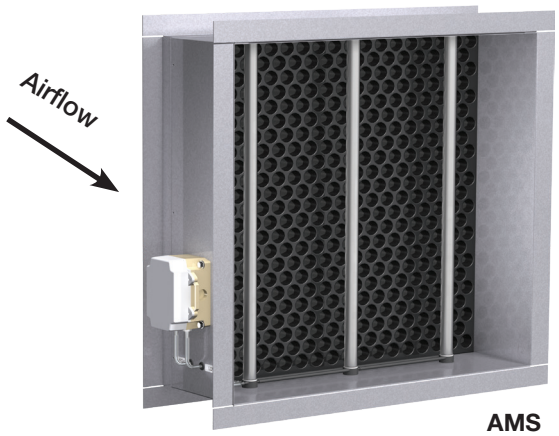
Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.



AMS

AMD

Note: A minimum velocity of 300 fpm (1.5 m/s) is required.

Table of Contents

Receiving and Handling

Upon receiving dampers, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

Dampers must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. Do not store at temperatures in excess of 100°F (38°C).

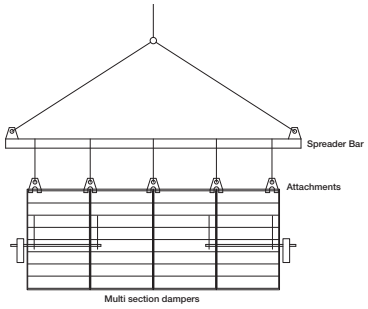
Safety Warning

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

Pre-Installation Guidelines

The basic intent of a proper installation is to secure the AMS & AMD series damper into the opening in such a manner as to prevent distortion and disruption of damper operation. The following items will aid in completing the damper installation in a timely and effective manner.

1) Check the schedules for proper damper locations within the building. Visually inspect the damper for damage.
2) Lift or handle damper using sleeve or frame. Do not lift damper using blades, linkage, actuators, pick-ups, or jackshafting. When handling multiple sections assemblies, use sufficient support to evenly lift at each section mullion (see drawing). Do not drag, step on, apply excessive bending, twisting, or racking.



3) Do not install screws in damper frame that will interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
4) Damper must be installed into duct or opening square and free of twist or other misalignment. Damper must not be squeezed or stretched into duct or opening. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/ actuator design.
5) Damper and actuator must be kept clean, dry and protected from dirt, dust and other foreign materials prior to and after installation. Examples of such foreign materials include but are not limited to:
    a) Mortar dust
    b) Drywall dust
    c) Firesafing materials
    d) Wall texture
    e) Paint overspray
6) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet (1.5m) of the damper. Excessive dirt or foreign material deposits on damper can cause excessive leakage and/or torque requirements and inaccurate airflow measurement to exceed damper/actuator design.
7) ACCESS: Suitable access (actuators maintenance, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct.

Electrical Guidelines

Electrical Guidelines

All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, any local codes that may apply, and wiring diagrams developed in compliance with the job or project design and specifications.

Important!

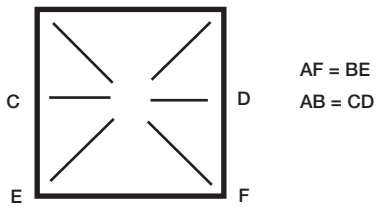
Electrical input may be needed for this equipment. This work should be performed by a qualified electrician. Verify power before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring. To avoid causing death or serious bodily harm to building occupants, follow all instructions carefully. Dampers must close completely to preserve the integrity of the fire smoke separation.

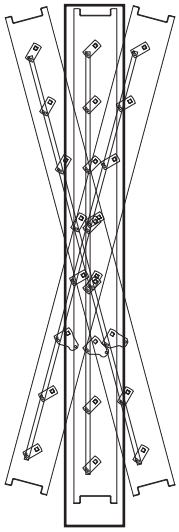
Installation- Failure to follow instructions will void all warranties

1. Ensure the AMS or AMD series damper is mounted with airflow straightener upstream of the damper.
2. Duct opening or opening square should measure ¼ inch (6mm) larger than damper dimension and should be straight and level.
3. Use shims between damper frame and duct opening or opening space to prevent distortion of frame by fasteners holding it in place. Brace at every horizontal mullion and vertically brace at every 8 feet (2.4m) of damper width for strength. Dampers in high velocity (2000 fpm [610m per second]) may require more bracing.

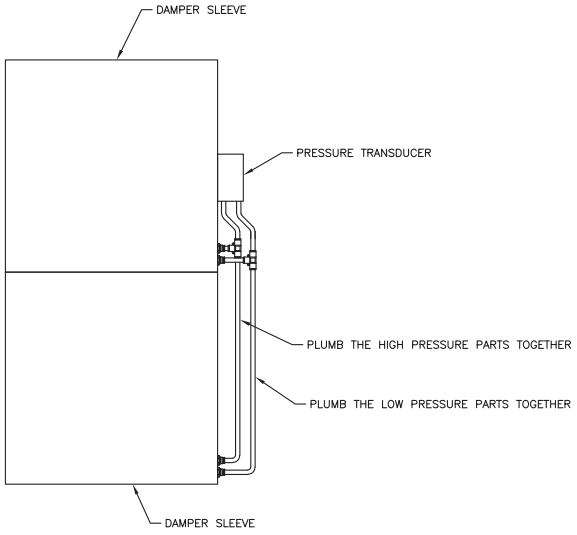
Note: Greenheck dampers are specifically designed and engineered for structural integrity based on model and conditions. Attachment, framing, mating flanges, and anchoring of damper assemblies into openings, ductwork, or walls is the responsibility of the installer. Design calculations for these retaining and supporting members should be determined by field engineers for that particular installation.

4. Individual damper sections, as well as entire multiple section assemblies must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each section.
5. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle dampers after installation to assure proper operation. On multiple section assemblies all sections should open and close simultaneously.
6) Installing two section high AMD series together. AMD's more than one section high will be shipped separately in individual sleeves. The high and low pressure ports need to be plumbed together and then plumbed back to the pressure transducer.





Do not twist or bow. Mount damper plumb in the opening.



Setup and Operation for AMS and AMD Series Without Factory Supplied Controller

Each AMD and AMS is shipped with a highly accurate pressure transducer (+/- 0.25% of range) that results in optimal airflow measurement accuracy (see **Figure 1**).The pressure transducer outputs a 0-10 VDC signal that is proportional to the pressure measured by the airflow station. The high pressure limit of the transducer is set at the factory to optimize the resolution of the reading. The selection is based on the maximum velocity of the application that was selected at the time the unit was ordered. The selected transducer range is listed on a label affixed to the AMD or AMS (see example label below). Using the high pressure limit of the transducer and the voltage output of the transducer the real-time pressure reading can be calculated using the formula:

$$P_{transducer} = (\text{Transducer Output Voltage}) * (\text{High Pressure Limit of Transducer}) / 10$$

Formula 1

The pressure reading of the transducer can then be used to calculate the volumetric flow rate going through the AMS or AMD using the formula:

$$Q_{SC} = \text{Damper Area} * K * (P_{transducer})^m$$

where Q_{SC} = cfm at standard air conditions

Formula 2

The K & m values are damper specific constants that are listed on the label. The area of the damper is also listed on the label.

Figure 1: BAPI transducer

Sales Order : 7524813 Line 20
Prod Order : 70351876 AMD-23
Width : 78.000 Height : 13.000

$Q_{sc} = Area * K * P^m$

Q_{sc}: cfm @ standard air conditions
P: Pressure (in*wc)
Area = 7.04 ft^2 K = 2,094 m = 0.49
Vmax: 1,500 fpm
Transducer Range: 0 - 1.00 IN.WC
Transducer Output: 0-10 VDC

AMD Label ADS476397

Label 1: AMD/AMS Label

Formula 2 calculates the cfm at “standard air conditions”. To correct the cfm value to the air density on the job (Q_{SITE}) use the formula and air density correction factor (cf) shown below.

$$Q_{SITE} = cf * Q_{SC}$$

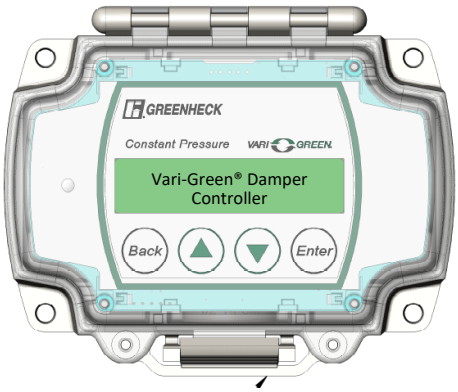
Formula 3

Duct Air Temp	Air Density Correction Factors																		
	Elevation Dimensions in feet and (meters)																		
°F (C°)	0 (0)	500 (152.4)	1000 (304.8)	1500 (457.2)	2000 (609.6)	2500 (762)	3000 (914.4)	3500 (1066.8)	4000 (1219.2)	4500 (1371.6)	5000 (1524)	5500 (1676.4)	6000 (1828.8)	6500 (1981.2)	7000 (2133.6)	7500 (2286)	8000 (2438.4)	8500 (2590.8)	9000 (2743.2)
-40 (-40)	0.79	0.81	0.82	0.84	0.85	0.87	0.88	0.90	0.92	0.93	0.95	0.97	0.99	1.01	1.02	1.04	1.06	1.08	1.10
-20 (-29)	0.83	0.85	0.86	0.88	0.89	0.91	0.93	0.94	0.96	0.98	1	1.01	1.03	1.05	1.07	1.09	1.11	1.14	1.16
0 (-18)	0.87	0.88	0.9	0.92	0.93	0.95	0.97	0.99	1	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21
20 (-7)	0.91	0.92	0.94	0.96	0.97	0.99	1.01	1.03	1.05	1.07	1.09	1.11	1.13	1.15	1.17	1.19	1.22	1.24	1.26
40 (4)	0.94	0.96	0.98	1	1.01	1.03	1.05	1.07	1.09	1.11	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.31
60 (15)	0.98	1	1.02	1.04	1.05	1.07	1.09	1.11	1.13	1.16	1.18	1.20	1.22	1.24	1.27	1.29	1.32	1.34	1.37
70 (21)	1	1.02	1.04	1.06	1.07	1.09	1.11	1.14	1.16	1.18	1.20	1.22	1.24	1.27	1.29	1.32	1.34	1.37	1.39
80 (27)	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.27	1.29	1.32	1.34	1.37	1.39	1.42
100 (38)	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.27	1.29	1.32	1.34	1.37	1.39	1.42	1.44	1.47
120 (49)	1.09	1.11	1.13	1.16	1.18	1.20	1.22	1.24	1.27	1.29	1.31	1.34	1.36	1.39	1.41	1.44	1.47	1.50	1.53
140 (60)	1.13	1.15	1.17	1.19	1.22	1.24	1.26	1.29	1.31	1.33	1.36	1.38	1.41	1.44	1.46	1.49	1.52	1.55	1.58
160 (71)	1.17	1.19	1.21	1.23	1.26	1.28	1.30	1.33	1.35	1.38	1.40	1.43	1.46	1.48	1.51	1.54	1.57	1.60	1.63
180 (82)	1.21	1.23	1.25	1.27	1.30	1.32	1.35	1.37	1.40	1.42	1.45	1.48	1.50	1.53	1.56	1.59	1.62	1.65	1.68
200 (93)	1.25	1.27	1.29	1.31	1.34	1.36	1.39	1.41	1.44	1.47	1.49	1.52	1.55	1.58	1.61	1.64	1.67	1.70	1.74

Table 1 - Air Density Correction Factor

Setup and Operation for AMS and AMD Series With Factory Supplied Controller

Units ordered with a factory controller are supplied with a Greenheck Vari-Green constant volume controller. The Vari-Green constant volume controller is highly configurable, but is shipped from the factory preprogramed as ordered and thus does not normally required field configuration. The full installation and operation manual for the controller is available at http://www.greenheck.com/products/detail/91 under the Instruction Manual tab.



In its default operating mode the controller will modulate the damper's actuator to achieve a cfm setpoint. The controller receives the cfm setpoint via an analog input. The controller also has an analog output that is proportional to the real-time cfm that is going through the AMS/AMD. The following section describes how to determine the voltage corresponding to the desired cfm setpoint and how to convert the voltage output into cfm.

Setting the Flow Setpoint

The controller accepts an analog input (configurable for either 0-10 or 2-10 VDC) that is proportional to a target volumetric airflow rate (cfm). The voltage corresponding to the setpoint can be determined using the following formulas:

0-10 VDC setpoint

$$C = Q / (V_{max} * A) * 10$$

2-10 VDC setpoint

$$C = Q / (V_{max} * A) * 8 + 2$$

Formula 3

Where:

C = Flow Setpoint (VDC)

Q = Desired Airflow (cfm)

$\mathbf{V}_{max}$ = Maximum Velocity as specified at the time the unit was ordered (fpm)

A = Face Area of the Damper (ft^2)

Note that V_{max} and A are found on the label affixed to the AMD/AMS next to the transducer (see Label 1)

Example: The BMS desires 6,000 cfm through a 24 in. x 24 in. AMD-42 that was ordered with a maximum velocity of 2,000 fpm. Find the voltage setpoint that corresponds to 6,000 cfm:

C = 6,000 / (2,000 * 4) * 10 = 7.5VDC (0-10 VDC)

C = 6,000 / (2,000 * 4) * 8 +2 = 8 VDC (2-10 VDC)

Controller's Analog Output Proportional to Real-Time Airflow

The controller outputs an analog signal (configurable for either 0-10 or 2-10 VDC) that is proportional to the real-time airflow rate (cfm) going through the AMD/AMS. The cfm corresponding to the voltage output can be determined using the following formulas:

0-10 VDC output

$$Q = (C * V_{max} * A) / 10$$

2-10 VDC output

$$Q = ((C-2) * V_{max} * A) / 8$$

Formula 4

Where:

C = Voltage Output Signal (VDC)

Q = Real-time Airflow (cfm)

$\mathbf{V}_{max}$ = Maximum Velocity as specified at the time the unit was ordered (fpm)

A = Face Area of the Damper (ft^2)

Note that V_{max} and A are found on the label affixed to the AMD/AMS next to the transducer (see Label 1)

Controller Display

The controller has a two line backlit LCD display. By using the up and down arrows on the controller's cover the display can be toggled to show one of three sets of data:

- Top Screen: Real-Time CFM and CFM Setpoint
- Middle Screen: Real-Time Velocity (fpm) and Velocity Setpoint
- Bottom Screen: Real-Time Differential Pressure Measurement and Actuator Position

Wiring the Controller

The basic wiring of the controller is shown below in **Figure 2**. The controller's three terminal blocks can be accessed by opening the cover of the enclosure.

Powering the Controller

The controller is powered by applying electrical power to the "Power In" terminal block. The controller can run off of 24 VAC +/- 20% 50/60 Hz ; 24 VDC +/- 10%.

Connecting the Pressure Transducer

The second terminal block is labeled "Remote Sensor" and is used to connect the pressure transducer. The three terminals from the Remote Sensor block connect directly to the pressure transducer as shown in **Figure 2**. The controller supplies the transducer with its power and reads the pressure signal.

Connecting the Damper Actuator

The actuator can be powered either by the same power supply as the controller (as shown in **Figure 2**) or by running a separate power supply to terminals 4 and 5 of the factory supplied terminal block on the AMD/AMS. In addition, the "Control Out" from the controller (terminal 7) must be run to terminal 6 on AMD/AMS terminal block.

Connecting the Flow (or position) Setpoint Signal

Connect the 0-10 VDC or 2-10 VDC flow (or position) setpoint to the controller's terminals 1 and 3. The controller's terminal 1, labeled Remote Setpoint, is the positive terminal and the controller's terminal 3 is the negative terminal.

Connecting to the Flow Output Signal

Connecting to controller terminals 6 and 3 allows the user to read the 0-10 VDC or 2-10 VDC flow output that is proportional to the cfm measured by the AMD/AMS. To convert the voltage signal to cfm see the section above on Controller's Analog Output Proportional to Real-Time Airflow.

Override Mode

See the full Vari-Green constant volume controller installation and operation manual for a description of the override feature. The override feature can be activated by closing the contacts of an external relay across terminals 2 and 3 (or by simply putting a jumper wire across them).

Vari-Green Constant Volume Controller Wiring Diagram

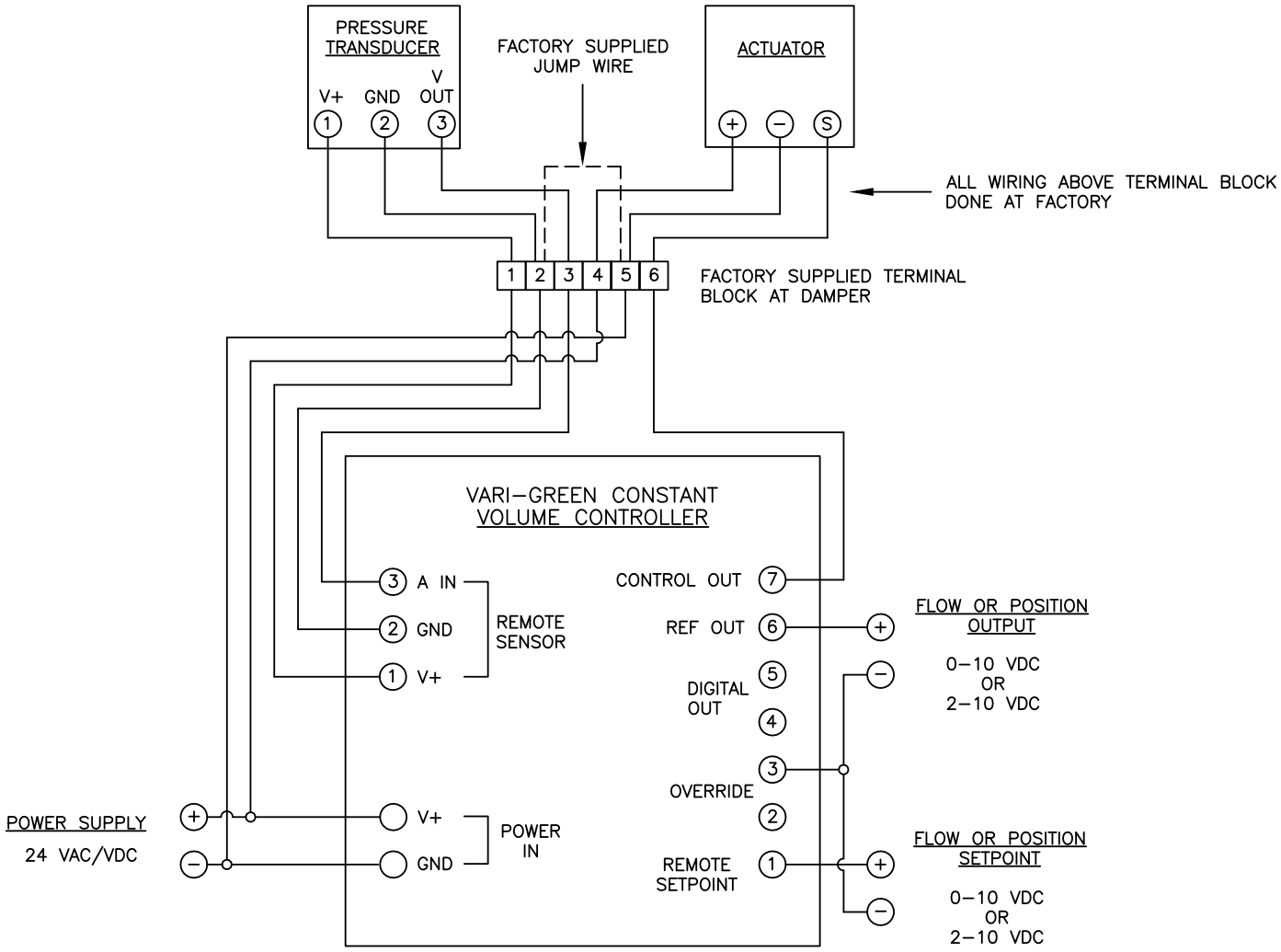
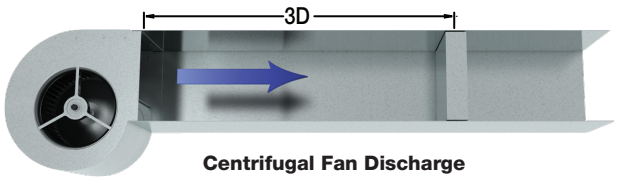


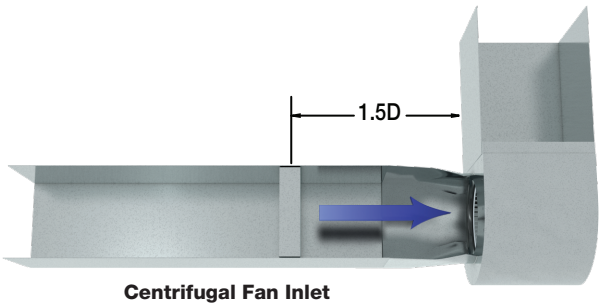
Figure 2

Optimal Placement for AMS & AMD Damper Series

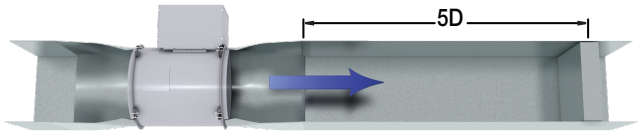
Fans



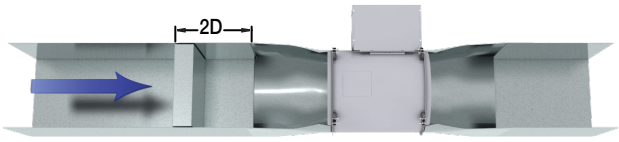
Centrifugal Fan Discharge



Centrifugal Fan Inlet

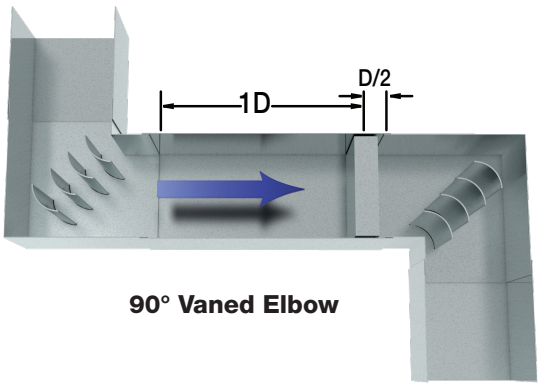


Vane Axial Fan Discharge

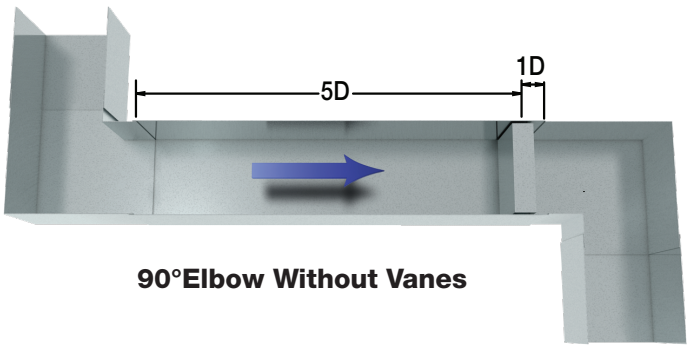


Vane Axial Fan Inlet

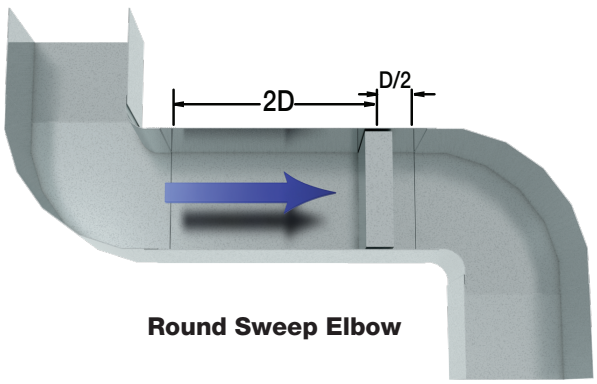
Elbows



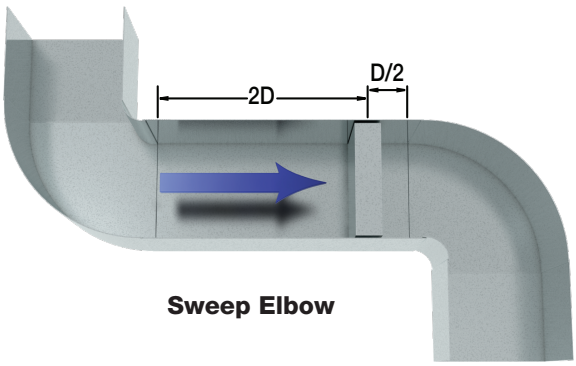
90° Vaned Elbow



90°Elbow Without Vanes

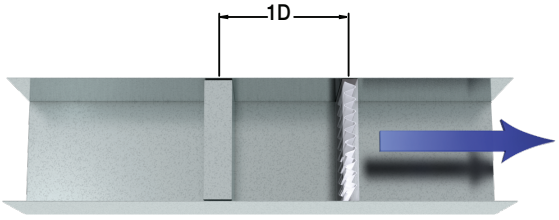


Round Sweep Elbow

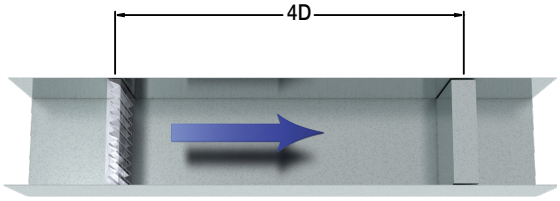


Sweep Elbow

Dampers

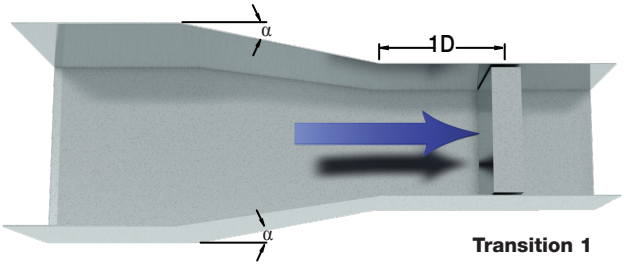


D1

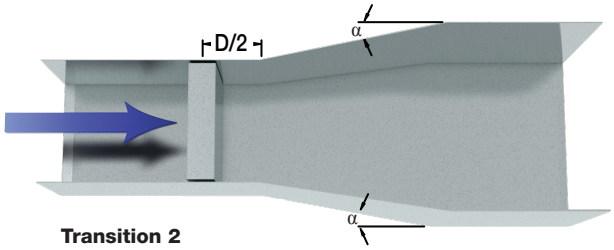


D2

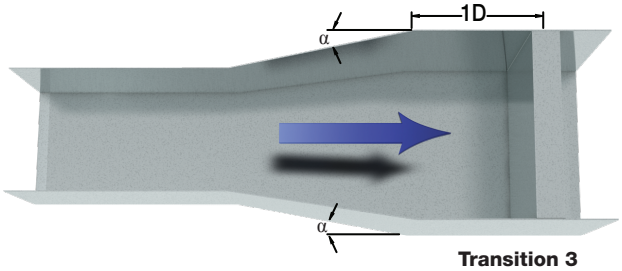
Transitions



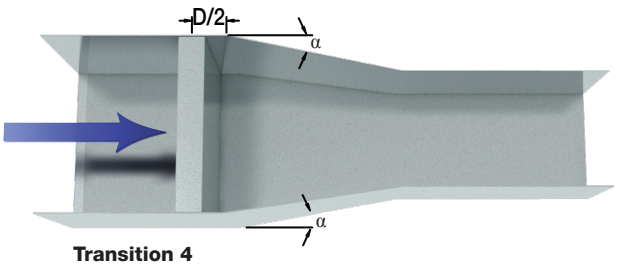
Transition 1



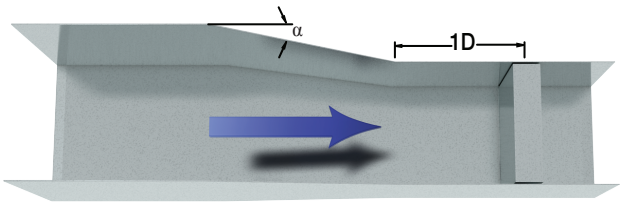
Transition 2



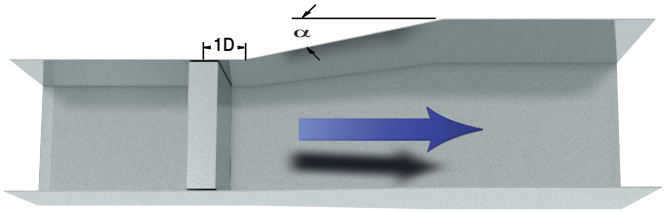
Transition 3



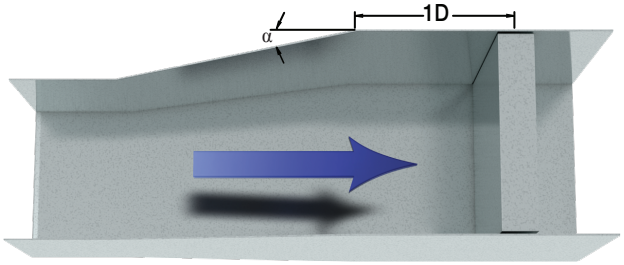
Transition 4



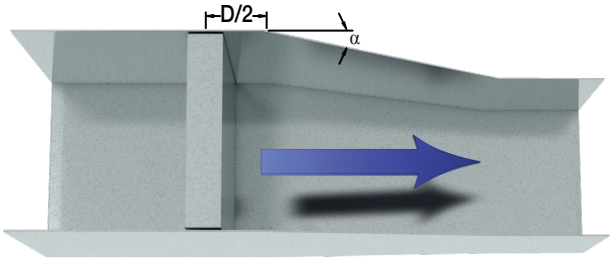
Transition 5



Transition 6

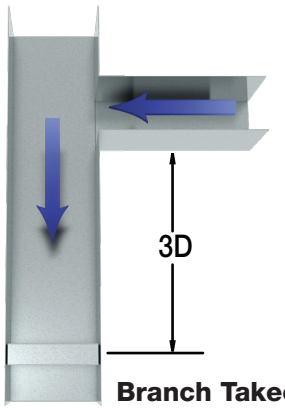


Transition 7

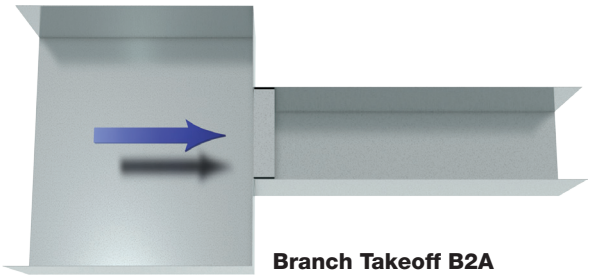


Transition 8

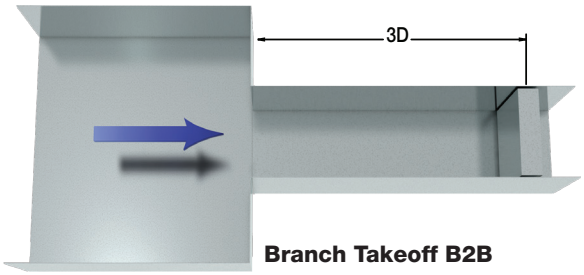
Takeoffs



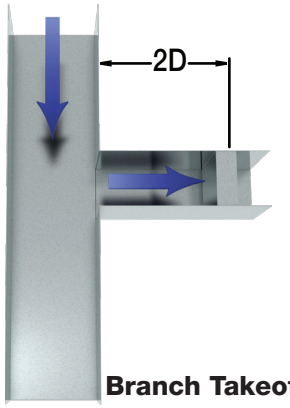
Branch Takeoff 1



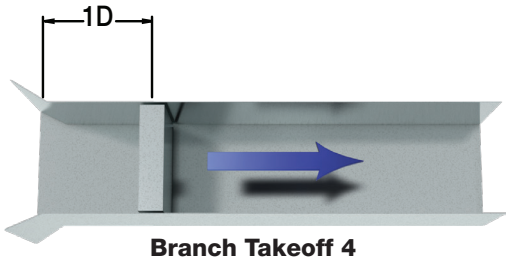
Branch Takeoff B2A



Branch Takeoff B2B

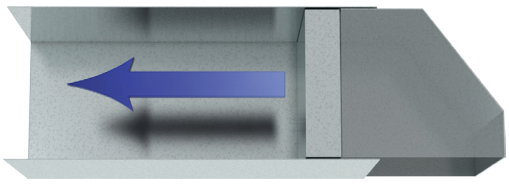


Branch Takeoff 3

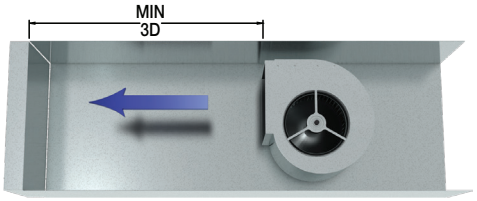


Branch Takeoff 4

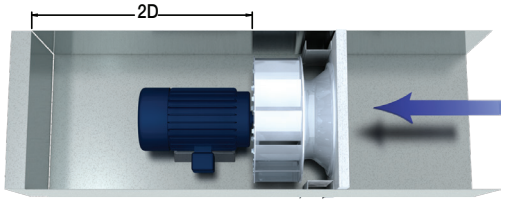
Air Handling Units



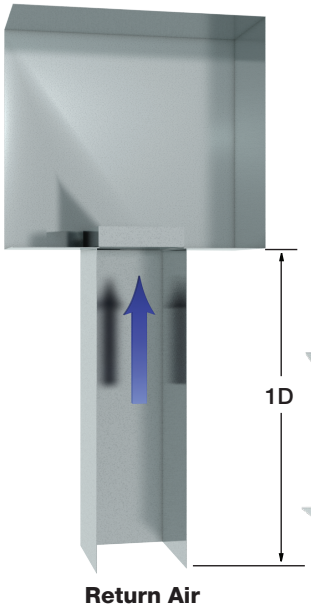
Hood



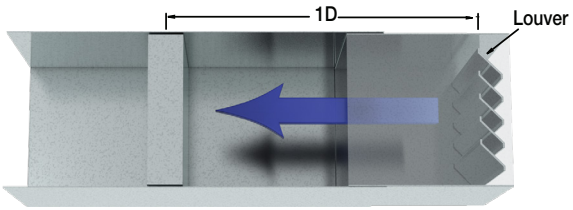
Fan Discharge 2



Fan Discharge 1



Return Air



Air Handler with Louver

Rectangular Duct: $D = \sqrt{\frac{4 \times \text{Width} \times \text{Height}}{\pi}}$

Circular Duct: D = Duct Diameter

Damper Maintenance

Greenheck's dampers are designed to be trouble free and hassle free under normal operation. Dampers are to installed square and straight so as to prevent binding during operation. the following annual damper maintenance suggestions will help to insure proper damper operation and increase the life expectancy of the damper.

Foreign Matter Over the course of time, dirt and grime may collect on damper surfaces. The damper surfaces should be cleaned to prevent hindrance to airflow.

Moving Parts Make sure that parts such as linkage, bearings, blades, etc. that are intended to move freely, can do so. Lubricating these components can prevent possible rusting and unnecessary friction increase. Use only a moli-spray oil or similar graphite based oil as regular lubricating oil will attract dirt.

Bearings. Synthetic, oil impregnated, and ball bearings (without grease fittings) do not require lubrication. Ball bearings with grease fittings require only minimal grease.

Closure Remove foreign materials that may be interfering with blade closure or effective sealing of the blades with each other or with the frame.

Operation While operating the damper through its full cycle, check to see that the blades open and close properly. If there is a problem, check for loose linkage, especially at the actuator. Tighten the linkage where required.

Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Product warranties can be found online at Greenheck.com, either on the specific product page or in the literature section of the website at Greenheck.com/Resources/Library/Literature.

GREENHECK
Building Value in Air.

Phone: 715.359.6171 • Fax: 715.355.2399 • Parts: 800.355.5354 • E-mail: gfcinfo@greenheck.com • Website: www.greenheck.com

