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

CDRAMS
ROUND AIR MEASURING STATION WITH INTEGRAL DAMPER

APPLICATION

The CDRAMS combines an air measuring station with a round ultra low-leak control damper that was developed to meet the industry requirements for an air measuring station for use in spiral duct applications. The specially designed blade-to-frame, full circumference seal is mechanically fastened between a dual skin blade. The flow sensing cross samples the air pressure across the full diameter of the duct. The complete unit is factory assembled and tested to provide effective setpoint monitoring and adjustment. The unit comes standard with a pressure transducer. The output signal is proportional to flow. The output signal can be read with a volt meter to position the damper at the desired set point. Automated control options are available.

STANDARD CONSTRUCTION

FRAME
20 gauge (1) galvanized steel.

FLOW SENSING CROSS
One-piece ABS Plastic on units 6" (152) dia. through 16" (406) dia. Two-piece anodized aluminum extrusion on units 18" (457) dia. through 24" (610) dia.

ACCURACY
+/- 5% of flow.

SENSOR PORT FITTINGS
Brass.

PRESSURE TRANSDUCER
RU-274-R2-VDC; 0-5 or 0-10 VDC output field selectable. Output signal is proportional to flow.

POWER REQUIREMENTS
12-40 VDC or 12-35 VAC.

DAMPER BLADE
Dual-skin galvanized steel.

BLADE SEAL
Full circumference neoprene seal, mechanically fastened between dual blade skins.

AXLE
.50" (13) dia. plated steel, extended 6" (152) from frame O.D.

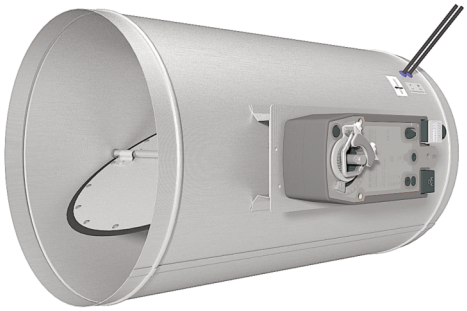
BEARINGS
Stainless steel sleeve.

DAMPER SIZES
D Diameter
6", 7", 8", 9", 10", 12", 14", 16", 18", 20", 22", 24" (152, 178, 203, 229, 254, 304, 356, 406, 457, 508, 559, 610).
L Length
6" dia. - 10" dia. (152 - 254) L = 17" (432)
Above 10" dia. - 20" dia. (254 - 508) L = 27" (686)
Above 20" dia. - 24" dia. (508 - 610) L = 31" (787)

VELOCITY REQUIREMENTS
Product Range - 400 to 4000 FPM (2 to 20 M/s)
Operating Range - 400 to 2,000 FPM (2 to 10.2 M/s)
-Standard units with RU274-R2-VDC transducer
Operating Range - 400 to 4,000 FPM (2 to 20 M/s)
-Units with VAFB24-BAC-RUS BACnet actuator with control. or AMS810 high pressure transducer.

OPERATING TEMPERATURE
Minimum -40°F (-40°C). Maximum 200°F (93°C).

FINISH
Mill galvanized frame and damper blade.



CDRAMS shown with optional Ruskin VAFB24-BAC-RAMS Air Measurement BACnet actuator with control.

CERTIFICATE NUMBER AJA07/11923

Application Hint:

Perfect for manually balancing a branch take-off or use with the VAFB24-BAC-RUS (BACnet actuator with control) in lieu of a VAV box or as a Constant Volume box for lab HEPA filter application.

FEATURES

- Factory installed and piped low pressure transducer
- Ultra low-leak damper
- Available from 6" to 24" (152 to 610) diameter

Ruskin CDRAMS helps satisfy the requirements for minimum outside air as required by the following.
- ASHRAE 62.1, 90.1 and 189.1.
- California Title 24
- International Mechanical Code (IMC)
- International Energy Conservation Code (IECC)

VARIATIONS

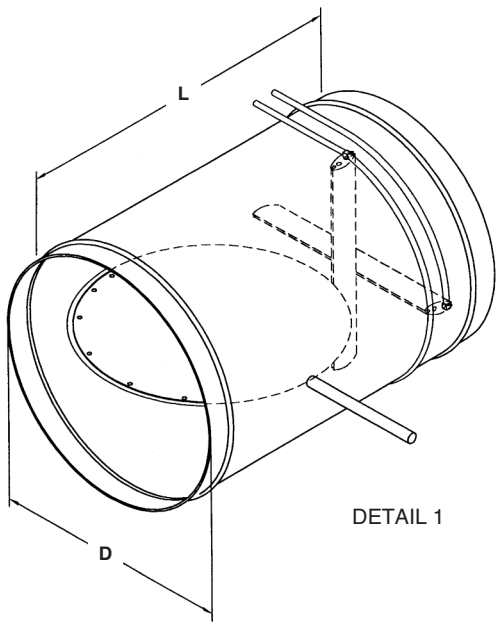
Ruskin model CDRAMS is available with the following variations at additional cost.
- 24 VAC Actuator (VAFB24-BAC-RUS BACnet actuator with control).
- Heavy duty hand quadrant
- AMS810 Transducer with LCD display (AMS810)
- DPT-IQ Transducer with backlit LCD Flow and Pressure display.
- Non-stock 120 VAC or 24 VAC electric actuators
- Actuator mounting bracket for field mounted, customer-furnished actuator.
- Anodized aluminum sensing blades
- Aluminum construction
- Stainless steel 304SS or 316SS construction
- Silicone, EDPM or viton seals

NOTES:
1. Values shown in parenthesis ( ) indicate metric units.
2. Units furnished approximately .125" (3) smaller than given opening diameter.

DIMENSIONAL DETAILS

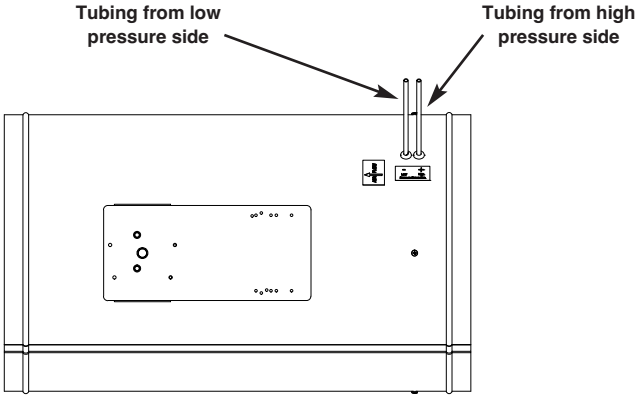
1. Specify “D” diameter (length is determined by diameter).
2. The standard transducer is field selectable 0-5 or 0-10 VDC output.

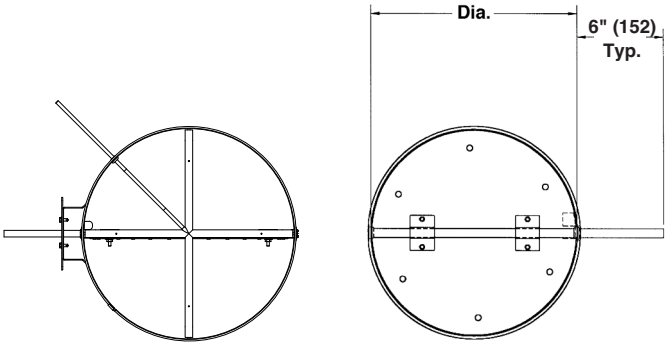
   Specify an AMS810 transducer as required.
   - 4-20 mA output or 0-5 VDC or 0-10 VDC (field selectable)
   - LCD display (displays dp)
   - High pressure applications on units over 1" (248 Pa) w.g.
3. Specify the means of damper control.
   - Manual operation requires a heavy duty hand quadrant.
   - BAS-controlled damper may have either a customer furnished actuator or Ruskin furnished modulating 24 volt actuator. Special actuators available upon request (consult factory).
   - Flow control applications require the Ruskin's VAFB24-BACRUS BACnet actuator with control. Specify the design setpoint CFM (l/s), along with a low and high limit CFM (l/s) when ordering this option. The low limit CFM (l/s) is generally set to the ASHRAE62.1 design for the space. The high limit is generally based on future occupancy or purge requirements. Design is a value that is between the low and high limits. Often, the design is the same as the low limit, since you should never operate below the ASHRAE minimum requirement in the space.
   - Actuator by others - Ruskin provides an actuator mounting bracket.



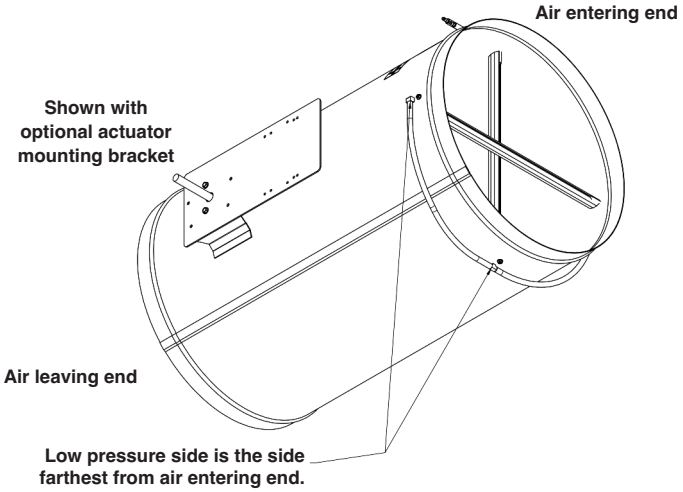
DETAIL 1

Construction shown with ABS flow measuring cross.

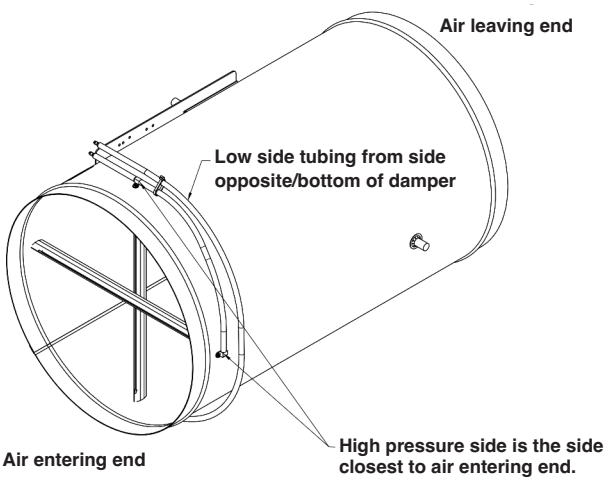




Construction details below shown with anodized aluminum flow measuring cross.



LOW PRESSURE SIDE TUBING ISOMETRIC VIEW



HIGH PRESSURE SIDE TUBING ISOMETRIC VIEW

INSTALLATION DETAILS

DETAIL 1

DETAIL 2

INSTALLATION INSTRUCTIONS

First, provide a space in the existing ductwork (Detail 1). The opening should be large enough to accommodate the length of the CDRAMS per the chart below.

Inspect the ductwork and/or the opening where the CDRAMS Damper will be installed for any obstructions or irregularities that might interfere with blade or the actuator. When installed in the ductwork, the ductwork should be supported in the area of the CDRAMS Damper to prevent sagging

Insert the CDRAMS assembly into the duct. Using 10-16 x 3/4" (19) long tek screws, securing the damper to the duct.

Detail 2 illustrates the installed CDRAMS assembly.

After installing the assembly in the ductwork, caulk around the damper frame to ensure that there is no leakage or bypass around the air measuring station.

Install the pressure transducer or the high pressure transducer with the Ruskin VAFB24-BAC RAMS Air Measurement BACnet actuator with control.

Last, pipe the CDRAMS high and low pressure tubes to the transducer or controller pressure ports. Make sure the high pressure tube is connected to the high pressure port and the low pressure tube is connected to the low pressure port. Use the formula below to determine flow.

"L" Length
6" dia. - 10" dia. (152 - 254) L = 17" (432)
Above 10" dia. = 20" dia. (254 - 508) L = 27" (686)
Above 20" dia. = 24" dia. (508 - 610) L = 31" (787)

SUGGESTED SPECIFICATION

MULTI-POINT CENTER AVERAGING

Multi-point center averaging flow probes take the pressure readings at the center of the assembly. Center averaging improves performance because they are not as affected by poor inlet conditions when compared to linear averaging flow devices. This is because each total pressure port has the same "weight" in determining the pressure reading. In contrast, the total pressure port closest to the point where the reading is taken will have a higher "weight" than the port that is farthest away from the reading.

$$CFM\ (l/s) = (Area \times Ka) \times \sqrt{PAMS}$$

K-FACTORS	
Inlet Size	**Ka**
6" (152)	2282
7" (178)	2496
8" (203)	2590
9" (229)	2642
10" (254)	2633
12" (305)	2408
14" (356)	2820
16" (406)	2749
18" (457)	3450
20" (508)	3450
22" (559)	3050
24" (610)	3200

AMPLIFICATION

Amplification is the ability of the flow probe to produce a signal greater than the velocity pressure. Pitot tubes read true velocity pressure, which requires 4005 FPM (20.3 m/s) to produce a 1" w.g. signal. Velocity pressure is the difference between total pressure and static pressure. Amplified flow probes improve upon this signal by taking the difference between total pressure and a reduced static pressure. Amplification is critical to accurate control of minimum flow rates. The CDRAMS is capable of providing a signal of sufficient magnitude for any type of controller to monitor easily. The performance ranges from 1.42 to 1.76, depending on the inlet size.

$Area = \pi R^2/144$

PAMS = Velocity Pressure Inches Water Gauge (Pa)

SENSITIVITY

Inlet sensitivity is a measure of flow sensing accuracy that can be lost to less than ideal inlet conditions. SMACNA recommends a minimum of three duct diameters of straight duct in front of any flow measuring device. This is not generally the standard practice on many job sites. Duct obstructions result in jogs and turns in both rigid and flexible supply duct. Real world conditions require a flow probe that is capable of measuring air volume to a +/- 5% accuracy, regardless of inlet conditions. If excessive inlet sensitivity results in a reduced flow signal for a given flow volume, the benefit of amplification has been lost. Regardless of sophistication, no controller can overcome less than adequate accuracy from a flow sensor under common field conditions.

The CDRAMS Flow Station has less inlet sensitivity than any other flow probe on the market, with no more than +/- 5% error regardless of inlet condition. In contrast, other center-averaging designs are capable of +/- 10% error. Linear averaging designs can range from +/- 10% to 35% depending on exact condition and angle of approach.

SUGGESTED SPECIFICATION

For units from 6" (152) to 16" (406) with ABS flow cross

Furnish and install, at locations shown on plans or in accordance with schedules, a true round air measuring station with integral control damper and factory piped pressure transducer. Device shall incorporate a cross shaped, multi-point, center averaging sensor, made of a high impact ABS material. Flow probe shall output an amplified differential pressure signal that is at least 1.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube and be capable of measuring air volume to a +/- 5% accuracy. The complete air measuring package shall be factory assembled into a turnkey product capable of sending a 0-10 VDC output signal that is proportional to CFM (l/s). Unit shall have a measuring range from 400 to 4,000 feet per minute (2 to 20.3 meters per second). Units equipped with the standard transducer shall have a measuring range from 400 to 2,000 feet per minute (2 to 10.2 meters per second). The standard transducer shall include a glass-on-silicone GL-Si capacitance sensor capable of measuring up to six field selectable pressure ranges up to 1" (249 Pa) water column. The transducer shall be accurate to ±1% of full scale and be contained within a NEMA 4 (IP-65) painted steel enclosure.

Transducer shall be factory mounted and piped through high and low brass pressure fittings to the sensor averaging ports on the center averaging flow cross. The integral damper shall have a full circumference seal, mechanically locked, between dual blade skins. The low profile blade seal shall be an integral part of the damper blade. Seals that are attached to the inside of the damper frame with adhesive or that clip-on, are not acceptable. Axle bearings shall be non-corrosive stainless steel sleeve type and shall be pressed into the damper frame. The damper axle shall be plated steel and shall run the full length of the blade and extend beyond the outside of the frame, a distance no less than 6" (152mm), to accommodate the control device most desirable for the application. Complete assembly shall be constructed, piped and commissioned in an ISO 9001 certified facility. Air Measuring Stations shall be, in all respects, equivalent to Ruskin Model CDRAMS.

Optional high pressure transducer spec for all CDRAMS:

Units equipped with the optional transducer shall have a measuring range from 400 to 4,000 feet per minute (2 to 20.3 meters per second). The transducer shall have an integral LCD display indicating actual differential pressure. The transducer shall have dip switches that allow for field selection of 0-5 VDC, 0-10 VDC or 4-20 mA output signal and have a minimum of five pressure ranges from 0" to 2.5" (0-610 Pa) water column. The transducer shall have an auto-zero function that is microprocessor controlled. The transducer assembly shall contain a micromachined, single-crystal silicon, piezoresistive pressure sensor. Sensor shall digitally compensate for thermal sensitivity. Accuracy of the transducer shall be ±.05% on 0 to 0.1" (0-25 Pa) range and 0.25" (0-62 Pa) range, ±0.25% on all other ranges. Stability shall be ±0.25% (of span selected) per year. Transducer shall be, in all respects, equivalent to Ruskin Model AMS810.

For units from 18" (457) to 24" (610) with aluminum flow cross

Furnish and install, at locations shown on plans or in accordance with schedules, a true round air measuring station with integral control damper and factory piped pressure transducer. Device shall incorporate a cross shaped, multi-point sensor, made of a aluminum material. Flow probe shall output an amplified differential pressure signal and be capable of measuring air volume to a +/- 5% accuracy. The complete air measuring package shall be factory assembled into a turnkey product capable of sending a 0-10 VDC output signal that is proportional to CFM (l/s). Unit shall have a measuring range from 400 to 4,000 feet per minute (2 to 20.3 meters per second). Units equipped with the standard transducer shall have a measuring range from 400 to 2,000 feet per minute (2 to 10.2 meters per second). The standard transducer shall include a glass-on-silicone GL-Si capacitance sensor capable of measuring up to six field selectable pressure ranges up to 1" (249 Pa) water column. The transducer shall be accurate to ±1% of full scale and be contained within a NEMA 4 (IP-65) painted steel enclosure.

Transducer shall be factory mounted and piped through high and low brass pressure fittings to the sensor averaging ports. All sensor tubing shall terminate in solid brass barbed fittings. The integral damper shall have a full circumference seal, mechanically locked, between dual blade skins. The low profile blade seal shall be an integral part of the damper blade. Seals that are attached to the inside of the damper frame with adhesive or that clip-on, are not acceptable. Axle bearings shall be non-corrosive stainless steel sleeve type and shall be pressed into the damper frame. The damper axle shall be plated steel and shall run the full length of the blade and extend beyond the outside of the frame, a distance no less than 6" (152mm), to accommodate the control device most desirable for the application. Complete assembly shall be constructed, piped and commissioned in an ISO 9001 certified facility. Air Measuring Stations shall be, in all respects, equivalent to Ruskin Model CDRAMS.

Optional VAFB24-BAC RAMS Air Measurement BACnet actuator for all CDRAMS

Units equipped with the optional actuator shall include the high pressure transducer as described in the paragraph to the left titled **"Optional high pressure transducer spec for all CDRAMS".**

In addition, the actuator shall be the BACnet interface and setup port for the air measurement station.

MODE OF OPERATION

The air measurement actuator accepts a CFM SETPOINT via analog input S2. The actuator will modulate the damper to maintain the set point value. Air flow measurement sensor is connected to Input S1 of the actuator and represents a velocity air flow measurement. Air measurement is calculated based on actuator's configuration and reported via the BACnet interface or an analog output from the sensor to the building automation system. Air Measurement actuator includes WEBSERVER and can be configured using any web browser such as InternetExplorer.

Direct Position Control via BACnet or Analog Input is also possible, using the flow input for reporting only.

- Torque 180 in-lb
- Ethernet 10/100 Mbit/s, TCP/IP, integrated Web server
- BACnet/IP, BACnet MS/TP
- Two analog inputs for flow sensing and receiving a DDC setpoint
- Setup via integrated Web Server and Ethernet IP connection, directly to actuator, using any web browser.
- Fail Safe Signal Interlock, drives damper closed on loss of signal.
- Spring open or spring close on loss of power as required for application.
- 95 seconds open, less than 60 seconds close
- NEMA 2, IP54, UL enclosure type 2
- Built in Data Logging
- Control up to three additional actuators via MP-Bus

Actuator shall be, in all respects, equivalent to Ruskin Model VAFB24-BAC-RUS.

RUSKIN

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