

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.



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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 ideal. Do not store at temperatures in excess of 100°F (37°C).

Safety Warning

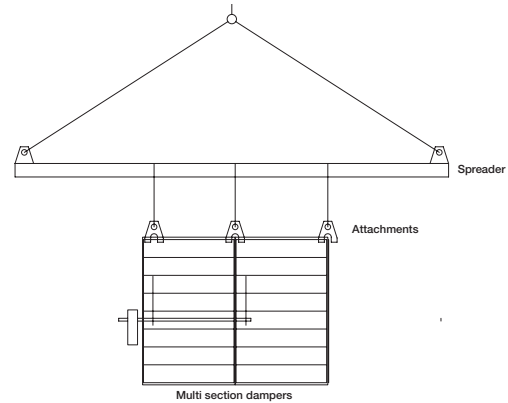
Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

This manual is the property of the owner and is required for future maintenance. Please leave it with the owner when the job is complete.

Pre-Installation Guidelines

The basic intent of a proper installation is to secure the AMD-xx-TD 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 your schedule for proper damper locations within the building. Visually inspect the damper for damage.
2. When you lift or handle the damper use the sleeve or frame. Do not lift damper using blades, linkage, actuators, probes, or jackshafting. When you handle multiple section 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, actuator, and transmitter 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 the 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

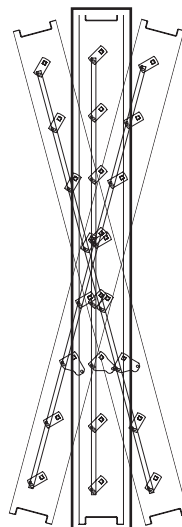
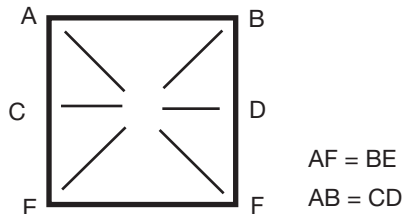
All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, any local codes that may apply, and wiring diagrams developed in compliance with the job or project design and specifications.

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 AMD-XX-TD series dampers is mounted with measurement probes upstream of the damper.
2. Your duct opening or opening square should measure $\frac{1}{4}$ inch (6mm) larger than damper dimension and should be straight and level.



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

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.

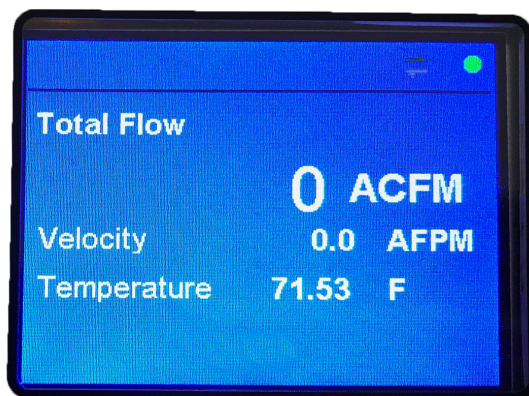
NOTE: Greenheck dampers are specifically designed and engineered for structural integrity based on model and conditions. Attachment, framing, mating flanges, and anchoring of damper assemblies into openings, ductwork, or walls is the responsibility of the installer. Design calculations for these retaining 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, you can cycle dampers after installation to assure proper operation. On multiple section assemblies all sections should open and close simultaneously.
6. AMD-xx-TD series more than one section high will be shipped separately in individual sleeves. Using the provided RJ-45 cable connect the bottom probe on the top section to the top probe on the bottom section. The bottom section has the transmitter mounted to it.

Setup and Operation for AMD-xx-TD Series Damper

All AMD-xx-TD's are supplied with a Vari-Green® airflow rate transmitter that is factory wired to one or more Vari-Green airflow measurement probe(s). The transmitter has been configured at the factory with customer supplied parameters. For normal applications the transmitter's configuration should not need to be modified in the field. However, if field configuration is necessary please reference the Vari-Green transmitter Installation, Operation, and Maintenance Manual available at www.greenheck.com.

Once electrical power is applied, the transmitter will go through a standard start-up sequence during which it will identify and enable each airflow sensor. This will take approximately 25 seconds. Once the start-up sequence has been complete, the transmitter's display will show the measured volumetric airflow rate, velocity, and ambient air temperature (see below). Under normal operation, a blinking green dot in the upper right corner of the display signifies that the processor is functioning correctly, and two flashing arrows indicate that the sensor(s) and transmitter are communicating normally.



You can order AMD-xx-TD's with or without a factory supplied controller. When a factory supplied controller is ordered, the controller can be configured for either analog operation or operation via a BACnet MS/TP connection. Setup and operation for these different options are described on the following pages.

AMD-xx-TD Series Damper Without a Factory Supplied Controller

Units ordered without a factory supplied controller are supplied with a standard modulating actuator. The Vari-Green transmitter and actuator are wired to a factory supplied terminal block. **Figure 1** shows the field wiring side of the terminal block.

The 0-10 VDC analog output at terminals 3 and 4 comes from the Vari-Green transmitter and is proportional to the velocity going through the AMD-xx-TD. A 10 VDC signal represents the maximum velocity that was selected at the time the unit was ordered. The selected maximum velocity and the area of the AMD-xx-TD are listed on a label adjacent to the terminal block. An example of how you can determine the velocity and/or cfm going through the unit is shown below.

Example 1:

Determine the CFM from a 24 in. x 24 in. AMD-xx-TD (area of 4 ft²) with a selected maximum velocity of 2,000 fpm and a voltage reading across terminals 3 and 4 of 3.5 VDC.

AMD-42-TD	
Sales Order 7398379	Line 20
Prod. Order 64240081	
Width 28.000 in.	Height 42.000 in.
Area = 8.00 ft ²	Max Velocity 3,000 fpm
Qmax = 24,500 cfm	
Controller Type = ANALOG	
$Q = \frac{V}{10} * Q_{max}$	
Q: Airflow (cfm)	
V: Measured Voltage from Transmitter	
ADS481148	

Measured Velocity = Max Velocity * (Measured Voltage / 10)

Measured Velocity = 2,000 * (3.5 / 10)

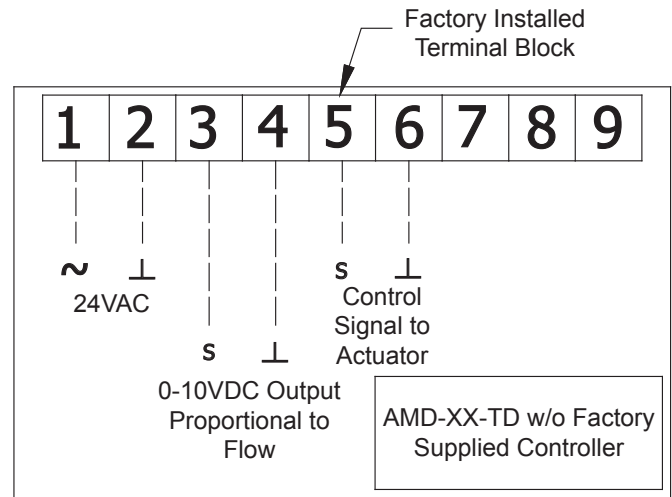
Measured Velocity = 700 fpm

and

Measured CFM = Measured Velocity * Area

Measured CFM = 700 fpm * 4 ft²

Measured CFM = 2,800 cfm



*** On multiple section high dampers, the actuators on the sections without the terminal block will need to be field wired into Terminals 1, 2, & 5 ***

Figure 1

AMD-xx-TD Series Ordered with a Factory Supplied Controller

When you order a factory supplied controller, it comes with a Greenheck exclusive VAF24-BAC-GTD actuator which has the controller integrate inside of it. The actuator/controller is configured by the factory at the time the unit was ordered for either analog or BACnet operation. This selection is made by setting the Setpoint Source datapoint to Local AI or BACnet. A complete list of all the BACnet datapoints is listed in Table 1 (page 7).

AMD-xx-TD Series Damper with an Analog Factory Supplied Controller

Figure 2 shows field wiring for an AMD-xx-TD ordered with a factory supplied controller configured for analog operation.

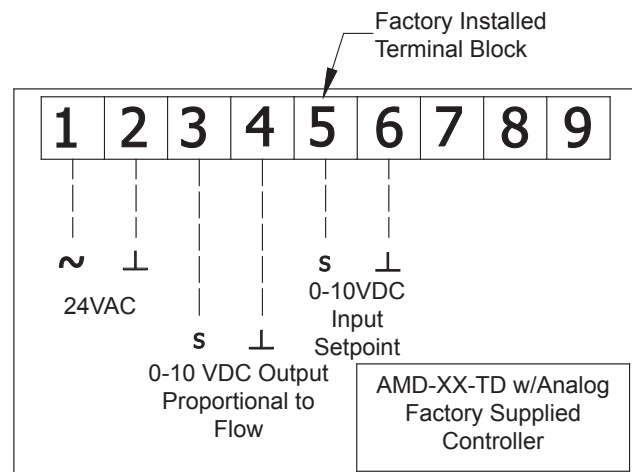


Figure 2

The controller is designed to modulate the AMD-xx-TD series damper such that it maintains a desired cfm setpoint. The setpoint is supplied via a 0-10 VDC analog input (terminals 5 and 6) that is proportional to that setpoint. The Vari-Green transmitter will output a 0-10 VDC signal (terminals 3 and 4) proportional to the actual cfm being measured by the unit. For both the desired cfm setpoint and the cfm output, a voltage reading of 10 VDC represents the **maximum** velocity that was selected at the time the product was ordered. The selected maximum velocity and the area of the AMD-xx-TD are listed on a label adjacent to the terminal block. Example 2 shows how to determine the voltage corresponding to the desired cfm setpoint.

Example 2:

Determine the voltage setpoint that should be sent to terminals 5 & 6 to achieve a flow of 4,800 CFM on a 24 in. x 24 in. AMD-xx-TD (area of 4 ft²) with a selected maximum velocity of 2,000 fpm.

Maximum CFM = 4 ft² * 2,000 fpm = 8,000 cfm

Voltage Setpoint = 10 * (Desired CFM Setpoint / Maximum CFM)

Voltage Setpoint = 10 *(4,800 / 8,000) = 6.0 VDC

See example 1 on how to convert the transmitter voltage output (terminals 3 & 4) to cfm.

AMD-xx-TD Series Damper with a BACnet Enabled Factory Supplied Controller

Figure 3 shows field wiring for an AMD-xx-TD ordered with a factory supplied controller configured for BACnet MS/TP connection.

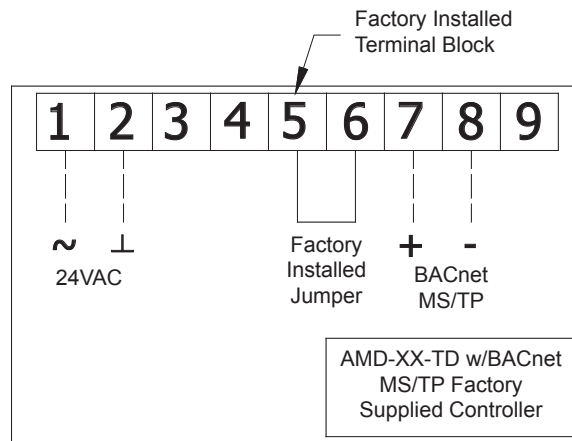


Figure 3

This controller is designed to modulate the AMD-xx-TD series damper such that it maintains a desired cfm setpoint. The setpoint is established by the *BACnetSetpoint* datapoint. Table 1 lists all of the BACnet datapoints. The *BACnet Setpoint* is a percentage of the *MaxCFMSetpoint* datapoint, which is set at the factory based on the maximum velocity which is selected at the time the unit is ordered.

Example 3: Determine the BACnet setpoint for a 24 in. x 24 in. AMD with a maximum velocity of 2,000 fpm and a target flow of 6,000 cfm.

MaxCFMSetpoint = 8,000 cfm (4 ft² x 2,000 fpm)

BACnet Setpoint = (Target CFM / Maximum CFM)

BACnet Setpoint = (6,000 / 8,000) = 75%

With a *BACnet Setpoint* of 75% the actuator/controller will position the damper to allow 6,000 cfm through it.

Position Control Mode

Example 3 applies when the actuator/controller is in its factory default operating mode called “Flow Control Mode”. However, for certain applications it may be desirable to operate the AMD-TD as a standard modulating damper. This can be accomplished by changing the *DamperMode* BACnet data point (see **Table 1**) from *CurrentAirflow* to *DamperPosition*. In “Position Control Mode” a *BACnet Setpoint* of 75% will drive the damper 75% open instead of finding a position that supplies 75% of the maximum airflow.

Safety Override of the BACnet Setpoint

If your application requires the ability to locally close the damper, the factory installed jumper wire should be removed and replaced with a normally closed “safety switch”. When the safety switch is closed the damper will track the *BACnet Setpoint* as if the jumper wire was left in place. When the safety switch is open the actuator will power the damper closed. Interlocking the damper with a fan such that the damper closes when the fan shuts down is an example of when the safety switch feature may be utilized.

Setting the Actuator/Controller’s BACnet Configuration

The actuator’s BACnet configuration including the device instance, MAC address, and baud rate can be accessed through its Ethernet port.

Connecting to the Actuator

1. Using an Ethernet cable, connect the CAT 5 Ethernet port on your computer to the CAT 5 port on your actuator.
2. Go into your computer’s Control Panel and access the Local Area Connection

Windows 7 or 8

- Access the Network and Internet settings then the Network Sharing Center
- Click on Change adapter settings then right click on the Local Area Connection and select Properties

Windows XP

- Open Network Connections
- Right click on the Local Area Connection and select Properties

Access IP Address Settings

1. Select Internet Protocol

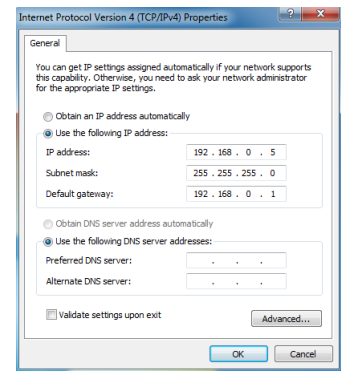
Windows 7 or 8

Select Internet Protocol Version 4 (TCP/IPv4) then click on Properties

Windows XP

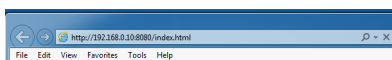
Select Internet Protocol (TCP/IP) then select Properties

2. Change the IP Address to the value shown below. Then hit the Tab key and the Subnet mask will populate. Then click OK.

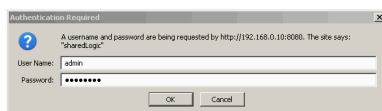


Access the Actuator

1. Open Internet Explorer and enter the following address: <http://192.168.0.10:8080/index.html>



2. Enter “amdsetup” as the User Name and “gfcamd” as the password.



Entering the BACnet Settings

1. Click on BACnet/MP settings.
2. Select MS/TP as Protocol
3. Configure the desired baud rate and MAC address
4. Choose unique Instance ID
5. Enter desired Device Name (optional)
6. Click Submit button

BACNet Data Point List

Table 1 lists and describes all of the BACnet data points associated with the controller inside the actuator of BACnet enabled AMD-TD series dampers.

Name	Type	#	Access	Description
Greenheck AMD-TD	AI	1	C	Displays the application version
AirflowSetpoint	AI	2	C	Displays the real-time setpoint in cfm
CurrentAirflow	AI	3	C	Displays the real-time volumetric airflow rate in cfm
AirVelocity	AI	4	C	Displays the real-time air velocity in fpm
DamperPosition	AI	5	C	Displays the real-time damper position as a percentage (0% - fully closed; 100% fully open)
MaxCFMSetpoint	AI	6	C	Displays the maximum volumetric airflow rate in cfm. This value is a function of the value selected for "Maximum FPM". (Max CFM Setpoint = Damper Area * Maximum FPM).
DamperArea	AV	1	C	Represents the nominal damper face area in square feet. Set by the factory.
MinimumFPMSetpoint	AV	2	C	Represents the minimum allowable velocity setpoint in fpm. If the actuator receives a setpoint below the "Minimum FPM Setpoint" the setpoint will be set to zero. The factory default value is 100 fpm.
BACnet Setpoint	AV	3	C	When the Setpoint Source is set to BACnet this variable establishes the unit's setpoint. When the Damper Mode is set to Flow the BACnet Setpoint is a percentage of the MaxCFM Setpoint. When the Damper Mode is set to Position the BACnet Setpoint is the percentage the damper is open. When the Setpoint Source is set not set to BACnet this variable has no impact on controlling the damper.
SafetyStatus	BI	1	C	Represents the status of the safety circuit. Inactive = Open/Failure; Active = Closed/OK
MaximumFPM	MV	1	C	Represents the maximum setpoint velocity in fpm. The value this variable is set to corresponds to a 10 VDC input to the actuator. This value is set at the factory based on maximum velocity that was selected at the time the unit was ordered. 1 = 500 fpm; = 1000 fpm; 3 = 1500 fpm; 4 = 2000 fpm; 5 = 2500 fpm; 6 = 3000 fpm; 7 = 3500 fpm; 8 = 4000 fpm
DamperMode	MV	2	C	Establishes the mode of operation for the actuator. When in flow control mode the actuator will view the setpoint as a target cfm to maintain. When in position control mode the actuator will view the setpoint percentage as a position to drive to (0% fully closed, 100% fully open). Whether the actuator is in Flow or Position control mode the source of the setpoint will be determined by the Setpoint Source variable. 1 = Flow; 2 = Position
SetpointSource	MV	3	C	When set to BACnet the actuator uses the BACnet variable as the setpoint. When set to Local AI it uses the actuator's second analog input (S2) as the setpoint. When set to Zth the actuator uses a handheld Zth module to establish the setpoint. 1 = Local AI; 2 = BACnet; 3 = ZTH

AI - Analog Input

AO - Analog Output

AV - Analog Value

BI - Binary Input

BO - Binary Output

BV - Binary Value

MI - Multi-State Input

MO - Multi-State Output

MV - Multi-State Value

R - ReadOnly

W - Writable

C - Commandable (Contains Priority Array)

Protocol Implementation Conformation Statement - PICS

General Information

Date: 11. April 2014
Vendor Name: BELIMO Automation AG
Vendor ID: 423
Product Name: VAFB24-OP GTD
Product Model Number: N/A
Applications Software Version: 1.34.0
Firmware Revision: 1.0.3
BACnet Protocol Revision: 1.6

Product Description:

The device is an air damper control actuator with the added benefit of a built-in programmable controller. Free programming environment allows handling of a wide range of HVAC control applications. MP-Bus master capabilities allow this device to monitor and control up to 15 additional slave devices that contain Belimo MP-Bus technology, affording significant expandability. BACnet server functionality allows easy integration in standard building automation systems. The commissioning of the device (BACnet Device Address, IP Address settings, MS/TP Address ...) is done via the integrated web-server.

BACnet Standard Device Profile: BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks supported:

Data Sharing - ReadProperty-B (DS-RP-B)
Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)
Data Sharing - WriteProperty-B (DS-WP-B)
Device Management - DynamicDeviceBinding-B (DM-DDB-B)
Device Management - DynamicObjectBinding-B (DM-DOB-B)
Device Management - DeviceCommunicationControl-B (DM-DCC-B)

Segmentation Capability: No

Data Link Layer Options: BACnet IP, (Annex J)
BACnet IP, (Annex J), Foreign Device
MS/TP master,
baud rates: 9'600, 19'200, 38'400, 76'800, 115'200

Device Address Binding: No static device binding supported

Networking Options: None

Character Sets Supported: ANSI X3.4

Standard Objects

The device provides datapoints for common operation as well as datapoints for parameterization using the following object types:

- Analog Input
- Analog Output
- Analog Value
- Binary Input
- Binary Output
- Binary Value
- Device
- Multi-State Input
- Multi-state Output
- Multi-state Value

Object Processing

Object Type	Optional Properties	Writable Properties
Analog Input	Description	
Analog Output	Description	Present_Value
Analog Value	Description	Present_Value
Binary Input	Description Active_Text Inactive_Text	
Binary Output	Description Active_Text Inactive_Text Relinquish_Default ¹⁾ Priority_Array ¹⁾	Present_Value
Binary Value	Description Active_Text Inactive_Text Relinquish_Default ¹⁾ Priority_Array ¹⁾	Present_Value
Device	Description Location	Object_Identifier Object_Name Location APDU_Timeout Number_Of_APDU_Retries Max_Master ²⁾ Max_Info_Frames ²⁾
Multistate Input	Description State_Text	
Multistate Value	Description State_Text Relinquish_Default ¹⁾ Priority_Array ¹⁾	Present_Value
Multistate Output	Description State_Text Relinquish_Default ¹⁾ Priority_Array ¹⁾	Present_Value

1) Only if object is commandable.

2) Only if MS/TP is the selected data link layer type

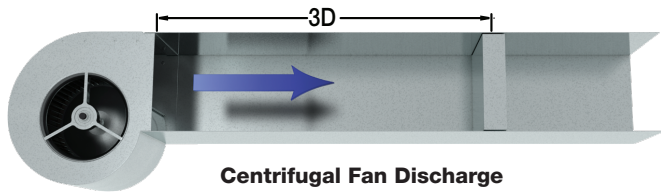
- The properties Object_Name and Location of the Device Object support up to 255 characters (all other character strings are read-only).
- The device does not support the CreateObject and DeleteObject service.

Service Processing

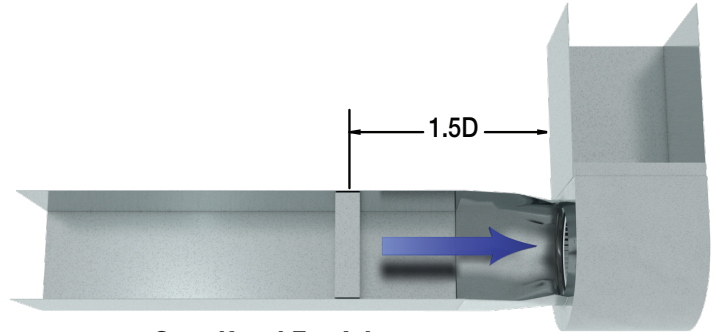
- The device supports DeviceCommunicationControl service. No password is required.

Optimal Placement for AMD-xx-TD Damper Series

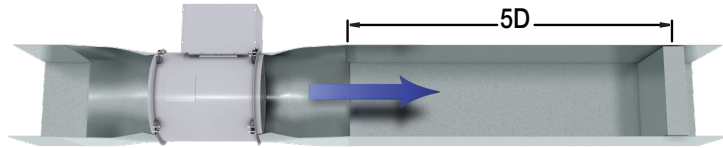
Fans



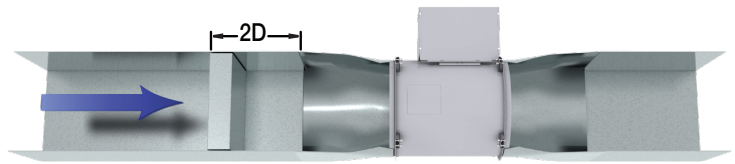
Centrifugal Fan Discharge



Centrifugal Fan Inlet

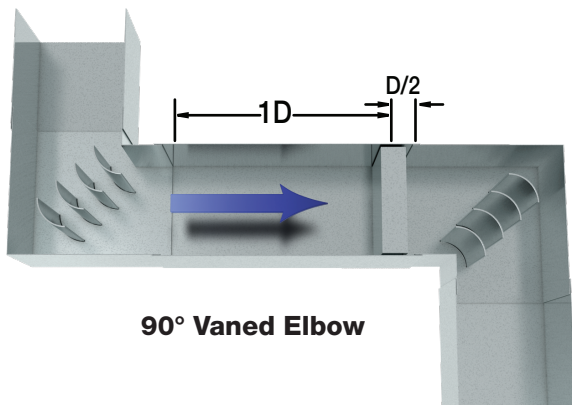


Vane Axial Fan Discharge

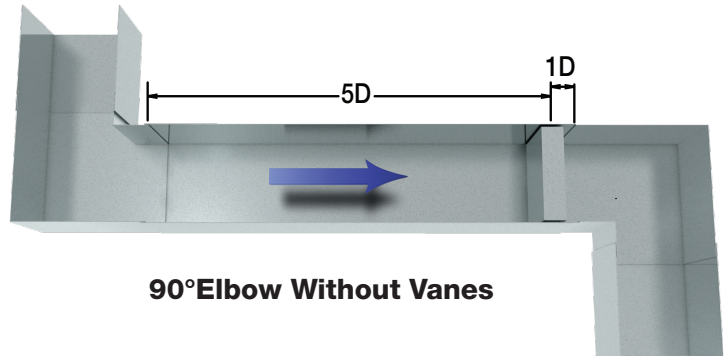


Vane Axial Fan Inlet

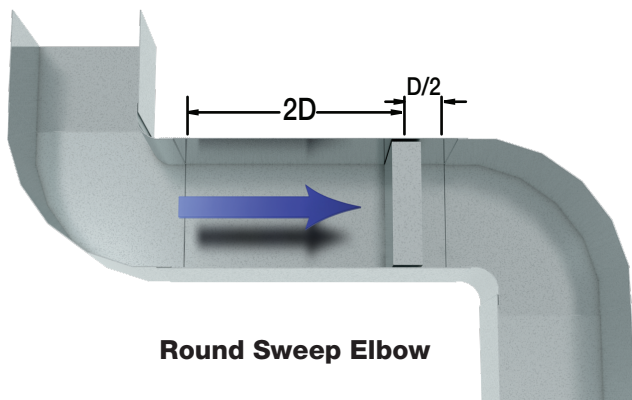
Elbows



90° Vaned Elbow

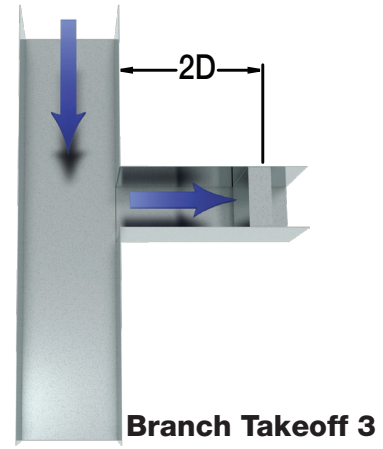
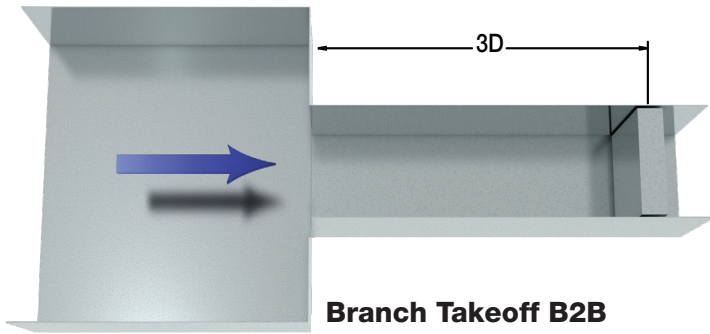


90° Elbow Without Vanes

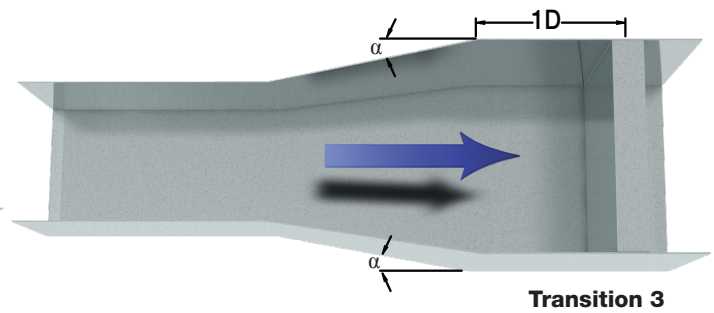
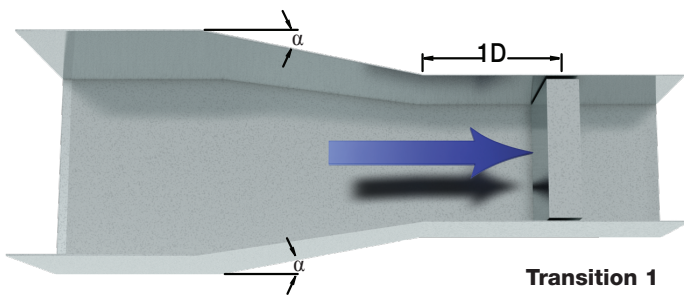


Round Sweep Elbow

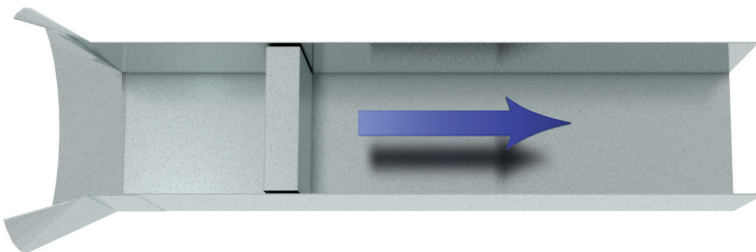
Takeoffs



Transitions



Bellmouth Inlets



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

Circular Duct: $D = \text{Duct Diameter}$

Minimum Installation Requirements

When installing the AMD-xx-TD, the installation should match as closely as possible to one of the examples shown on pages 10 and 11. Failure to match the installation examples may negatively affect the performance and accuracy of the AMD-xx-TD.

Avoid locating the AMD-xx-TD where they will be exposed to condensing moisture, such as downstream of a coil or humidifier.

Design requirements for installing the AMD-xx-TD:

- **Turbulent Airflow:** The engineered design of the AMD-XX-TD sensor aperture will permit accurate airflow measurement in the presence of moderate air turbulence as long as the AMD-XX-TD is installed the required distance as shown above in the examples on pages 10 and 11.
- **Stratified Airflow:** The AMD-XX-TD should be mounted so that the probes cross any stratified airflow - not parallel to flow.
- **Airborne Contaminants:** The levels of air filtration and cleanliness associated with commercial HVAC systems are satisfactory for the AMD-XX-TD. Applications containing contaminants or condensing moisture may impair airflow measurement accuracy and functionality.

Damper Maintenance

Greenheck's dampers are designed to be trouble free and hassle free under normal operation. Dampers are to be 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.

