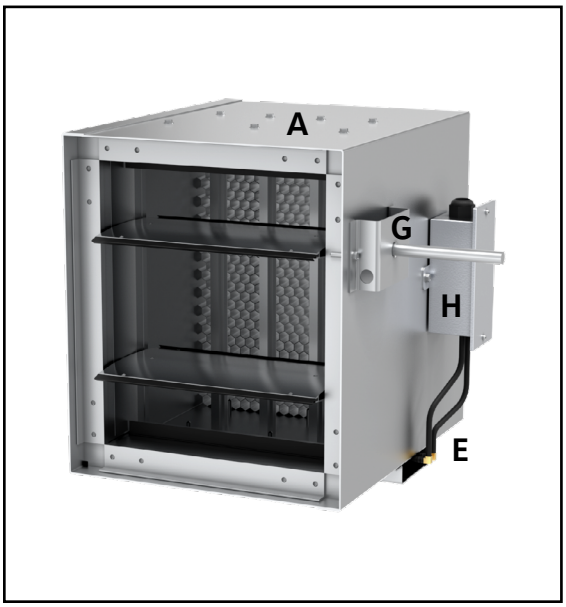
The AMS050 has a specific airflow inlet and outlet and must be installed in the correct orientation. **The airflow enters through the airflow straightener and exits the unit from the damper frame side.**

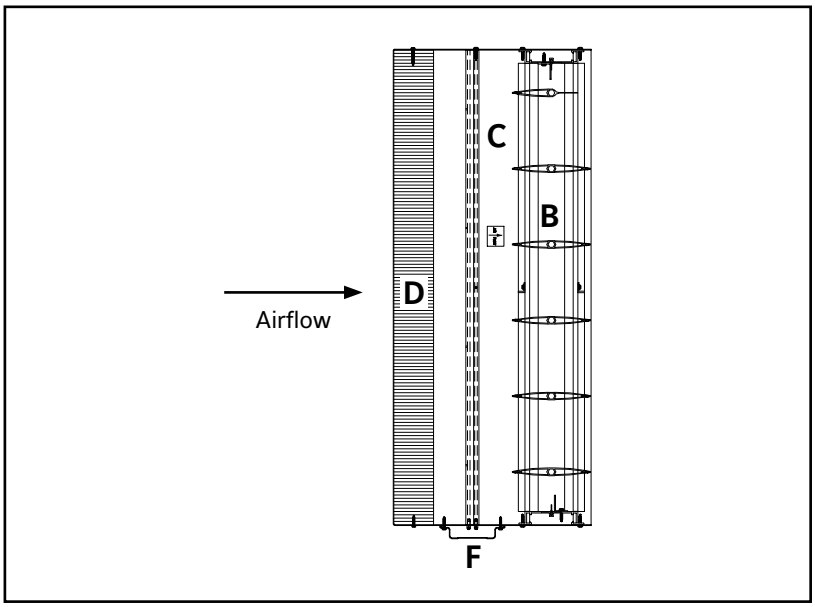
IMPORTANT: Prior to installation, inspect the assembly to ensure that caulk is present between the damper frame and the adjacent casing/sleeve on all four sides of the damper. Caulking around the damper frame is required on either the upstream or downstream side of the damper to ensure low leakage performance of the assembly. Also ensure that the exterior longitudinal seams of the casing/sleeve are caulked to prevent airflow from passing into or out of the assembly, thereby affecting performance. Caulking around the perimeter of the damper frame and caulking the exterior longitudinal casing/sleeve seams are completed at the plant prior to shipment. If, after inspection, the caulking is incomplete or otherwise not satisfactory, the assemblies should be caulked in the field prior to installation.

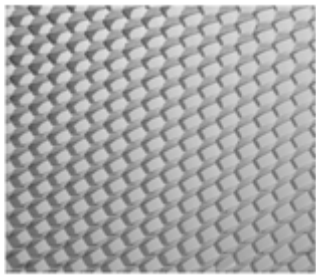
After installing the unit in the ductwork or opening, caulk around the upstream and downstream ductwork connections to ensure that there is no leakage or bypass air around the AMS050 assembly. The AMS050 is supplied with a pressure transducer as standard practice. Refer to the wiring schematic and controls section of this document for necessary field power connections.

Reasonable access must be provided to allow inspection and maintenance of the probes, damper, and actuator (if applicable).

AMS050 PRODUCT COMPONENTS







D – Honeycomb Airflow Straightener (Model AS100)

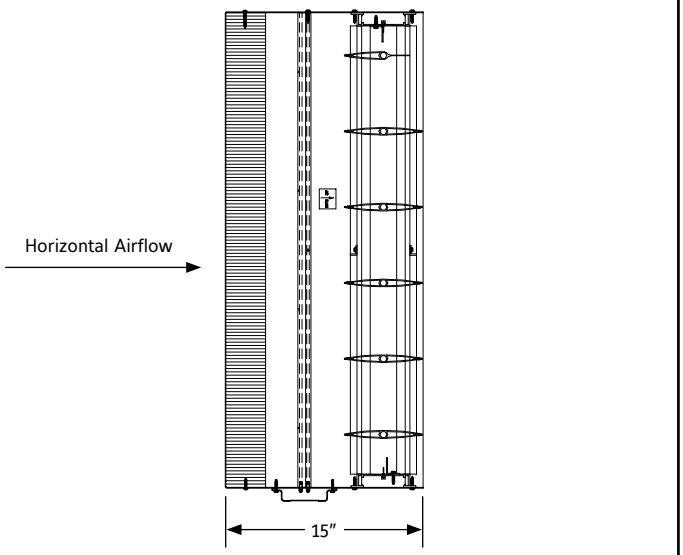
Model AMS050 Components	
I.D.	**Description**
A	Aluminum Sleeve/Casing
B	Extruded Aluminum Control Damper (Model CD50 Standard)
C	Anodized Flow Sensing Probes
D	Honeycomb Airflow Straightener (Standard Feature – Model AS100)
E	High/Low Pressure Tubing
F	Tubing Shield
G	Drive Axle (Jackshafting for Multi-Section Units)
H	Low Pressure Transducer (Several Models Available)

AMS050 CONSTRUCTION DETAILS

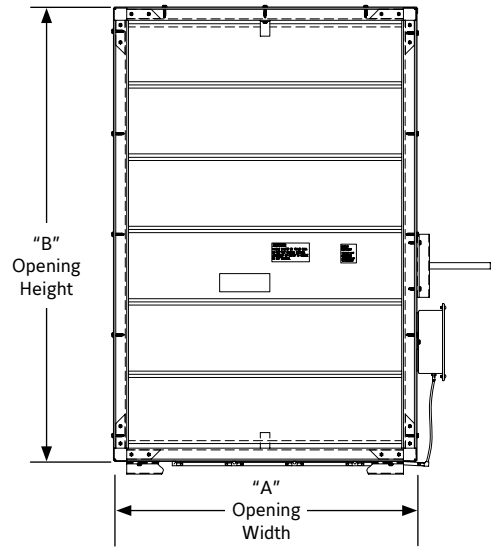
The AMS050 is an airflow measuring device that uses velocity pressure data across a series of sensor blades to determine airflow. The sensor blades are rugged, anodized aluminum extrusion with sensing holes arranged to pick up the Total and Static pressures in the system. Total and Static pressure points are factory piped using high and low pressure tubing to a pressure transducer (transducer is standard feature on all AMS050 units).

There are a number of applications for the AMS050 airflow measuring station.

AMS050 PRODUCT DIMENSIONS / MOUNTING ORIENTATION

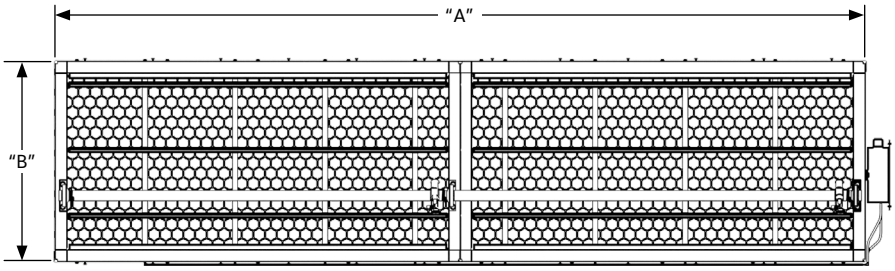


Side View

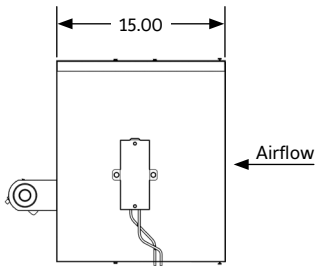


View from Downstream of the Install
(Right Hand Mounting Orientation)

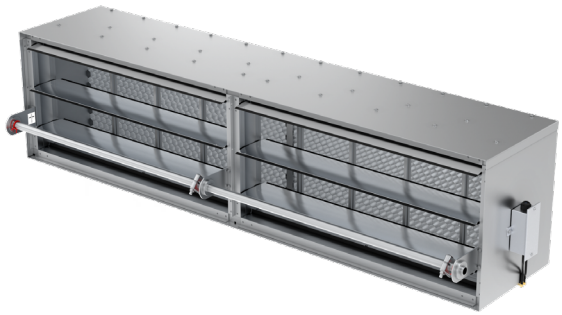
AMS050 PRODUCT DIMENSIONS / MULTI-SECTIONS



Face View



Side View



NOTE:

Maximum Single Section dimensions are 60"x72". Multi-Section assemblies are available to accommodate all installation dimensions.

INSTALLATION

The AMS050 airflow measuring station with integral damper ships from the factory as a single assembly. The assembly may also include an optional factory-supplied and mounted 24VAC modulating actuator, if requested.

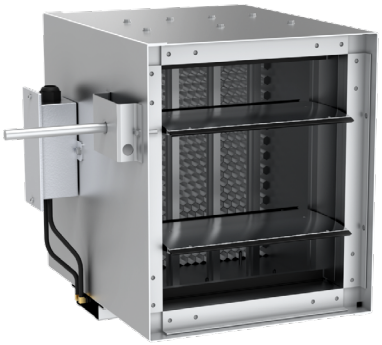
After the assembly has been inspected and is approved for installation, review the installation location and determine the proper orientation of the assembly prior to mounting. The AMS050 must be mounted such that the airflow enters the assembly through the honeycomb airflow straightener and leaves the assembly after passing through the control damper. The assembly comes standard with a sleeved frame/casing but can be customized to include optional mounting flanges on one end or on each end of the assembly, if requested.

Prior to ordering the AMS050, the optimal location for the damper's extended drive axle, the actuator, and the transducer should be determined. The default location for these components is external on the RIGHT HAND side of the assembly (as viewing the unit from downstream of the installation). The option for External LEFT HAND side and Internal are also available for selection when ordering.

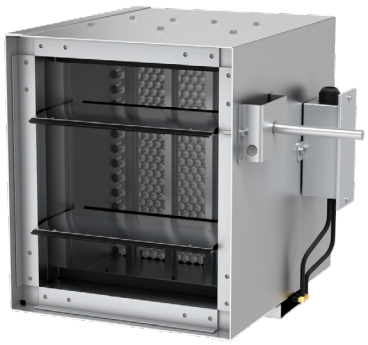
After installing the assembly in the ductwork or opening, caulk around the upstream and downstream ductwork connections to ensure that there is no leakage or bypass air around the AMS050 assembly.

The AMS050 is supplied with a pressure transducer as standard practice. Refer to the wiring schematic of the specific transducer model utilized with your AMS050 assembly for necessary field power connections.

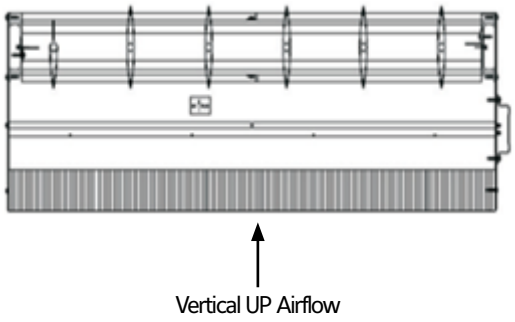
Reference the product placement guidelines in this document for acceptable installation locations relative to obstructions installed nearby in the ductwork.

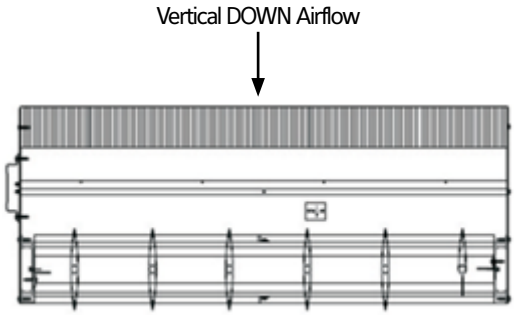


LEFT HAND Mounting Orientation
(View from Downstream of the Install)



RIGHT HAND Mounting Orientation
(View from Downstream of the Install)



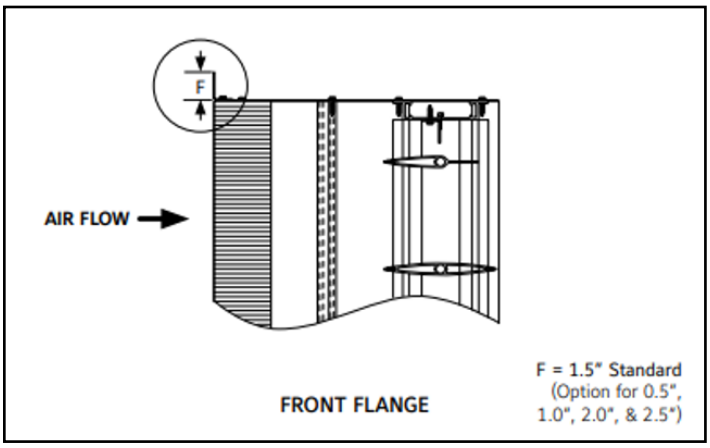


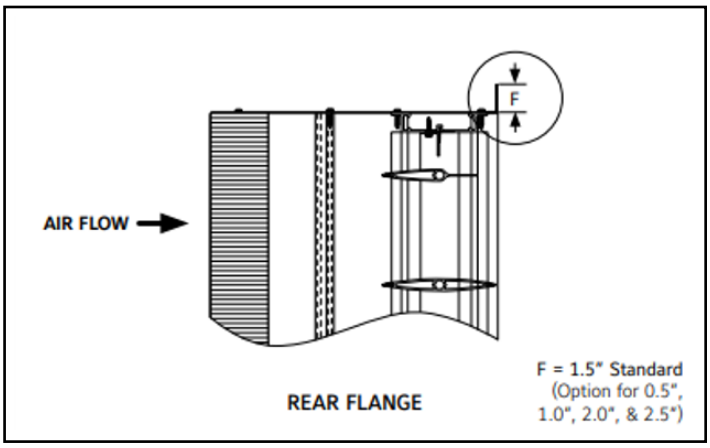
NOTE:

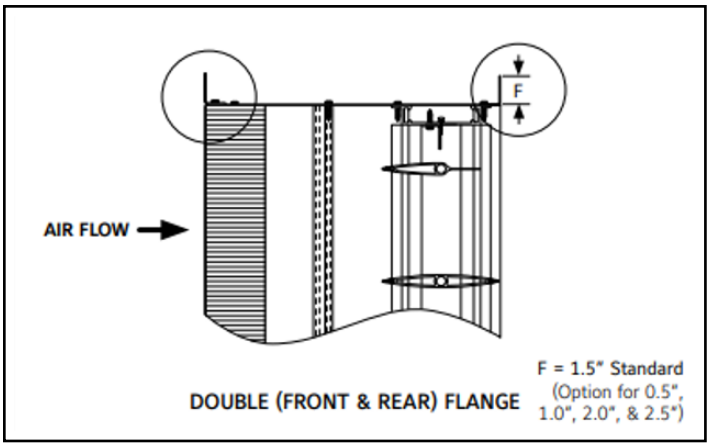
- Mounting orientation is derived from the perspective of viewing the AMS050 unit from downstream of the installation (with airflow hitting you in the face).
- The unit is designed for both horizontal and vertical airflow applications.
- When ordered with transducer (standard), the transducer is piped and mounted to the sleeve as standard. For vertical airflow applications, orient/mount the transducer vertically above the tubing "tap" location (above the tubing shield) or incorporate a J-loop so that any potential condensation/liquid will drain back into the tubing.
- When ordered with a transducer, bring power to the transducer and set up ranges and output type per information provided on the transducer model's product data sheet.

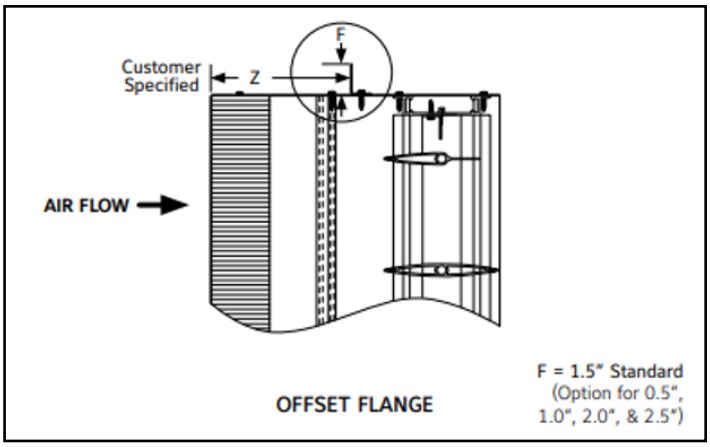
IMPORTANT: Consult Ruskin for installations when the damper blades will be installed vertically. Design modifications may be required.

MOUNTING FLANGE OPTIONS





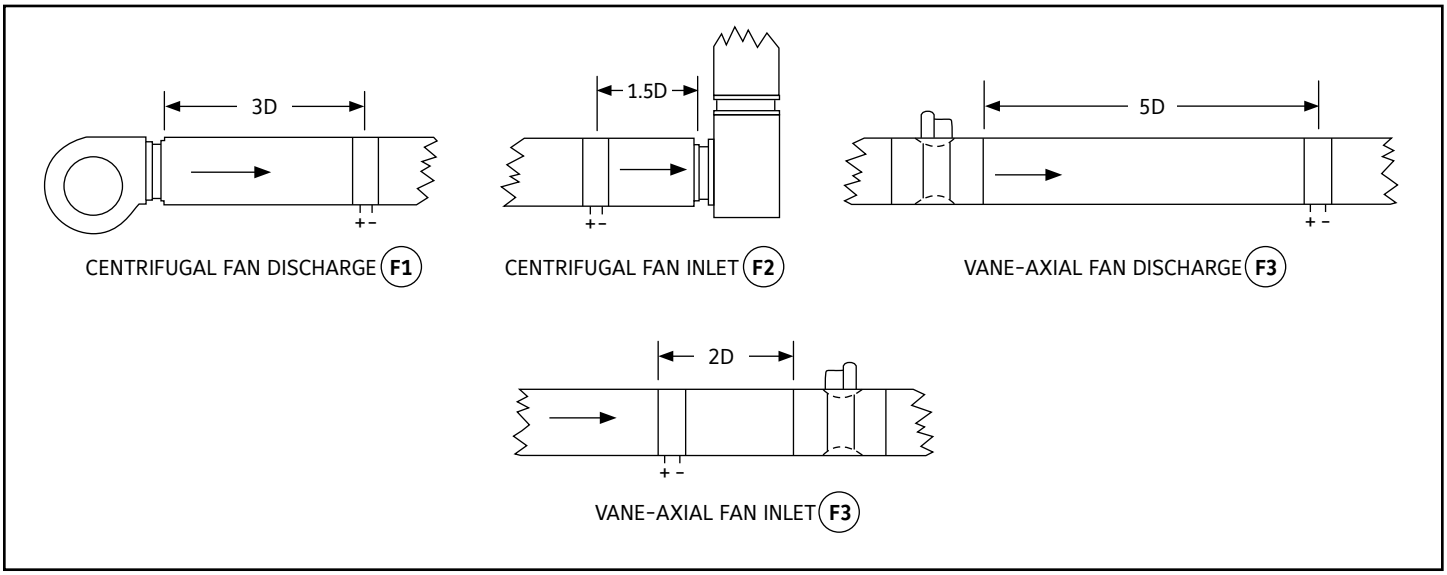




PRODUCT PLACEMENT GUIDELINES

Airflow Measuring Station Placement Guidelines for Acceptable Performance ***(Minimum Spacing Requirements)***
(See Page 12 to Determine Value of Duct Diameter 'D')

FANS



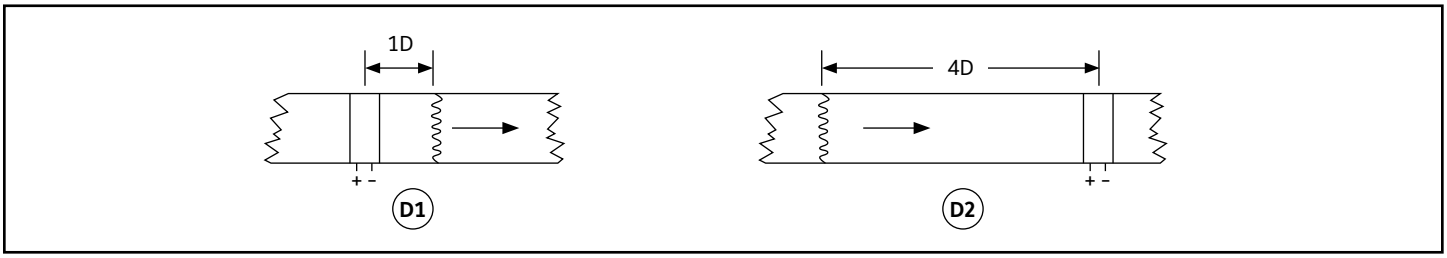
CENTRIFUGAL FAN DISCHARGE (F1)

CENTRIFUGAL FAN INLET (F2)

VANE-AXIAL FAN DISCHARGE (F3)

VANE-AXIAL FAN INLET (F3)

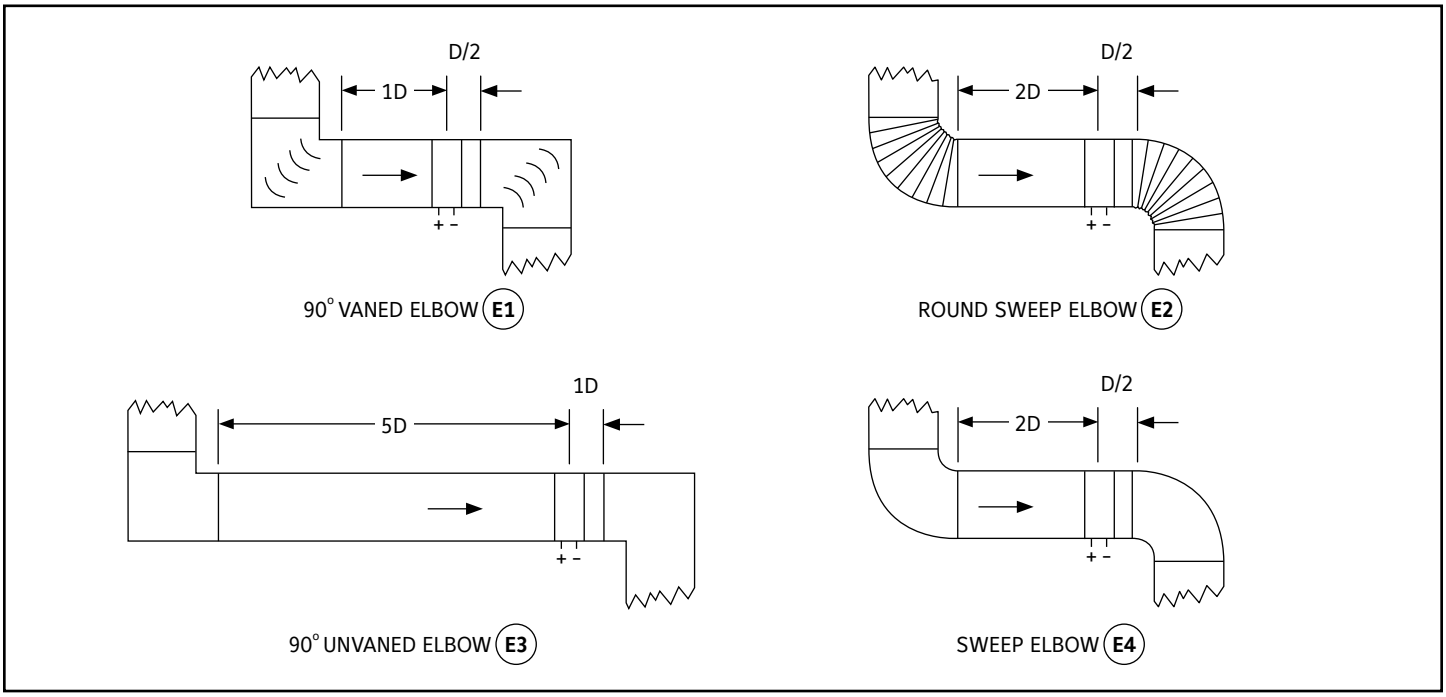
MISC DUCT OBSTRUCTIONS



(D1)

(D2)

ELBOWS



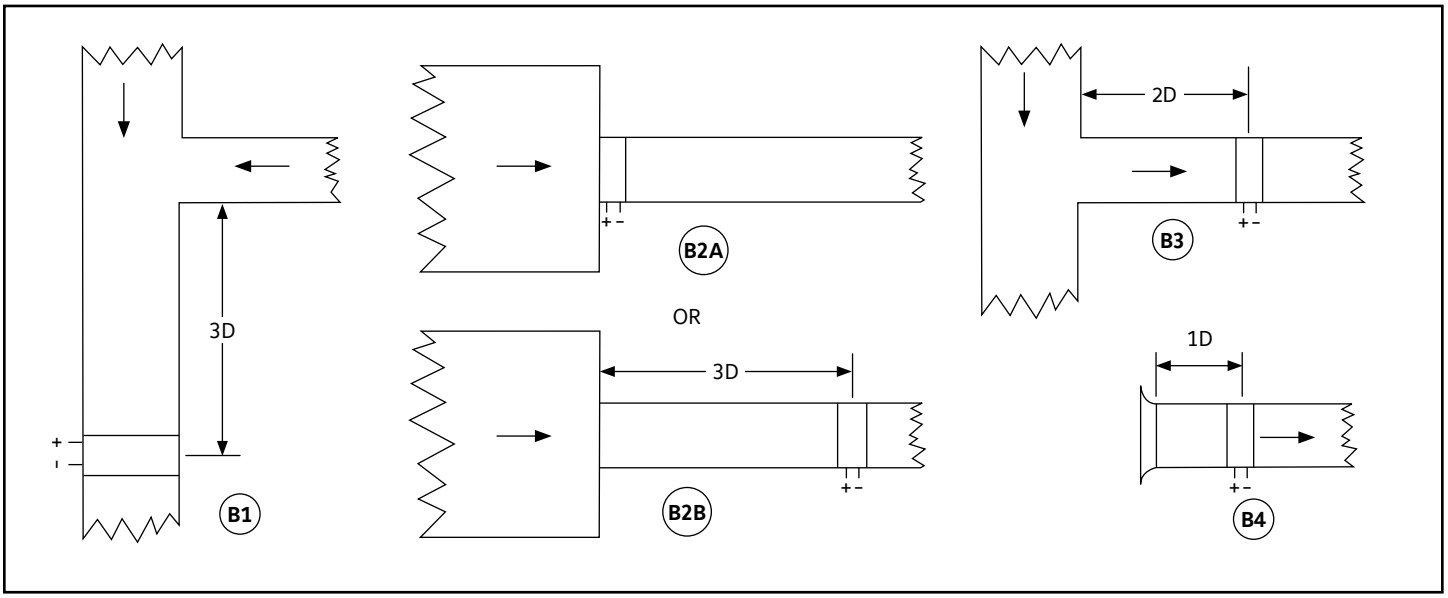
90° VANED ELBOW (E1)

ROUND SWEEP ELBOW (E2)

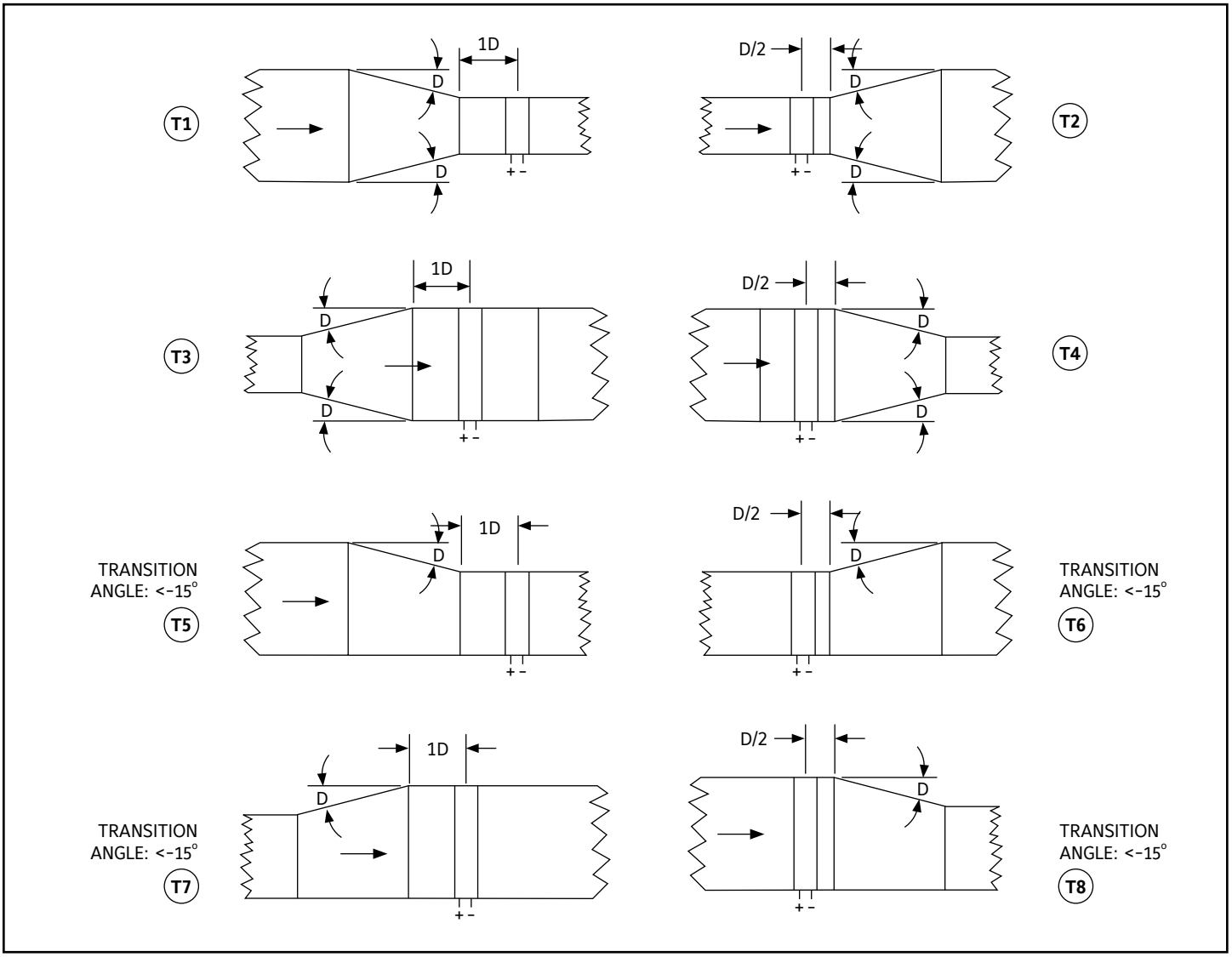
90° UNVANED ELBOW (E3)

SWEEP ELBOW (E4)

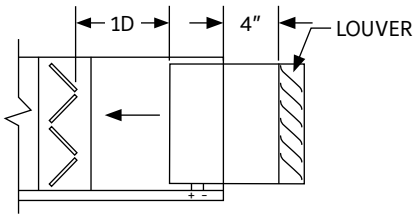
BRANCH TAKEOFF



TRANSITIONS

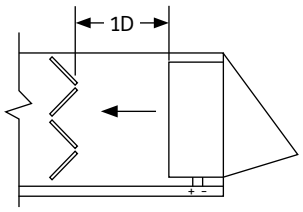


AIR HANDLING UNITS



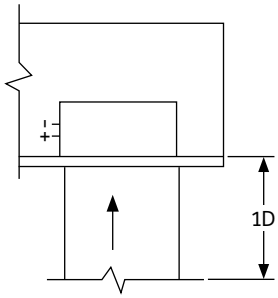
LOUVER

L1



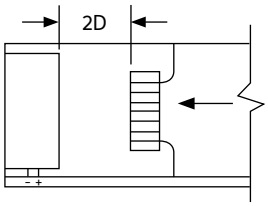
HOOD

H1

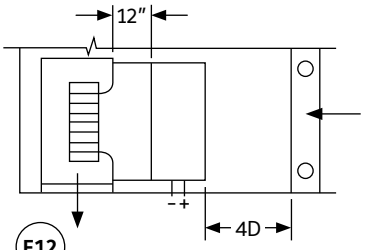


RETURN AIR

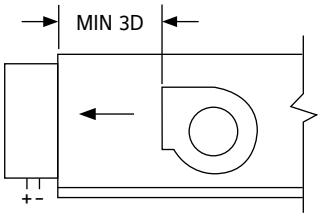
R1



FD1



F12



FAN DISCHARGE

FD2

DUCT DIAMETER EQUIVALENTS CHART

Determine the Value of 'D'

For ROUND ducts, the value of 'D' is the actual duct diameter. The placement of an air measuring station in ROUND duct that is located downstream of a 90° vaned elbow (as shown in the detail E1 above) would be 1D. Hence, for a 20" diameter duct, 1D would equate to 20 inches.

For RECTANGULAR ducts, the value of 1D can be found by referencing the chart shown below. To determine 1D, locate the relevant DUCT WIDTH from the 1D EQUIVALENT CHART below, and then locate the cell in the DUCT WIDTH column which intersects with the relevant DUCT HEIGHT. The number at this intersection represents the 1D 'distance' in inches (1D).

Duct Height	1D Equivalent Chart for Rectangular Ducts																												
	Duct Width																												
	6	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**	**32**	**34**	**36**	**38**	**40**	**42**	**44**	**46**	**48**	**50**	**52**	**54**	**56**	**58**	**60**
6	6.8	7.8	8.7	9.6	10	11	12	12	13	14	14	15	15	16	16	17	17	17	18	18	19	19	20	20	20	21	21	21
8	7.8	9	10	11	12	13	14	14	15	16	16	17	17	18	19	19	20	20	21	21	22	22	23	23	23	24	24	25
10	8.7	10	11	12	13	14	15	16	17	17	18	19	20	20	21	21	22	23	23	24	24	25	25	26	26	27	27	28
12	9.6	11	12	14	15	16	17	17	18	19	20	21	21	22	23	23	24	25	25	26	27	27	28	28	29	29	30	30
14	10	12	13	15	16	17	18	19	20	21	22	22	23	24	25	25	26	27	27	28	29	29	30	30	31	32	32	33
16	11	13	14	16	17	18	19	20	21	22	23	24	25	26	26	27	28	29	29	30	31	31	32	33	33	34	34	35
18	12	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30	31	32	32	33	34	35	35	36	36	37
20	12	14	16	17	19	20	21	23	24	25	26	27	28	29	29	30	31	32	33	33	34	35	36	36	37	38	38	39
22	13	15	17	18	20	21	22	24	25	26	27	28	29	30	31	32	33	33	34	35	36	37	37	38	39	40	40	41
24	14	16	17	19	21	22	23	25	26	27	28	29	30	31	32	33	34	35	36	37	37	38	39	40	41	41	42	43
26	14	16	18	20	22	23	24	26	27	28	29	30	32	33	34	35	35	36	37	38	39	40	41	41	42	43	44	45
28	15	17	19	21	22	24	25	27	28	29	30	32	33	34	35	36	37	38	39	40	40	41	42	43	44	45	45	46
30	15	17	20	21	23	25	26	28	29	30	32	33	34	35	36	37	38	39	40	41	42	43	44	45	45	46	47	48
32	16	18	20	22	24	26	27	29	30	31	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	49
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60	21	25	28	30	33	35	37	39	41	43	45	46	48	49	51	52	54	55	57	58	59	61	62	63	64	65	67	68

Example 1

The 1D Equivalent of a 20" round duct = 20 inches

The 1D Equivalent of a 20" x 10" duct = 16 inches

Example 2

Using Detail E3 as a reference, the airflow measuring device should be installed a minimum of 5D downstream of a 90° unvaned elbow and a minimum of 1D upstream of a 90° unvaned elbow. For this 20" x 10" duct, the upstream length of 5D would amount to 5 x 1D (1D = 16 inches) which totals 80 inches. The downstream length of 1D would amount to 1 x 1D (1D = 16 inches) which totals 16 inches.

NOTE:

1. All numbers are expressed in inches.
2. 2D = 1D x 2, 3D = 1D x 3, etc.
3. Equation for 1D = SQRT ([4 x H x W] / 3.1416)

SEQUENCE OF OPERATION

Option 1
Manual Balancing

With a manual locking hand quadrant and a low-pressure transducer and air flowing through the air measurement station the transducer output is monitored to determine the velocity pressure.

Using the formula provided for converting velocity pressure into an airflow measurement the damper can be locked into a fixed position.

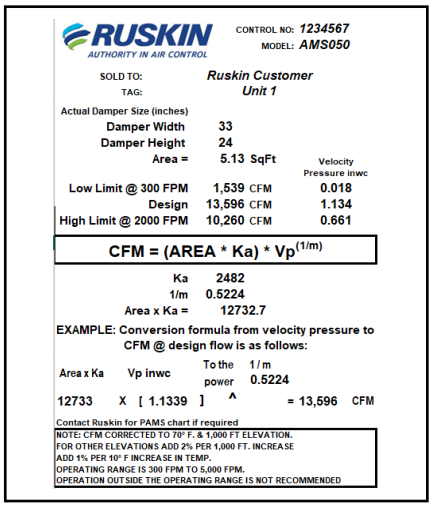
$$CFM = (Area \times Ka) \times Pams^{1/m}$$

Pams = Velocity Pressure (Vp)

1/m = Exponent for air measurement station very near SqRoot

Ka = Constant established by testing for specific air measurement station

Sample Tag factory applied onto the side of each AMS050 unit. Tags are Unit-Specific


RUSKIN
AUTHORITY IN AIR CONTROL

CONTROL NO: 1234567
MODEL: AMS050

SOLD TO: Ruskin Customer
TAG: Unit 1

Actual Damper Size (inches)

			Velocity Pressure inwc
Damper Width	33		
Damper Height	24		
Area =	5.13	SqFt	
Low Limit @ 300 FPM	1,539	CFM	0.018
Design	13,596	CFM	1.134
High Limit @ 2000 FPM	10,260	CFM	0.661

CFM = (AREA * Ka) * Vp(1/m)

Ka	2482
1/m	0.5224
Area x Ka =	12732.7

EXAMPLE: Conversion formula from velocity pressure to CFM @ design flow is as follows:

Area x Ka		Vp inwc		To the power	1/m 0.5224		
12733	X	[1.1339	]	^		= 13,596	CFM

Contact Ruskin for PAMS chart if required

NOTE: CFM CORRECTED TO 70° F. & 1,000 FT ELEVATION.
FOR OTHER ELEVATIONS ADD 2% PER 1,000 FT. INCREASE
ADD 1% PER 10° F INCREASE IN TEMP.
OPERATING RANGE IS 300 FPM TO 5,000 FPM.
OPERATION OUTSIDE THE OPERATING RANGE IS NOT RECOMMENDED

Option 2
BAS Control

The AMS050 is installed in the duct or outside air opening and equipped with a low-pressure transducer and a modulating damper actuator (factory supplied/mounted or field supplied/mounted). Airflow through the measuring station generates a velocity pressure that is converted into an analog signal using a low-pressure transducer with the pressure range selected to read the expected range of measured airflows. The output from this transducer is monitored by the building automation system (BAS) and converted into an airflow measurement using the formula for that specific measuring station as shown on the Vp tag attached to the side of the air measurement station (see above). The BAS calculates the CFM and sends a control signal to the actuator to modulate the damper according to the prescribed airflow requirement.

Option 3
Includes use of Factory-Supplied Ruskin Airflow Measuring Actuator/Controller

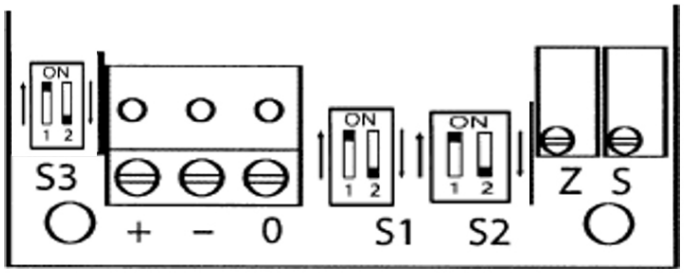
When an optional Ruskin Airflow Measuring Actuator/Controller is installed on the AMS050 unit, it will ship factory installed and wired for single-point power connection to the supplied junction box. The airflow measuring actuator/controller must be field configured to match the supplied transducer and the correct corresponding pressure range. The specific BACnet network requirements are configured at the same time using a laptop computer's web browser connected to the actuator's RJ45 port. The actuator/controller accepts a BACnet commanded or 0-10V CFM setpoint input from the building automation system (BAS). The actuator/controller will modulate the damper accordingly to achieve the prescribed CFM setpoint and will report the corresponding airflow measurement via the BACnet interface to the BAS. The pressure transducer converts the velocity pressure from the AMS050 air measurement station into an analog signal read by the actuator/controller. For an analog output from the AMS050, simply connect a second low-pressure transducer teed into the same pressure lines or specify the optional DPT-IQ with two analog outputs.

Contact Ruskin with the control number shown on the Vp Tag from the side of the AMS050 to obtain technical support for your specific unit.

TRANSDUCER DIP SWITCH SETTINGS AND WIRING DETAILS : MODEL RU-274-R2-VDC

The switch selection settings shown below will provide a Pressure Range of 0 -1.0" wc (250 Pa) **(S1)**, Uni-directional Output **(S2)**, and 0-10V output configuration **(S3)**. These switch selections are the Default settings as supplied from the factory.

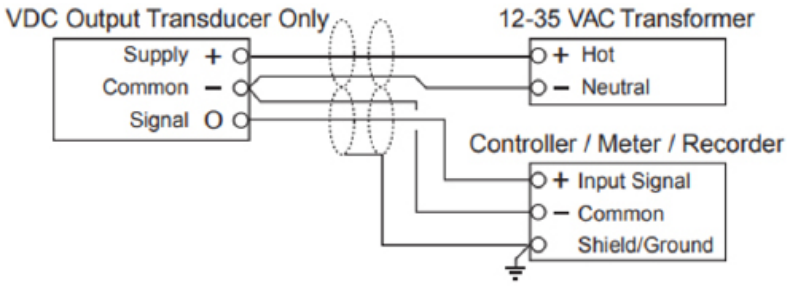
To obtain the greatest airflow measurement resolution, use the lowest pressure range that will work to read the expected velocity pressure at the maximum airflows to be measured. For other settings and pressure ranges, consult the transducer's product data sheet.

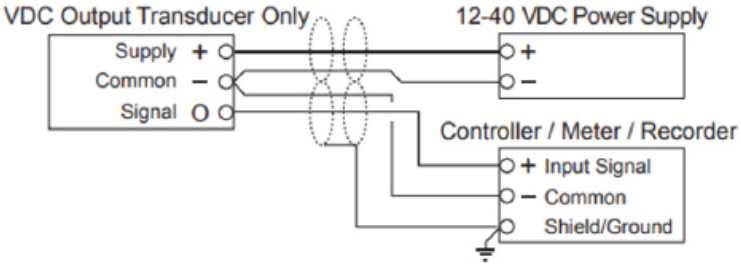


Notice: The AMS050 is available with several transducer model options. If the AMS050 unit on you project has something other than the solutions specified in this document, consult your local Ruskin representative or the company that provided the low-pressure transducer on this air measurement station.

Follow the steps below to set up the factory default model RU-274-R2-VDC low-pressure transducer. As noted, the switch settings shown above are for a 0-10VDC output and a 0 - 1.0" wc (250 Pa) pressure range. Normal power source is 24VAC, however, 12 to 40VDC or 12 to 35VAC are also acceptable. Use the lowest pressure setting that will work for the maximum airflow expected.

TRANSDUCER WIRING DIAGRAMS & INSTRUCTIONS (MODEL RU-274-R2-VDC)





1. The terminal block can be wired by carefully unplugging it from the circuit board.
2. Locate the (+) (-) and the (O) terminal markings on the circuit board.
3. Attach the power wires to the respective (+) and (-) terminals.
   Note: the (-) terminal is also the negative output termination point.
4. Connect the (O) terminal, which is the positive VDC output terminal, to the BAS input.
5. Verify the VDC output with a digital volt meter connected to the (O) and (-) terminals.
6. Voltage output signal and differential pressure range are dipswitch selectable. Reference the installation instructions for the low-pressure transducer for additional information.

CONTROLS

The AMS050 Air Measuring Station can be purchased with modulating actuator controlled by others or with the Ruskin Air Measurement Actuator (RAM). When purchased with a modulating actuator and low-pressure transducer, the standard transducer is the Ruskin RU-274-R2-VDC and is configured for 0-1.0 inwc (0-249 Pa) out-of-the-box corresponding to a 0-10VDC output. For the greatest air measurement resolution, use the lowest pressure range that will work for the maximum airflow expected. The RU-274-R2-VDC transducer requires a power source between 12-40VDC or 12-35VAC. Optional transducers having LCD displays are used when a mA output or dual outputs are required and NEMA4 is not required. The formula provided on the VP tag on the side of the AMS050 must be applied to convert velocity pressure output from the low-pressure transducer into a CFM value. Free area, K-factor and exponent for the air measurement station is on the VP tag and is developed specifically for that unit. Applying other formulas may result in greater air measurement error and unacceptable results. The actuator controlled by the BAS can be modulated, opened or closed, using an analog signal compatible with the specific actuator.

NOTE:

When the optional Ruskin Air Measurement (RAM) Actuator is installed on the AMS050 unit, it will ship factory installed and wired for single-point power connection. Contact Ruskin with the Control Number shown on the Vp Tag on the side of the AMS050 for support during set-up.

Optional Ruskin Air Measurement (RAM) Actuator

The VAMB24BAC spring return or the VAMB24BAC maintain last command have the same built in web server and the AMS050 can be supplied with either actuator as an air measurement and flow controller.

WIRING AND PIPING CONNECTIONS

1. When controlled by others, connect power to the actuator and to the transducer, following the information in the product data sheet for each device.
2. Connect 24VAC or DC power supply to the AMS050 when supplied with the optional Ruskin Air Measurement Actuator (RAM) with single point power J-box and terminal strip.
3. With the RAM, connect the 0-10V analog output from the BAS to terminals 10 (-) and 12 (+) on the J-box terminal strip or when controlled by others, connect the BAS directly to a modulating actuator. Observe polarity.
4. With the RAM, air measurement is output via a BACNet network interface connected to the J-box terminals 6 (-) and 7 (+) MS/TP connections. For an analog air measurement output the BAS is wired directly to the low-pressure transducer or the V output from the DPT-IQ low-pressure transducer. Reference the product data sheet for the transducer for wiring.
5. Velocity pressure tubing from the AMS050 to the low-pressure transducer can be extended up to 115feet from the air measurement stations location when factory installation of the transducer on the AMS050 is not.

TRANSDUCER MODEL RU-274-R2-VDC SPECIFICATIONS

RU-274-R2-VDC Transducer (low-pressure transducer)	
Power	12-40 VDC or 12-35 VAC
Pressure Ranges	Dip Sw Selectable 0-0.25, 0-0.5, 0-1.0 in wc
Outputs	0-10 VDC (0-5 VDC field selectable) (Optional 4-20 mA Order AMS8100-LR Transducer)
Enclosure	Painted NEMA 4 (IP-65)
Accuracy	+/-1% FS
Operating Range	0°F to 175°F (-18°C to 80°C)

MAINTENANCE

1. Disconnect the sensing tubes between the damper and the pressure transducer or controller. Apply a clean pressurized air source to the air piping connections at the AMS050 frame in order to blow out the sensing ports in the fixed sensing blades of the AMS050. **DO NOT connect this air source to the pressure transducer or control modules. This will damage the instruments.** Replace tubing to the equipment in reverse order of removal.
2. The air straightener section of the AMS050 and the air sensing blades should be annually inspected for particulate build-up. Use a damp cloth to wipe clean the sensing blade surface. Water may be used to clean and flush the air straightening section and the sensing blades of the AMS050. Using pressurized air for purging the sensing blades of water is recommended.

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

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

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