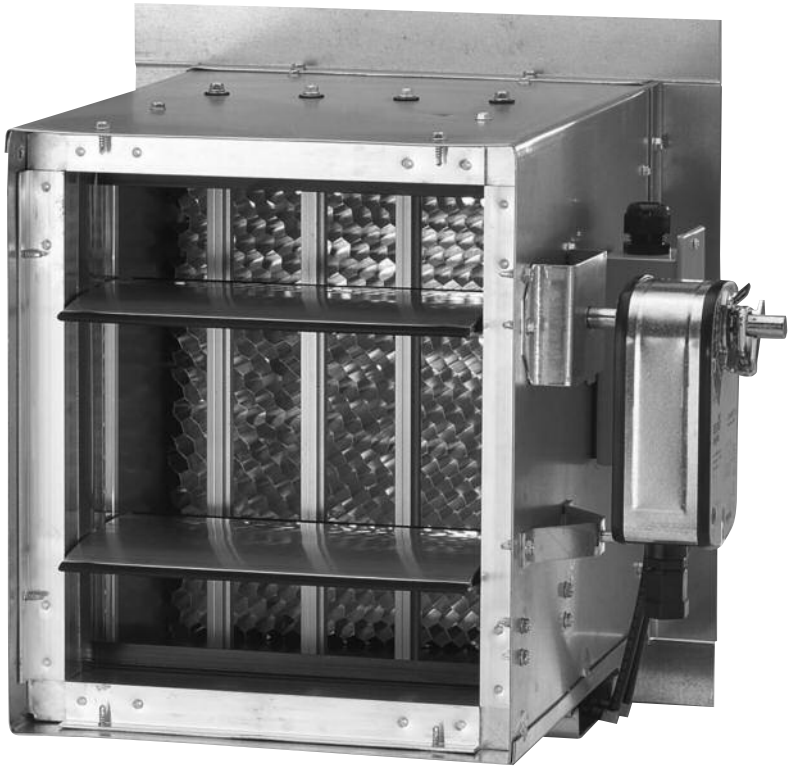
RUSKIN

Air Quality Solutions

Installation & Maintenance Manual



Model: AMS050

Air Measuring Station with Integral Damper

II-AMS050-818/Replaces II-AMS050-912

Table of Contents

! WARNING

THIS ACCESSORY IS TO BE INSTALLED BY A QUALIFIED SERVICE TECHNICIAN. TO AVOID UNSATISFACTORY OPERATION OR DAMAGE TO THE PRODUCT AND POSSIBLE UNSAFE CONDITIONS, INCLUDING ELECTRICAL SHOCK AND FIRE, 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 OR USING UNAUTHORIZED PARTS MAY BE EXCLUDED FROM THE MANUFACTURER'S WARRANTY COVERAGE.

! WARNING

DISCONNECT ELECTRICAL POWER PRIOR TO SERVICING THIS UNIT. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

Product Application

The Air Measuring Station (AMS050) is designed to be used in any application that requires accurate airflow measurement at velocities between 300 and 5,000 feet per minute (1.5 and 25 m/s). Unit may be installed in the duct or in an air handling unit and can be used to measure outside air, return air, discharge air or exhaust air flows into or out of a building or air handling unit.

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 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 step sensor with a 3" (76mm) deep 3000 series aluminum honeycomb air straightener for accurate measurement to maximize performance and offer repeatable and accurate results.
- Field selectable output signal is proportional to the CFM.

Key Benefits

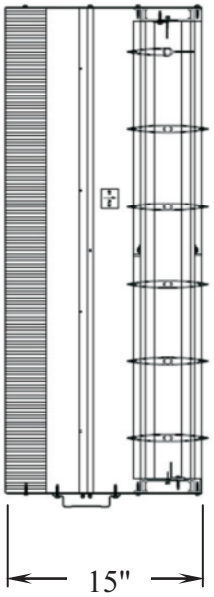
- Contributes to earning required Indoor Environmental Quality (EQ) and Energy and Atmosphere (EA) LEED prerequisites.
- Save energy dollars by measuring the minimum ventilation airflow to within ±5% accuracy. Control the amount of unconditioned air into the space.
- Meet International Building Code (IBC) and International Energy Conservation Code (IECC) requirements.
- Maintain proper ventilation to dissipate dangerous indoor contaminants such as mold spores, bacteria and chemicals.
- Create a healthy indoor environment to reduce absenteeism, increase productivity, improve comfort and reduce the risk of litigation

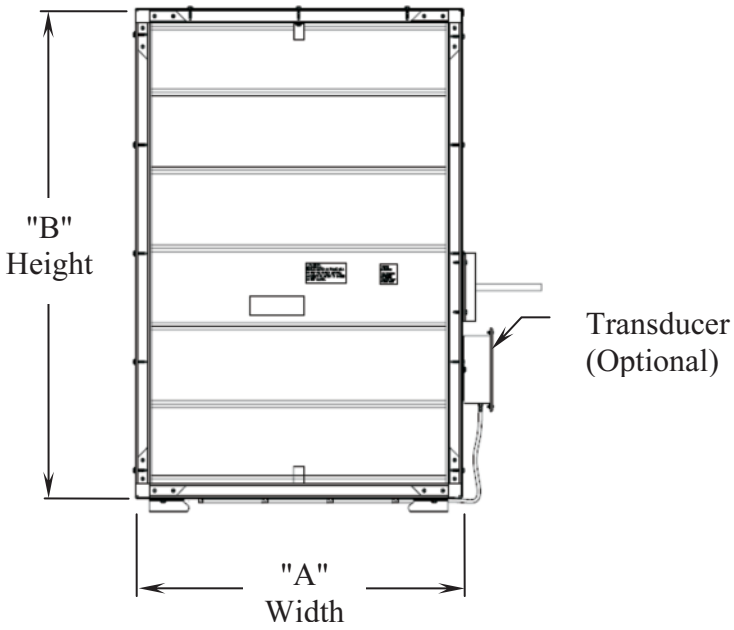
Construction Details

The AMS050 is an air measuring device that uses pressure across a series of step sensor blades to measure air flow. The step sensor blades are rugged anodized aluminum extrusion with holes arranged to pick up the average total and static pressures in the system. Total and Static pressure points are piped to a pressure transducer* with an integral glass-on-silicone GL-Si capacitance sensor that is accurate to 1% of full scale. There are a number of applications for the AMS050 air measuring station. For additional control, an optional AMS controller is available for use with the AMS050. When ordered, the controller is factory calibrated to the job-specific measuring range.

Refer to the sequence of operation section of this document for further details.

*Note: The GL-Si transducer is a standard feature on all AMS050 units ordered after October of 2006. Prior to this date, it was necessary to order the RU-274-R2-VDC transducer as an optional feature.





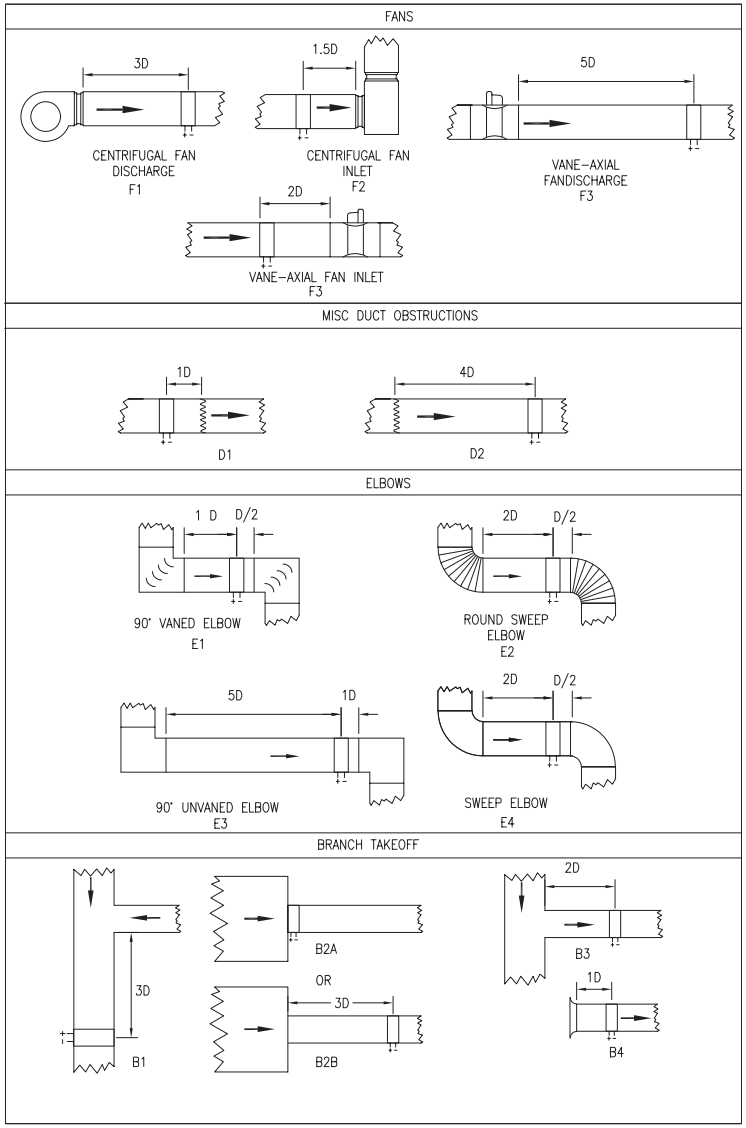
Installation

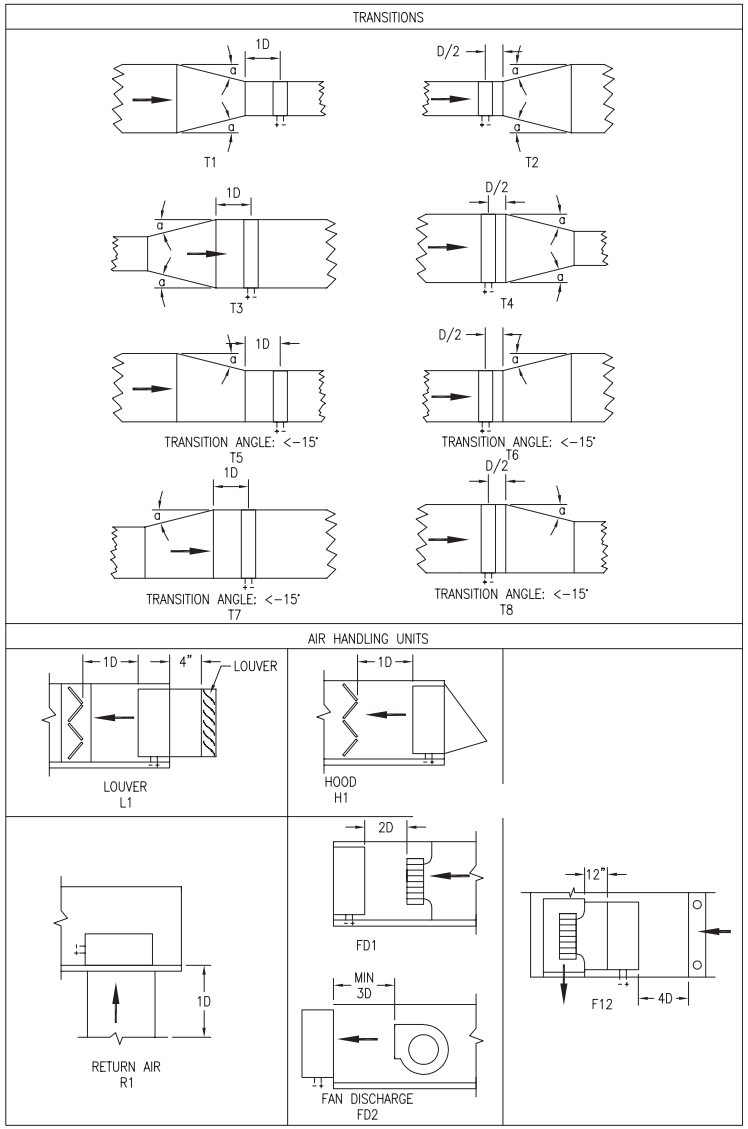
The AMS050 Air Measuring Station with Integral damper and optional digital controller panel may ship in separate containers. Please verify that you have received everything noted on the packing slip prior to proceeding with the installation.

Remove the AMS050 from its shipping container and inspect for damage, rust or corrosion. Care must be taken in handling the unit. Always handle the AMS50 by its frame. Do not lift it by the blade, linkage, axle, motor or jackshaft. Do not drop, drag, step on or apply excessive bending, twisting or racking loads to the AMS050. Special care should be used to protect the honeycomb straightener.

1. Inspect the duct work and/or opening where the AMS050 assembly will be installed for any obstruction or irregularities that might interfere with blade or linkage rotation, or optional actuator mounting. If it is to be installed in ductwork, the ductwork should be supported at the area of the AMS050 to prevent sagging due to the unit's weight.
2. The AMS050 must be installed with the frame square and without twisting or bending. The unit must be installed with its blade axis horizontal. The damper blades, axles and linkage must be able to operate without bending.
3. The best location for the extended shaft or jackshaft must be determined before installing the damper. The damper may be rotated 180 degrees to get the extended shaft on the correct side of the ductwork. After the damper is installed the shaft location cannot be changed without removing the damper. The jackshaft, if installed, will always be in the leaving air stream. The AMS050 has a specified inlet and outlet. The outside air (or other controlled air stream) enters the unit through the air straightening section and exits from the damper side.
4. Use appropriate shims between the damper frame and duct opening to prevent distortion of the frame by fasteners holding it in place. If creating a multi-section assembly, be sure that all the sections are fastened together on both sides.
5. If the actuator linkage or shafting present a problem for installation, please consult your local Ruskin representative or the Ruskin factory. The AMS050 should be cycle tested after installation to assure proper operation.
6. After installing the assembly in the ductwork or mounting hole, caulk around the damper frame to insure that there is no leakage or bypass air around the air measuring station.
7. The optional AMS Control unit is factory calibrated and tested in order to perform correctly in its job-specific application. The Digital Control unit is typically shipped loose in a NEMA 1 electrical enclosure and must be installed within 100 feet (30.5m) of the AMS050 in an environmentally controlled space. A wiring schematic label is located on the cover plate for future reference and in this document. The enclosure must be securely attached to a flat solid surface, such as a wall or air handling unit casing.
8. Refer to wiring schematic and controls section of this document for necessary field power connections.
9. Refer to page 5 for ideal application specific air measuring product placement options. Consult your local representative with questions about placement.

Air Measurement Station Placements for Ideal Installations





1D EQUIVALENT CHART																														
		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
DUCT HEIGHT	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
	34	16	19	21	23	25	26	28	29	31	32	34	35	36	37	38	39	41	42	43	44	45	46	47	47	48	49	50	51
	36	17	19	21	23	25	27	29	30	32	33	35	36	37	38	39	41	42	43	44	45	46	47	48	49	50	51	52	52
	38	17	20	22	24	26	28	30	31	33	34	35	37	38	39	41	42	43	44	45	46	47	48	49	50	51	52	53	54
	40	17	20	23	25	27	29	30	32	33	35	36	38	39	40	42	43	44	45	46	47	48	49	50	51	52	53	54	55
	42	18	21	23	25	27	29	31	33	34	36	37	39	40	41	43	44	45	46	47	49	50	51	52	53	54	55	56	57
	44	18	21	24	26	28	30	32	33	35	37	38	40	41	42	44	45	46	47	49	50	51	52	53	54	55	56	57	58
	46	19	22	24	27	29	31	32	34	36	37	39	40	42	43	45	46	47	48	50	51	52	53	54	55	56	57	58	59
	48	19	22	25	27	29	31	33	35	37	38	40	41	43	44	46	47	48	49	51	52	53	54	55	56	57	59	60	61
	50	20	23	25	28	30	32	34	36	37	39	41	42	44	45	47	48	49	50	52	53	54	55	56	58	59	60	61	62
	52	20	23	26	28	30	33	35	36	38	40	41	43	45	46	47	49	50	51	53	54	55	56	58	59	60	61	62	63
	54	20	23	26	29	31	33	35	37	39	41	42	44	45	47	48	50	51	52	54	55	56	57	59	60	61	62	63	64
	56	21	24	27	29	32	34	36	38	40	41	43	45	46	48	49	51	52	53	55	56	57	59	60	61	62	63	64	65
	58	21	24	27	30	32	34	36	38	40	42	44	45	47	49	50	52	53	54	56	57	58	60	61	62	63	64	65	67
	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

To determine the placement of an air measuring station that is located down stream of a 90° vaned elbow (as shown in the detail E1 above); follow the duct width down to the duct height. The number at this intersection represents distance in inches (1D).

Example 1
The 1D Equivalent of a 20” x 10” duct = 16”

Example 2
The same 20” x 10” duct installed as shown in detail E3 would be 16” x 5 (5D)

Notes:
1. All numbers are expressed in inches.
2. 2D = 1D x 2, 3D = 1D x 3, etc.
3. Equivalent round duct diameter = SQRT ([4 x H x W] ÷ 3.1416)

Sequence of Operation

Option 1
Manual Balancing

The unit is installed in the outside air opening and furnished with a manual locking hand quadrant and an RU274 pressure transducer. Under flow, the transducer output is checked with a volt meter and compared to the pressure chart (P.A.M.S.). The damper is manually adjusted until the voltage output is equal to the desired CFM flow. The RU274 transducer output signal can be wired to the BAS to prove flow.

CFM can be determined by referencing the chart and utilizing the formula below. Both Ka and L/m values are constants. See the PAMS chart provided with your unit for Ka and l/m for your specific unit.

$$CFM=(AREA * Ka) * Pams^{(l/m)}$$

VOLTS	Pams	CFM	FPM
0.1	0.01	1549.6	280.3
0.2	0.02	2253.0	407.6
0.3	0.03	2804.5	507.3
0.4	0.04	3275.9	592.6
0.5	0.05	3695.4	668.5
0.6	0.06	4077.7	737.6
0.7	0.07	4431.7	801.6
0.8	0.08	4763.0	861.6
0.9	0.09	5075.8	918.2
1	0.1	5373.0	971.9
1.1	0.11	5656.7	1023.3
1.2	0.12	5928.9	1072.5
1.3	0.13	6190.8	1119.8
1.4	0.14	6443.5	1165.6
1.5	0.15	6688.1	1209.8
2	0.2	7812.2	1413.1
3	0.3	9724.3	1759.0
4	0.4	11358.7	2054.7
5	0.5	12813.2	2317.8
6	0.6	14138.9	2557.6
7	0.7	15366.2	2779.6
8	0.8	16515.2	2987.4
9	0.9	17599.7	3183.6
10	1	18630.1	3370.0

Sample P.A.M.S. Chart
(P.A.M.S. Charts are job specific)

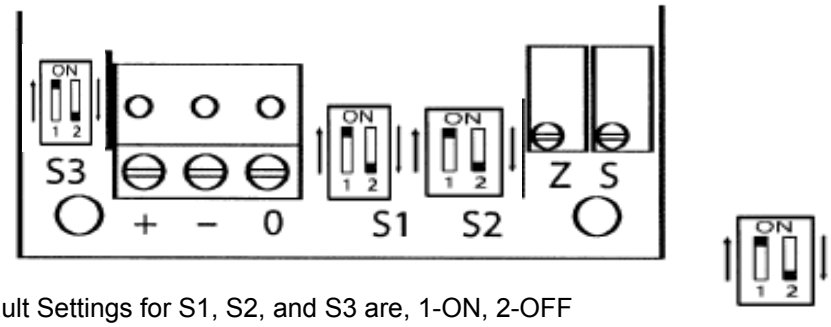
Option 2
BAS Control

The unit is installed in the outside air opening and furnished with an RU274 transducer and a damper actuator. Under flow, the transducer output produces a voltage signal to the Building Automation System (BAS). The BAS calculates the CFM based on the formula and velocity pressure (P.A.M.S.). The BAS sends a control signal to the AMS050 actuator to modulate the desired CFM flow.

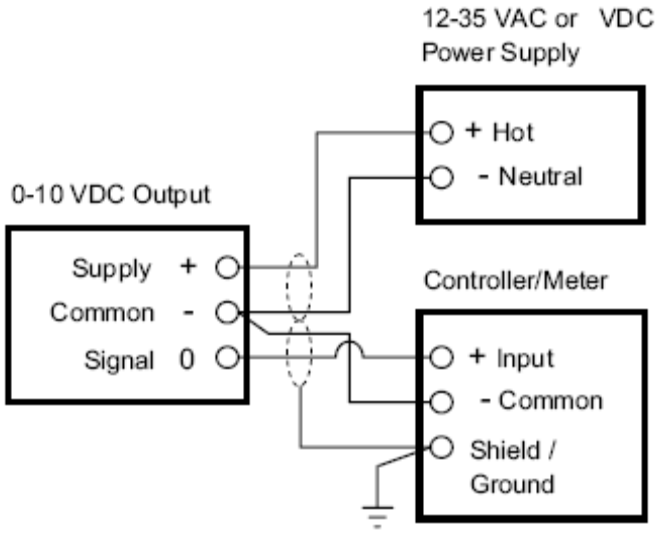
Option 3
Full Factory Controls

The unit is installed in the outside air opening and furnished with a damper actuator, factory calibrated control panel with microprocessor and integral pressure transducer (model AMS070V). A control signal equal to the desired air flow (reference sample I/O chart on Page 10), is sent to the AMS050 control panel. The microprocessor compares the setpoint input signal with the actual flow and positions the damper actuator to maintain the specified CFM. For the example on Page 10, if a 3 VDC signal is sent to the controller, the damper would be modulated to restrict or increase flow until 5,200 CFM ±5% is reported. For further details reference the AMS070V Wiring schematic.

Standard RU-274-R2-VDC Transducer Dip Switch Settings and Wiring Details



The Default Settings for S1, S2, and S3 are, 1-ON, 2-OFF
For other settings and pressure ranges consult transducer product data sheet



Notice: The AMS050 is available with multiple control solutions. If the AMS050 unit on you project has something other than the solutions specified in this document, consult your local representative or the company that provided this air measurement station.

Follow the steps below to set up the standard RU-274-R2-VDC low-pressure transducer. The default settings are shown above for a 0-10VDC output and a 0-1.0 inwc (249 Pa) pressure range. Normal power source is 24VAC however 12 to 40VDC or 12 to 35VAC are also acceptable.

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 or without full factory controls. When purchased without factory controls the AMS050 will be shipped with a Ruskin low-pressure transducer. The standard transducer is a Ruskin RU-274-R2-VDC and is factory configured for 0-1.0 inwc (0-249 Pa) corresponding to a 0-10VDC output. The transducer requires a power source of either 12-40VDC or 12-35VAC. Optional transducers with LCD displays or 0-20mA output are also available.

The formula provided on the PAMS (Pressure Across Measuring Station) chart must be applied to convert the output from the low-pressure transducer into a CFM value. Each unit is provided with a PAMS chart developed specifically for that unit. Applying other formulas may result in greater air measurement error and unacceptable results.

When the optional AMS070V full factory controls are ordered the AMS050 unit will ship with floating damper actuators that are driven by two triac outputs from the controller. The AMS070V controller is factory programmed to the customer's specific requirements and accepts a 0-5V CFM setpoint input from the building automation system (BAS). The controller will produce a 4-20MA output signal corresponding to the actual air flow at any point in time. The controller will modulate the damper position to maintain the setpoint CFM value. The controller is equipped with an internal pressure transducer that converts the differential pressure from the air measurement station into the measured air flow value. The AMS070V controller is housed in a 12" x 12" x 6" (305 x 305 x 152 mm) NEMA1 enclosure with a 120/208/240VAC to 24VAC transformer. Each controller is shipped with an input output chart showing the input and output scaling for that specific unit. Contact Ruskin with the control number to obtain the calibration charts for your specific unit.

Optional AMS070V Control Panel Installation

1. The controller enclosure should be mounted securely on an adjacent wall or attached to the air handling unit. The panel should be mounted within 100 feet (30.5 m) of the AMS050 to assure proper pressure signal function. If the enclosure must be mounted more than 100 feet (30.5 m) from the AMS050, please consult your local Ruskin representative or the company that you purchased the device from.
2. Loosen the enclosure cover screws and remove the cover.
3. Remove the appropriate knock-outs for connection of the field wiring to the enclosure's terminal blocks.
4. Fasten the enclosure to the wall or flat surface using the four mounting holes in the back of the panel enclosure.

Wiring and Piping Connections

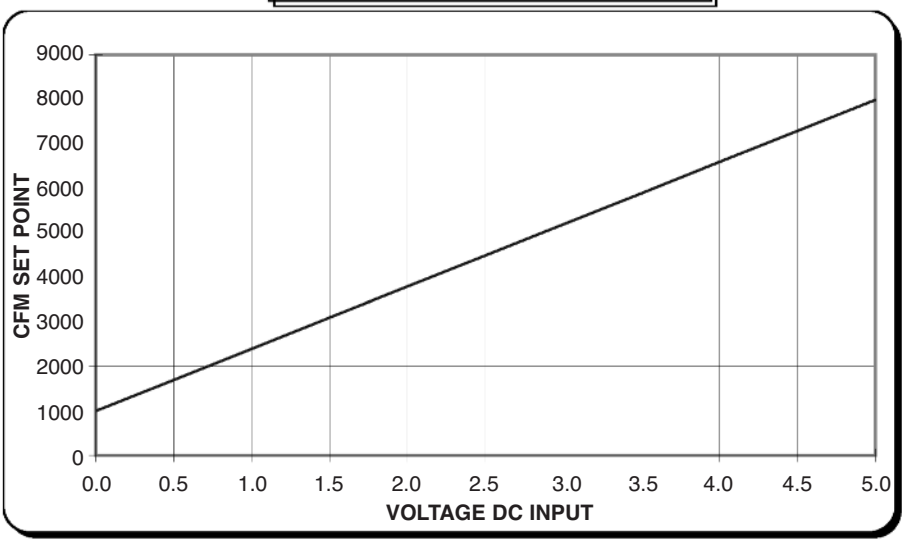
1. Connect 120/208/240VAC power supply to the AMS050 control panel L1 and L2.
2. Connect the three actuator wires as shown (see page 9). Connect the **black** (com) wire to controller terminal **24H**. Connect the **red** wire to controller terminal **24G** (com) terminal. Please note actuator wiring is as listed above, red 24G, black 24H.
3. Connect 0-5VDC signal from the BAS to UI (universal input) and common. Observe polarity.
4. Connect 4-20mA analog output AO and Common from the controller to the BAS system. Observe polarity.
5. Connect pressure tubing from the controller to the airflow sensing blade, connecting the low pressure port to the blade side nearest the damper and the high pressure port to the blade side nearest the air straightener.
6. Optional Un-Occupied signal – connect dry contact between DI and Comm. Close contact to drive damper closed when building is unoccupied. Open contact for normal operation.

RUSKIN®
Air & Sound Control

CUSTOMER: Ruskin Customer
CN#: 1234567
TAG: Air Measurement Station
Damper Width: 24
Damper Height: 24
Square Feet: 3.63

AMS050 AIR MONITOR DAMPER WITH AMS070V CONTROLLER

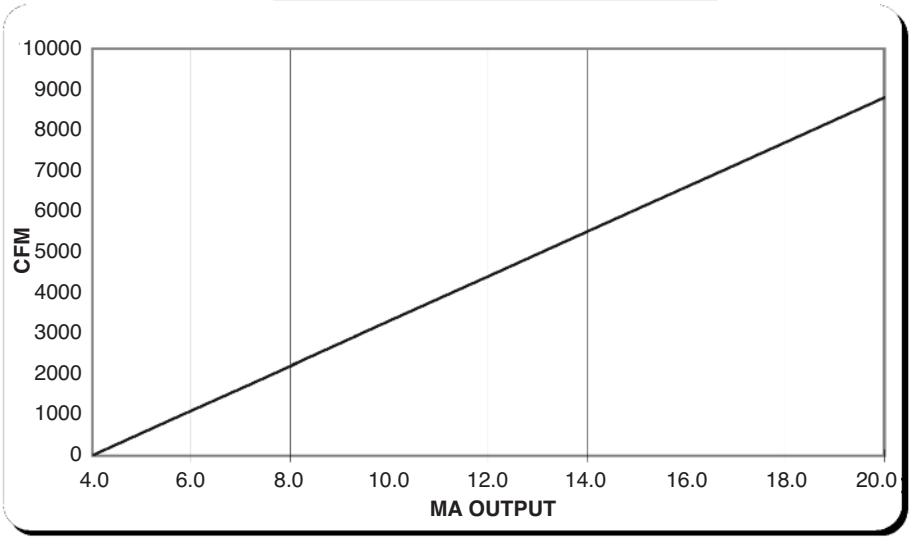
CFM SETPOINT
SETPOINT = 1400 x VDC + 1000



INPUT VOLTAGE	CFM SETPOINT
0.0	1000
0.5	1700
1.0	2400
1.5	3100
2.0	3800
2.5	4500
3.0	5200
3.5	5900
4.0	6600
4.5	7300
5.0	8000

CUSTOMER SET POINT	
2.14	4000

MEASURED CFM
CFM = 550 x (mA - 4)

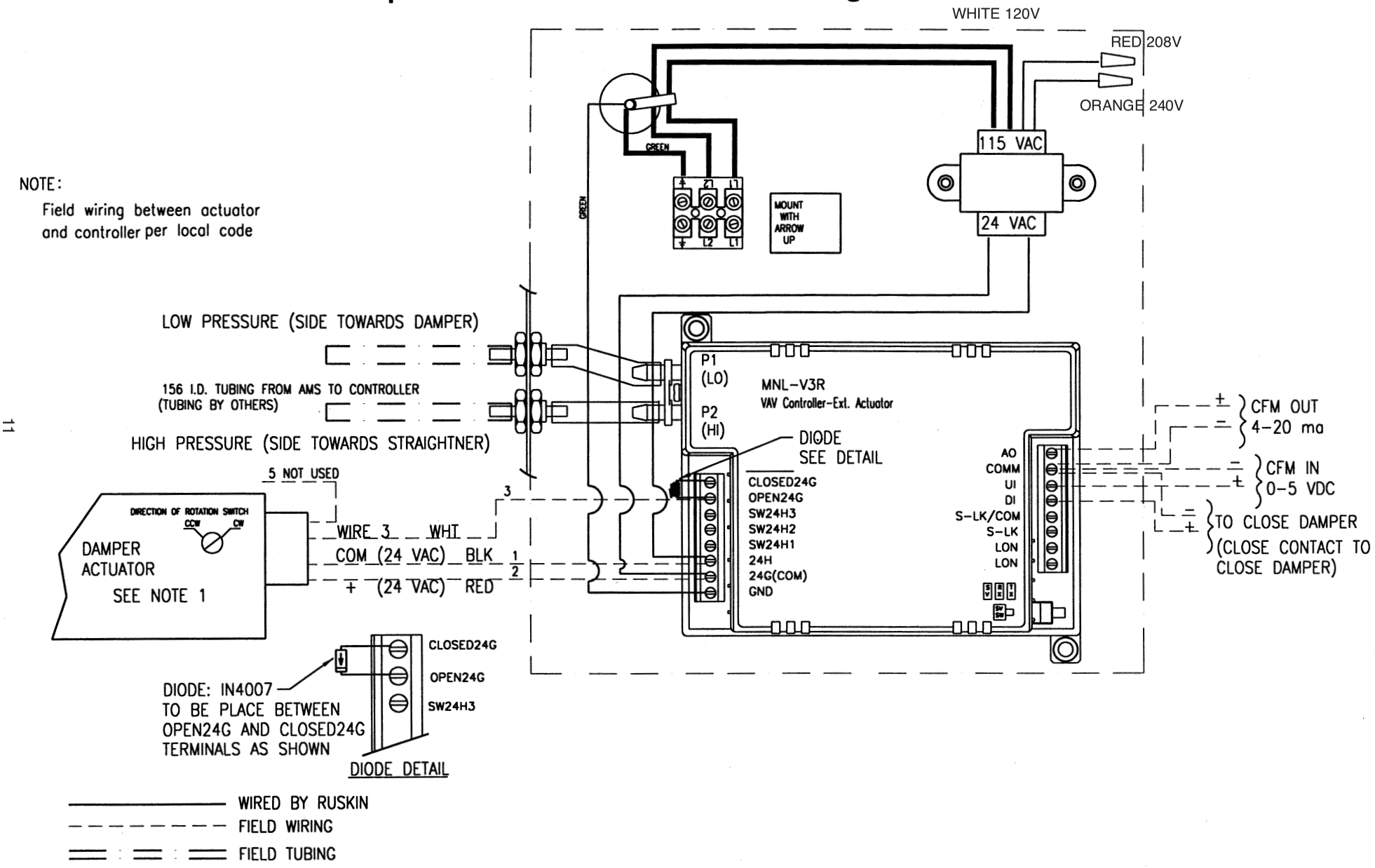


MA OUTPUT	ACTUAL CFM
4.0	0
5.6	880
7.2	1760
8.8	2640
10.4	3520
12.0	4400
13.6	5280
15.2	6160
16.8	7040
18.4	7920
20.0	8800

CUSTOMER SET POINT	
11.27	4000

NOTE:
CFM CORRECTED TO 70° F. & 1000 FT ELEVATION.
FOR OTHER ELEVATIONS ADD 2% PER 1000 FT. INCREASE
ADD 1% PER 10° F INCREASE IN TEMP.
RECOMMENDED OPERATING RANGE IS 300 TO 2000 FPM.
OPERATION OUTSIDE THE OPERATING RANGE IS NOT RECOMMENDED

Optional AMS070V Controller Wiring Details



Specifications

RU-274-R2-VDC Transducer (low pressure transducer)

Power	12-40 VDC or 12-35 VAC
Outputs	0-10 VDC (0-5 VDC field selectable) Optional 4-20 mA Order AMS810 Transducer
Enclosure	Painted NEMA 4 (IP-65)
Approvals	AMCA Certified +/-5%
Operating Range	0°F to 175°F (-18°C to 80°C)

AMS070V Controller (optional)

Power	120/208/240 VAC
Inputs	0-5 VDC (CFM Setpoint) Pressure (low and high ports)
Optional	Dry Contact between DI and Comm to close damper
Outputs	4-20mA analog signal (CFM (m/s) Measured)
Enclosure	Painted NEMA 1 Enclosure 12" x 12" x 6" (305 x 305 x 152 mm) Deep
Operating Range	-22°F to 140°F (-30°C to 60°C)
Memory	Nonvolatile EPROM

Maintenance

1. Semi-annually the damper tie-bar linkage and the jackshaft (if used) or extended shaft bearings should be lubricated with silicone free lubricant.

2. Damper blade axle bearings do not normally require lubrication.

3. When dampers are installed where they are exposed to heavy dust-laden air, frequent flushing of the damper axle bearings with water is recommended for extended bearing life.

4. 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.

5. 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.

RUSKIN

3900 Dr. Greaves Rd.
Kansas City, MO 64030
(816) 761-7476
FAX (816) 765-8955
www.ruskin.com