

# HVAC Control Dampers

## Models VCD and MBD

- Selection
- Construction
- Performance

*Automatic Control and Manual Balancing Dampers*



# HVAC Control and Manual Balancing Dampers

Greenheck HVAC control dampers bring the same quality engineering and manufacturing that has earned Greenheck its position as an industry leader over the past 50 years.

- Broadest line of damper products in the industry
- Extensive laboratory and testing facilities
- Comprehensive ongoing product improvement and testing programs
- Innovative Variable Symmetrical Blades (VSB) product design

All this plus a genuine commitment to fulfilling customer expectations has rightfully earned Greenheck's reputation as "The Solution Company".



## Greenheck control dampers are a better choice

Greenheck's VSB design provides many benefits:

- High damper free area
- Lower pressure losses
- Low operating torque
- Operating torque not affected by airflow direction through damper

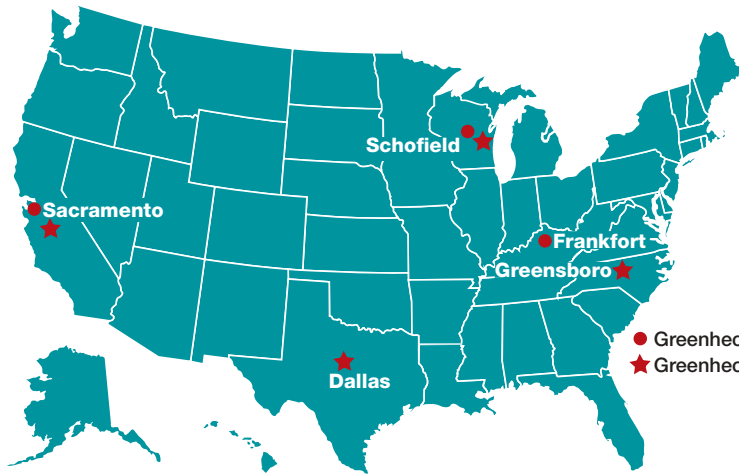
Low Profile Frame (on dampers under 17 in. high) add additional benefits:

- Further increases damper free area
- Minimizes pressure losses through smaller dampers

## Products you can trust

Comprehensive state-of-the-art laboratory and testing facilities have always been important to Greenheck's continuing business success. A laboratory facility devoted exclusively to development and testing of damper related products contains the HVAC industry's most extensive and modern equipment for testing to the latest versions of AMCA, ANSI, ASHRAE, UL, and other industry standards of performance. Greenheck uses these laboratory capabilities to provide the most comprehensive performance data, including leakage and pressure loss, over the widest range of sizes. Our lifecycle and endurance testing goes far beyond any current industry requirements.





## There where you need us

Greenheck operates three strategic damper manufacturing locations to serve you better: Sacramento, CA; Schofield, WI; and Frankfort, KY. We also operate conveniently located Distribution Centers in Schofield, Sacramento, Dallas, TX and Greensboro, NC.

● Greenheck Damper Manufacturing Center  
★ Greenheck Distribution Center

## Ready when you are

Many Greenheck control dampers are included our company's Quick Build (QB) program. QB ensures rapid response time, with products manufactured next day, three days, five days, or ten days, then shipped to you at your job site.



## Strong support



All Greenheck products are supported by the industry's best product literature, electronic media, and Computer Aided Product Selection program (CAPS). You'll also find extensive product and Installation and Operating Manual (IOM) information on the Internet.



And, of course, you can always count on the personal service and expertise of our national and international representative organizations. To locate your nearest Greenheck representative, call 715-359-6171, or visit our website at [www.greenheck.com](http://www.greenheck.com)

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## VSB Design - "Unique Advantage to Greenheck"

Greenheck's Variable Symmetrical Blade (VSB) design uses a combination of four symmetrical blade sizes (4 in., 5 in., 6 in., and 7 in.) to maximize the free area at any damper height. The VSB design also allows for consistent operating characteristics regardless of airflow direction. Traditional damper designs utilize only one blade width (usually 6 or 7 in.). This reduces the cost to manufacture, but compromises the dampers' performance capabilities by having cut-off or extended blades and oversized closure strips.

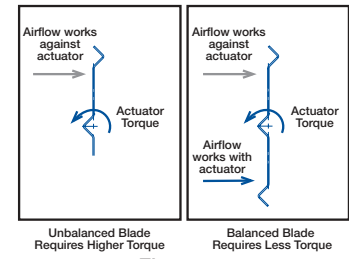
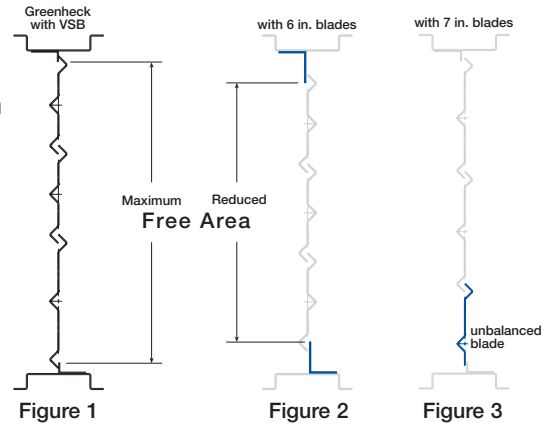
### Greenheck VSB Design:

With VSB, a specific height damper might use two 6 in. blades and one 7 in. blade requiring minimal top and bottom blade stops. All blades are symmetrical and balanced. See Figure 1.

### Traditional Blade Design:

With 6 in. blades available, this same damper would require three 6 in. blades and oversized blade stops. The free area would be significantly less. See Figure 2. Dampers that have 7 in. blades available,

using this same damper, would require two full blades and part of a third, see Figure 3. The cut-off blade is unbalanced (not symmetrical) requiring higher operating torque. See Figure 4.



## Blades

**3-V blades** are fabricated from a single thickness of 16 ga. galvanized steel incorporating three longitudinal structural V grooves (each running the full length of the blade). This blade is standard in models VCD-15, 18, 20, and 23 and has low to medium velocity and pressure capabilities.

**Airfoil blades** are constructed of heavy gauge extruded aluminum or double skin galvanized steel. This blade design presents a lower resistance to airflow and is typically used in high pressure systems. Airfoil blades are standard on models VCD-33, 34, 40, 42, and 43.

- Options:
- Insulated blade (VCD-34)
  - Stainless steel construction
  - Vertical blade orientation



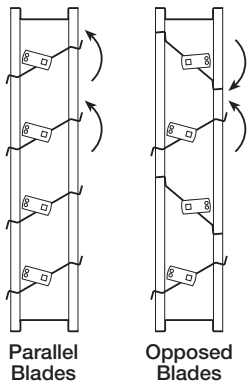
3-V Blade



Airfoil Blade

## Parallel Versus Opposed Blade Operation

Control dampers are offered with either parallel or opposed blades. Each style has distinguishing characteristics in regards to control of the fan's performance plus a change in air velocity profile.



- Parallel blade operation is preferred when the damper makes up a significant portion of the total system pressure loss. Parallel blades are used when greater control is required near the top end of the volume operating range or for systems requiring two position (fully open or fully closed) operation. Parallel blades should not be used upstream of critical components due to uneven airflow.
- Opposed blade operation offers the best control over the entire operating range when the damper doesn't make up a significant portion of the total system pressure loss. Opposed blades are used for applications where it is necessary to maintain even distribution of air downstream from the damper. Opposed blades are the best selection for ducted outlets. An opposed blade operation must be open further to obtain the same resistance to airflow as a parallel blade damper.

## Linkage

Blade to blade linkage (for parallel or opposed blade action) is concealed within the damper frame. Linkage is engineered to accurately control each and every blade without need for adjustment. Plated steel construction ensures a long corrosion free life. Stainless steel construction is optional.

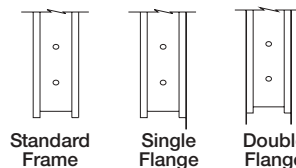
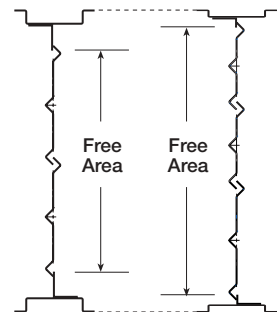


## Frame

Most models utilize a heavy-duty 5 in. x 1 in. hat channel frame, (16 ga. steel or 0.125 in. aluminum) which is specifically designed for installation inside ductwork. Another free area enhancing design feature is the use of low profile top and bottom frames on all dampers that are 17 in. high or less. (See free area illustration on the right ). On these small dampers, the top and bottom frame members become more substantial obstructions to the damper's percent of free area. By using a low profile top and bottom frame, the free area percentage can be increased with subsequent reduction in pressure loss.

Tog-L-Loc® corner construction is incorporated in every control damper frame. This design provides higher structural rigidity compared to traditional dampers designed with welded frames. The Tog-L-Loc® design also ensures that every frame has square corners which helps prevent the blades from binding on the jamb seals. This ensures a strong, square, and rigid frame for trouble free damper operation due to less friction.

- Options:
- Single flange (either side of frame)
  - Double flange (both sides of frame)



Tog-L-Loc®  
Reinforced Corner

## Axles

Greenheck's VCD models use square plated steel axles which are positively locked to the damper blades, eliminating slippage between blades and axles. Stainless steel construction is optional.

## Bearings

Molded synthetic bearings rotate in a polished extruded raceway in the damper's frame. Extremely low friction and significantly long operating life result from this advanced bearing design. Bronze or stainless steel bearings are optional.

## Seals

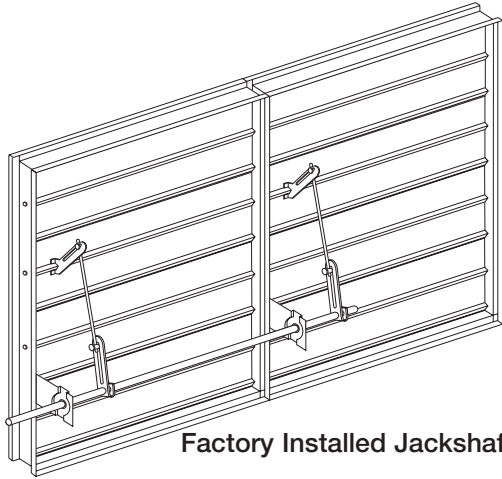
Flexible metal jamb seals (between blade ends and damper side frames) and extruded vinyl blade seals (between blade edges) reduce leakage. Silicone, EPDM rubber blade seals, and flexible stainless steel jamb seals are optional.

*Options listed are not available on all models. Special consideration is required if ambient temperatures will exceed 180° F*

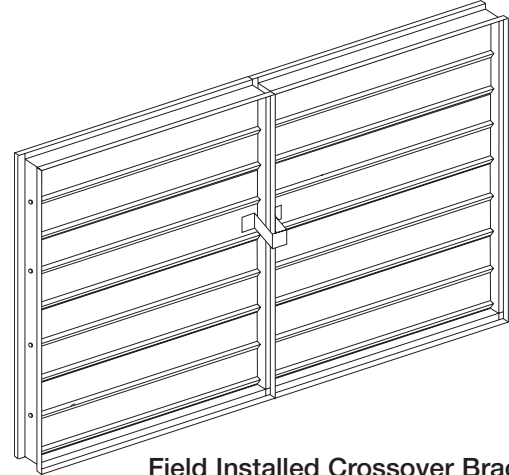
# Multiple Section Dampers

Each of Greenheck's VCD Control Dampers has a maximum size for a single damper section or panel. These vary from 48 in. x 60 in. for VCD-15 & VCD-18 to 60 in. x 74 in. for VCD-33 & VCD-34. Dampers larger than a single section will be made up of equal size sections which, depending upon model and size, may be shipped as a single complete assembly or as separate sections for field assembly.

Most multi-section damper assemblies are supplied with a factory installed jackshaft so all sections operate together. Models VCD-15 and VCD-18 utilize a field-installed crossover bracket to connect adjacent sections.



Factory Installed Jackshaft

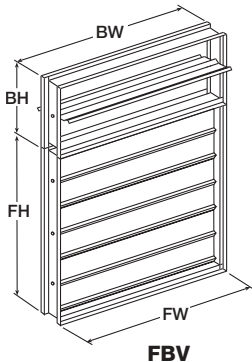


Field Installed Crossover Bracket

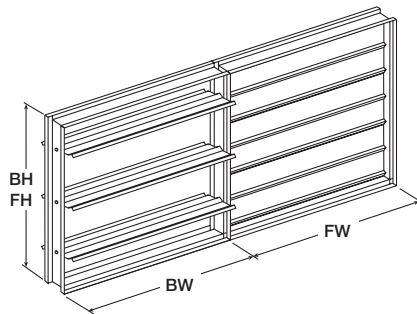
*Damper assemblies (larger than one section) are not designed to be structurally self-supporting. Additional horizontal bracing is recommended to support the weight of the damper and vertical bracing should be installed if required to hold against system pressure.*

## Face & Bypass Dampers

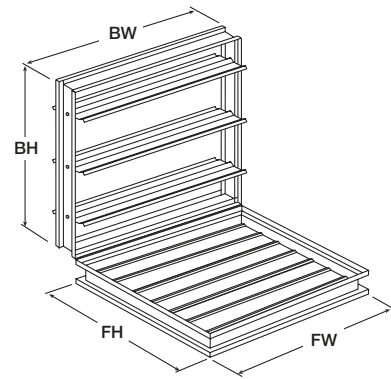
Most VCD models can be supplied in a Face & Bypass configuration where the sections of the damper operate in reverse from each other. Face & Bypass dampers are available in vertical, horizontal, and right angle arrangements as shown below.



FBV



FBH

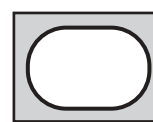


FBR

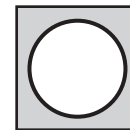
## Transitions and Sleeves

In applications where dampers are required to be installed in round or oval ductwork, they must be supplied with the appropriate transition option. Rectangular dampers are constructed 2 in. larger than the duct dimensions and provided with a factory sleeve. The sleeve is transitioned at each end to the appropriate round, oval, or rectangular duct size.

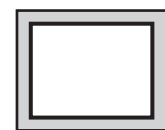
Transition options available:



Type O



Type R



Type C

## Round Dampers

Round damper frames are rolled from a single thickness of galvanized steel and reinforced as required for strength.

VCDR-50 and 53 single blade damper blades are fabricated from a single thickness of galvanized steel. One or more reinforcing channels are added to facilitate axle connection and to strengthen the flat blade. VCDRM-50 and 53 use a combination of rectangular and radiused blades to fill damper height.

VCDR and VCDRM models are equipped with rectangular plated steel axles. Linkage, (where furnished), is as described previously under the VCD rectangular damper section. Bearings are bronze sleeve type. The silicone rubber seal on model VCDR-53 is located around the top and bottom blade circumference and the vinyl seal is used between the blades.

All VCDR and VCDRM models include a standoff bracket and an extension pin.



VCDR



VCDRM

## MBD Dampers



MBDR-50



MBD-15



MBD-10  
with optional Standoff

Manual balancing dampers are designed for use in balancing an HVAC duct system to achieve desired airflow at all locations. These dampers are then locked in position. MBDs are designed only for control of airflow, not for tight shut-off.

Rectangular frames are designed for installation within a section of rectangular duct and round frames are designed to connect between two sections of round duct. Axles are square plated steel. Bearings are sleeve type. Linkage (where furnished), is as described previously under VCD dampers. MBDs do not use blade or jamb seals.

All MBD models include a manual locking quadrant for field installation after the MBD is installed in ductwork. All MBDR models include a manual locking quadrant factory installed on the damper.

Options: 1½ in. standoff kit for manual locking quadrant to accommodate external duct insulation.

*When selecting an actuator, the following criteria should be taken in to careful consideration:*

## **Who will supply the actuator?**

Actuators may be furnished by the damper manufacturer, factory installed and ready to operate, or if a control specialist is employed to provide a control system for the entire HVAC system, the control specialist may furnish appropriate actuators and install them in the field. In this instance, dampers are usually supplied with extended operating shafts for connection of field installed actuators. Greenheck often supplies actuators, factory mounted and ready to operate. This ensures an appropriately sized and properly installed actuator for each damper.

## **Should the actuator be manual, electric, or pneumatic?**

**Manual:** Locking quadrant actuators can be used if the damper's position is fixed (when used for balancing airflow) or needs to change only occasionally (such as summer/winter changeover).

**Electric:** Easier interface with digital control devices. Electric actuators must have a voltage selected. Typical actuator voltages are 24 vdc, 24, 120, 208, and 240 vac. Fail safe electric actuators are also called spring return, and the fail position (open or closed) should be noted.

**Pneumatic:** For HVAC designs where pneumatic (air) controls are preferred. Actuators will be inherently fail safe, but fail position (open or closed) should be noted. Pneumatic actuators for HVAC control dampers require a 20 to 25 psi dedicated instrument air system. Interface with electronic controllers is accomplished through solenoid valves, or positioners, which are accessories.

## **What type of control action will the damper perform?**

**Balancing:** If the damper maintains a set position to balance airflow in a system, a manual locking quadrant is the appropriate actuator.

**Two Position:** Opens the damper to allow airflow and/or close the damper to prevent airflow.

**Modulating Control:** The position of the damper is determined by a modulating control signal from a device or controller that monitors temperature, pressure, or some other condition in the HVAC system. Actuators must be compatible with the control signal generated by the controller to which they are expected to respond. Electric actuator modulating control signals may be:

- 0 – 10 volts dc (very typical in HVAC control systems)
- 4 – 20 milliamps dc (also encountered in HVAC and industrial systems)
- 135 ohm (an older system used by Honeywell Series 90 controls)

Pneumatic actuators respond to varying control air pressures and are selected with appropriate spring ranges to position dampers from open to closed (or closed to open) as control air pressure varies from 5 – 10 psi, or 8 – 13 psi. Spring ranges of 3 – 8 psi and 3 – 13 psi are also available but rarely used for damper applications. Larger dampers and applications where precise damper positioning is critical should have pneumatic actuators equipped with positive positioners (3 - 15 psi signal) for added reliability.

**Fail Safe:** Opens or closes the damper when power is removed from the actuator. Also called “normally open”, or “normally closed”, this actuator may be either two-position or modulating.

## **What are other considerations?**

**NEMA Rating:** Specify for specific applications or environments.

**Mounting Position:** Externally or internally mounted.

**Accessories:** Auxiliary switches, solenoid valves, positioners.

## Manual Hand Quadrant See Figure 5

- ✓ Location
  - Internal or external



Figure 5  
Manual Quadrant

## Electric Actuator Checklist See Figures 6 & 7

- ✓ Power Supply
  - 24 Vdc, 24 Vac, 120 Vac, 208 Vac, and 240 Vac
  - Frequency
- ✓ Operation
  - Spring Return (spring will drive damper to original starting point)
  - Power Open or Power Closed
- ✓ Operating Mode
  - Modulating (damper position determined by modulating control signal)
  - Floating (damper can be stopped anywhere between open and closed)
  - Two position (damper position is open or closed)
- ✓ Fail Direction (for spring return only)
  - Open or Closed
- ✓ Location
  - Internal or external
- ✓ Control Signal (for modulating only)
  - 0-10 Vdc, 4-20 mAdc, or 135 ohm
- ✓ NEMA Enclosure
  - 1, 3, 4, 4X, or 7 (specify one for specific application)
- ✓ Accessories
  - Auxiliary Switches
  - Transformers

Figure 6



External Mount

Figure 7



Internal Mount

*Greenheck's most commonly used electric actuator manufacturers are Honeywell, Siemens, Belimo, Multi-Products, and Invensys. Call your Greenheck representative for other options.*

## Pneumatic Actuator Checklist See Figure 8

- ✓ Power Supply
  - 20 psi
- ✓ Operation
  - Spring Return (spring will drive damper to original starting point)
- ✓ Operating Mode
  - Modulating (damper position determined by modulating pressure signal)
  - Two Position (damper position is open or closed)
- ✓ Fail Direction (for spring return only)
  - Open or Closed
- ✓ Location
  - Internal or external
- ✓ Control Signal (for modulating only)
  - 3-15 psi
- ✓ Accessories
  - Solenoid Valves or Positioners

Figure 8



Pneumatic

*Greenheck's most commonly used pneumatic actuator manufacturers are Siemens, Invensys, and Johnson Controls. Call your Greenheck representative for other options.*

Pressure loss through an open damper (change in pressure) and leakage through a closed damper are two performance criteria required to appropriately select and apply a control damper in an HVAC system.

Any damper's pressure loss depends where and how the damper is installed in the HVAC system. AMCA Standard 500D defines several configurations to be used for testing damper pressure drop. Greenheck has tested its dampers for pressure loss in the three test figures shown here and provides data for each.

- Figure 5.3 illustrates a fully ducted damper.
- Figure 5.2 illustrates a ducted damper exhausting air into an open area.
- Figure 5.5 illustrates a plenum mounted damper.

All testing has been conducted in accordance with AMCA Standard 500D and data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

Actual pressure loss found in any HVAC system is a combination of many factors. This pressure loss information, along with an analysis of other system influences should be used to estimate actual pressure losses for a damper installed in a given HVAC system.

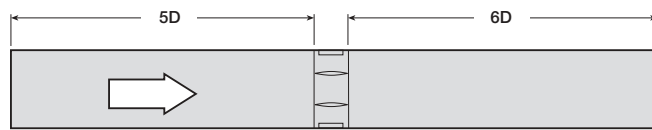


Figure 5.3

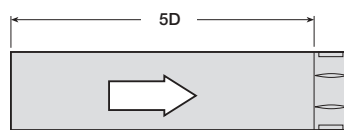


Figure 5.2

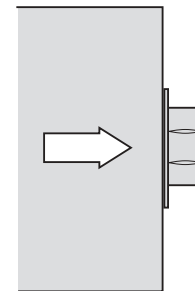


Figure 5.5

$$D = \sqrt{\frac{4(W)(H)}{3.14}}$$

D=Duct length  
W=Damper width  
H=Damper height

## Pressure Loss

Pressure and a dimensionless parameter called the pressure loss coefficient ( $C_o$ ).

To calculate the pressure drop across a given damper:

1. Select the AMCA test figure that most closely resembles how the damper will appear in the system.

2. Use the formula:  $\Delta p = C_o * (V / 4005)^2$

$\Delta p$  = pressure loss measured in inches wg

$C_o$  = pressure loss coefficient (see model specific coefficients on performance data pages)

V = Face velocity measured in fpm

3. Substitute the damper face velocity and the appropriate value of  $C_o$  for the damper model and AMCA test figure.

**EXAMPLE:** Calculate the pressure loss of a 24 in. x 24 in. model VCD-23 damper in a fully ducted configuration (Fig. 5.3) that sees a face velocity of 1500 fpm.

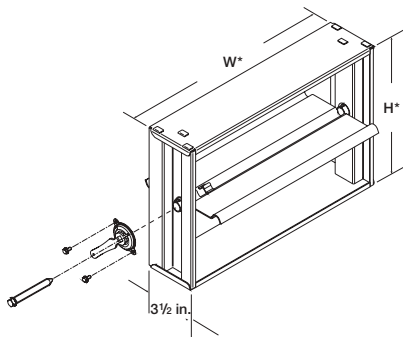
Using the VCD-23 pressure loss coefficient table corresponding to AMCA Fig. 5.3 it can be seen that the  $C_o$  value for a 24 in. x 24 in. damper is 0.65. Substituting  $C_o$  and the velocity into the  $\Delta p$  formula:  $\Delta p = 0.65 (1500/4005)^2$   $\Delta p = 0.091$  in. wg

## Leakage

Leakage testing was conducted in accordance with AMCA Standard 500D and is expressed as cfm/ft<sup>2</sup> of damper face area. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

### MBD-10 APPLICATION AND DESIGN

Model MBD-10 is a manual balancing damper designed to regulate flow of air in a HVAC system. Damper is not intended to be used in applications for positive shut off or for automatic control.



#### Standard Construction

**Frame:** Reinforced 18 ga. galvanized steel

**Blade:** 20 ga. galvanized steel

**Operator:** 3/8 in. sq. locking manual quadrant

**Actuator Shaft:** 3/8 in. sq. - 2 1/2 in. long extension

**Axles:** Integral 1/2 in. dia.

**Minimum Size:** 6 in. W x 4 in. H

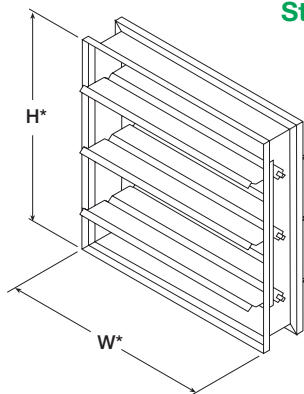
**Maximum Size:** 36 in. W x 12 in. H

**Temperature:** 180°F

**Options:** 1 1/2 in. standoff bracket (with extended pin) to accommodate external duct insulation. Bearing located on opposite side of quad.

### MBD-15 APPLICATION AND DESIGN

Model MBD-15 is a manual balancing damper designed to regulate the flow of air in a HVAC system. Damper is not intended to be used in applications for positive shut off or for automatic control. Design incorporates heavy gauge galvanized steel construction for durability and longevity. MBD-15 meets SMACNA's recommended construction requirements for manual balancing dampers.



#### Standard Construction

**Frame:** 5 in. x 1 in. x 16 ga. galvanized steel hat channel with reinforced corners.

**Blades:** 16 ga. galvanized steel reinforced with three longitudinal structurally designed vee's.

**Linkage:** Concealed in jamb

**Axles:** 1/2 in. dia. plated steel

**Bearings:** Synthetic (acetal) sleeve

**Control Shaft:** 1/2 in. dia. plated steel extends 6 in. beyond frame. Comes with 1 1/2 in. standoff bracket for external insulation.

**Actuator:** 1/2 in. dia. locking manual quadrant.

**Minimum Size:** One blade 6 in. W x 6 in. H  
Two blades 6 in. W x 10 in. H

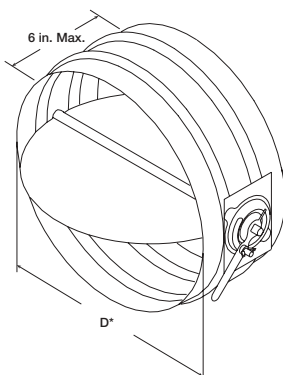
**Maximum Size:** Single section 48 in. W x 60 in. H  
Multiple section 96 in. W x 96 in. H

**Temperature:** 180°F

\*W&H dimension furnished approximately 1/4 in. undersize.

### MBDR-50 APPLICATION AND DESIGN

Model MBDR-50 is a round manual balancing damper designed to regulate flow of air in a HVAC system. Damper is not intended to be used in applications for positive shut off or for automatic control.



#### Standard Construction

**Frame:** Reinforced 20 ga. galvanized steel

**Blades:** 20 ga. galvanized steel

**Axles:** 1/2 in. dia. plated steel

**Bearings:** Synthetic (acetal) sleeve type

**Actuator:** 3/8 in. sq. locking manual quadrant

**Minimum Size:** 5 in. dia.

**Maximum Size:** 24 in. dia.

**Options:** 1 1/2 in. standoff bracket (with pin) to accommodate of external duct insulation.

\*D dimension furnished approximately 1/4 in. undersize.

## Application and Design

The VCD-15, 18, 20, and 23 series dampers have 3-V style blades for applications as an automatic control or manual balancing damper. Wide ranges of electric or pneumatic actuators are available for these models.

### VCD-15

The VCD-15 series is a general purpose damper intended for applications in low pressure and velocity systems under circumstances where low leakage performance is not necessary.

### VCD-18

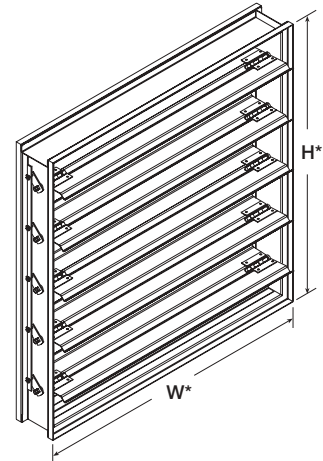
The VCD-18 series is a general purpose, low leakage control damper intended for applications in low pressure and velocity systems.

### VCD-20

The VCD-20 series is a ruggedly built, general purpose damper intended for applications in low to medium pressure and velocity systems under circumstances where low leakage performance is not necessary.

### VCD-23

The VCD-23 series is a ruggedly built, low leakage control damper intended for applications in low to medium pressure and velocity systems.



\* W&H dimension furnished approximately 1/8 in. undersize.

## Standard Construction

### Frame: VCD-15, VCD-18

5 in. x 1 in. x 20 ga. galvanized steel hat channel. Reinforced corners. Low profile head and sill on dampers less than 17 in. high.

### VCD-20, VCD-23

5 in. x 1 in. x 16 ga. galvanized steel hat channel. Reinforced corners. Low profile head and sill on dampers less than 17 in. high.

**Blades:** 16 ga. galvanized steel, reinforced with 3 longitudinal structurally designed vee's.

**Linkage:** Side linkage out of airstream (concealed in frame)

### Seals: VCD 15 & 20

None

### VCD 18 & 23

Extruded vinyl blade seals

Flexible metal compression type jamb seals

**Axles:** 1/2 in. dia. plated steel. Removable control shaft extends 6 in. beyond frame.

**Bearings:** Synthetic (acetal) sleeve

**Minimum Size:** One Blade 6 in. W x 6 in. H  
Two Blade 6 in. W x 10 in. H

**Maximum Size:** VCD 15 & 18  
Single Section 48 in. W x 60 in. H  
Multiple section size 84 in. W x 60 in. H

### VCD 20 & 23

Single Section 48 in. W x 74 in. H  
Multiple section size unlimited

**Temperature:** 180°F

## Performance Data

### PRESSURE LOSS COEFFICIENT

VCD-15, 18, 20, 23	12 x 12	24 x 24	36 x 36	12 x 48	48 x 12
AMCA Fig. 5.2	2.41	0.65	0.44	0.76	1.10
AMCA Fig. 5.3	3.35	0.90	0.66	1.07	1.62
AMCA Fig. 5.5	4.36	2.02	1.87	2.21	2.83

See page 10 for Figures 5.2, 5.3, and 5.5.

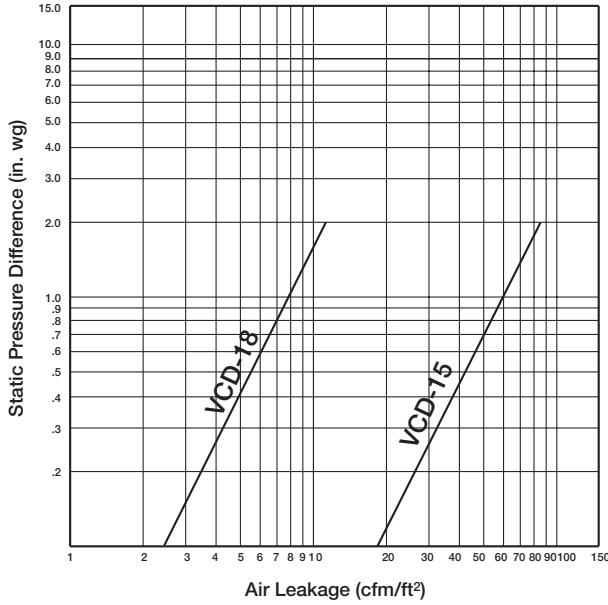


Greenheck certifies that the model's VCD-15, 18, 20, and 23 shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Programs. The AMCA Certified Ratings Seal applies to air performance ratings only.

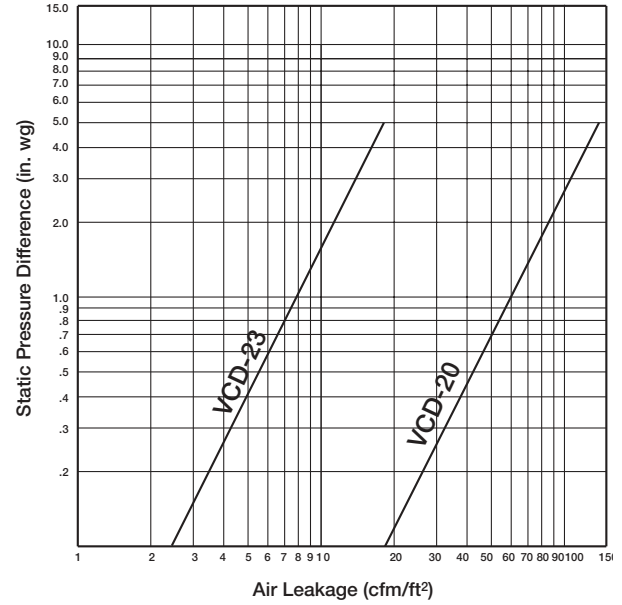
### LEAKAGE DATA

Leakage testing was conducted in accordance with AMCA Standard 500D and is expressed as cfm/ft<sup>2</sup> of damper face area. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

#### VCD-15, VCD-18

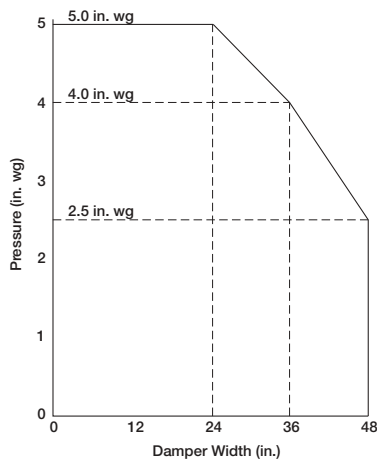


#### VCD-20, VCD-23

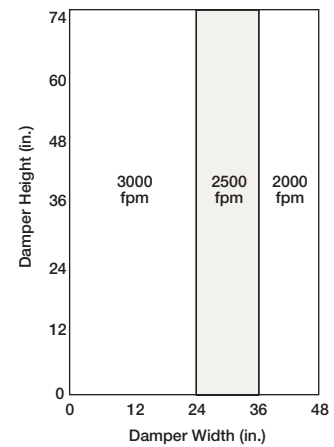


### PRESSURE & VELOCITY LIMITS FOR VCD-20, VCD-23

#### Pressure Limitations



#### Velocity Limitations



NOTE: VCD 20 and 23 will withstand higher pressures and velocities. Displayed ratings are conservative to prevent misapplication. Consult Greenheck if you have an application outside these limitations. Temperatures in excess of 180°F require special consideration. Refer to page 22 for the pressure and velocity limitations for VCD 15 and 18.

## Application and Design

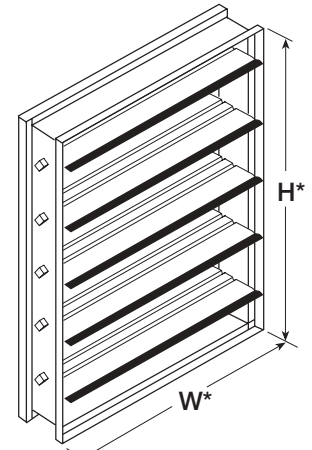
The VCD-33 and 34 series dampers have an airfoil style blade designed to meet the highest standards established for commercial control dampers. Wide ranges of electric and pneumatic actuators are available for these models.

### VCD-33

The VCD-33 series is an extremely low leakage damper intended for application in medium to high pressure and velocity systems.

### VCD-34

The VCD-34 series is a ruggedly built, low leakage control damper with thermally insulated blades intended for application in medium pressure and velocity systems.



\* W & H dimension furnished approximately 1/8 in. undersize.

## Standard Construction

**Frame:** 5 in. x 1 in. x 16 ga. galvanized steel hat channel. Reinforced corners. Low profile head and sill on dampers less than 17 in. high.

**Blades:** **VCD-33**  
Airfoil shaped, galvanized steel double skin construction, 14 ga. equivalent thickness.

**VCD-34**  
Insulated, airfoil shaped, galvanized steel double skin construction, 14 ga. equivalent thickness.

**Linkage:** Side linkage out of airstream (concealed in frame)

**Seals:** Extruded silicone rubber blade seals  
Flexible metal compression type jamb seals

**Axles:** 1/2 in. dia. plated steel. Removable control shaft extends 6 in. beyond frame.

**Bearings:** Synthetic (acetal) sleeve

**Minimum Size:** **VCD-33**  
One Blade 6 in. W x 6 in. H  
Two Blade 6 in. W x 10 in. H

**VCD-34**  
One Blade 10 in. W x 6 in. H  
Two Blade 10 in. W x 10 in. H

**Maximum Size:** Single Section 60 in. W x 74 in. H  
Multiple section size 84 in. W x 60 in. H

**Temperature:** 180°F

## Performance Data

### PRESSURE LOSS COEFFICIENT

VCD-33, 34	12 x 12	24 x 24	36 x 36	12 x 48	48 x 12
Fig. 5.2	3.56	1.28	0.89	1.78	1.97
Fig. 5.3	2.01	0.60	0.27	0.91	1.02
Fig. 5.5	5.35	2.59	2.43	2.97	3.14

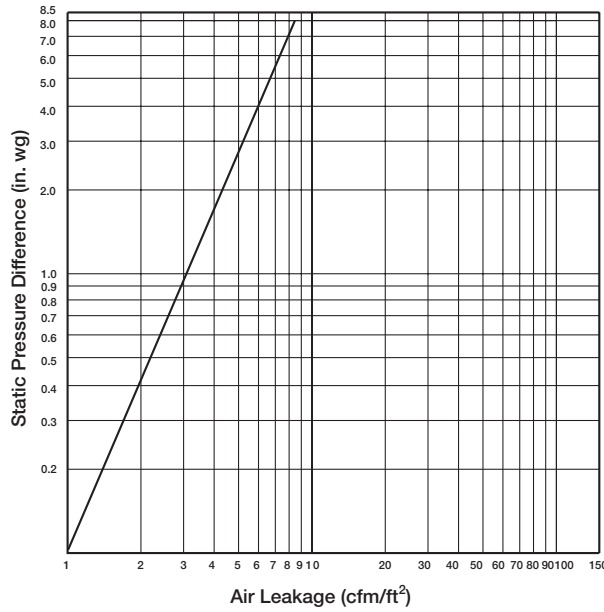
See page 10 for Figures 5.2, 5.3, and 5.5.

Pressure Loss testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

**LEAKAGE DATA**

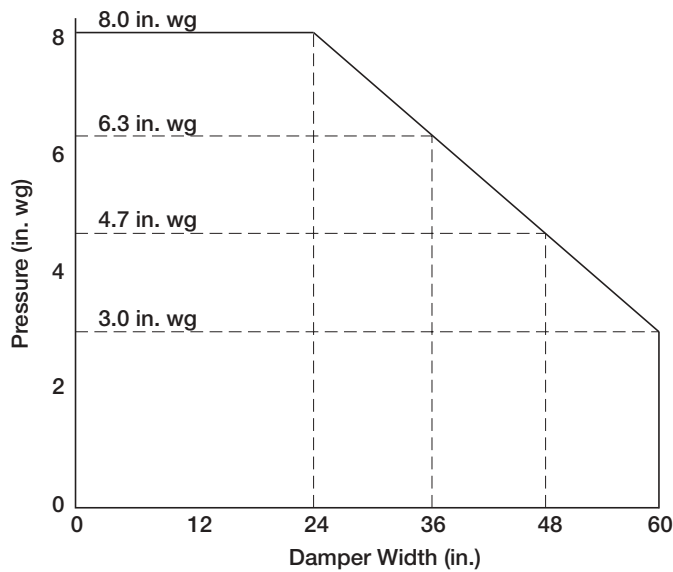
Leakage testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

**VCD-33, VCD-34**

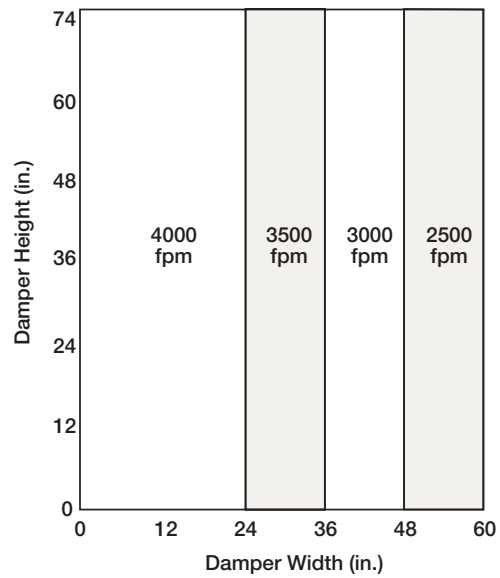


**PRESSURE & VELOCITY LIMITS FOR VCD-33, VCD-34**

**Pressure Limitations**



**Velocity Limitations**

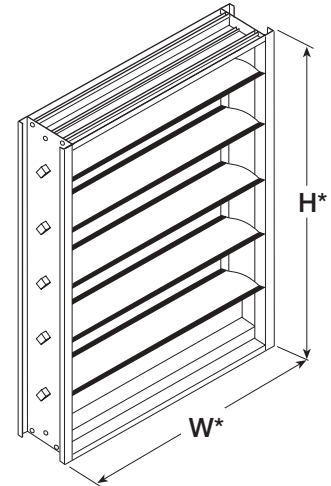


NOTE: VCD-33, and 34 will withstand higher pressures and velocities. Displayed ratings are conservative to prevent misapplication. Consult Greenheck if you have an application outside these limitations. Temperatures in excess of 180°F require special consideration.

### Application and Design

#### VCD-40

The VCD-40 is an ultra low leakage high performance control damper with extruded aluminum airfoil blades. Blades are completely contained within the frame allowing the damper to be directly mounted to a louver, filter frame or similar application with no blade interference. Smooth profile extruded aluminum airfoil blades insure the lowest resistance to airflow in HVAC systems with velocities to 6000 fpm and pressures to 6 in. wg.



\* W&H dimension furnished approximately 1/8 in. undersize.

### Standard Construction

- Frame:** 4 in. x 1 in. x 0.125 in. min. wall thickness, aluminum hat channel.
- Blades:** Heavy gauge extruded aluminum, airfoil shape with metal blade to blade overlap. 4 in. maximum depth.
- Linkage:** Side linkage out of airstream (concealed in frame)
- Seals:** Extruded silicone rubber blade seals  
Stainless steel compression type jamb seals
- Axles:** 1/2 in. dia. plated steel. Removable control shaft extends 6 in. beyond frame.
- Bearings:** Synthetic (acetal) sleeve
- Minimum Size:** One Blade 6 in. W x 6 in. H  
Two Blade 6 in. W x 8 in. H
- Maximum Size:** Single Section 60 in. W x 74 in. H  
Multiple section size unlimited
- Temperature:** 180°F

### Performance Data

#### PRESSURE LOSS COEFFICIENT

VCD-40	12 x 12	24 x 24	36 x 36	12 x 48	48 x 12
Fig. 5.2	3.05	1.16	1.05	1.31	1.78
Fig. 5.3	2.13	0.40	0.45	0.78	1.01
Fig. 5.5	4.52	2.37	2.31	2.98	3.12

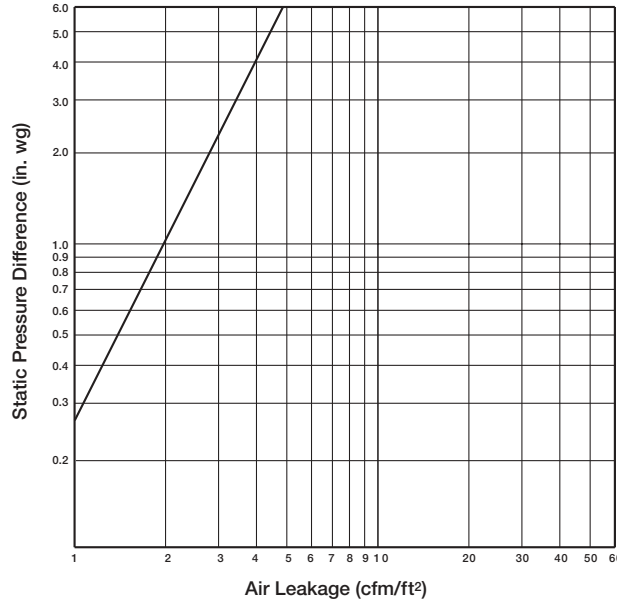
See page 10 for Figures 5.2, 5.3, and 5.5.

Pressure Loss testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

**LEAKAGE DATA**

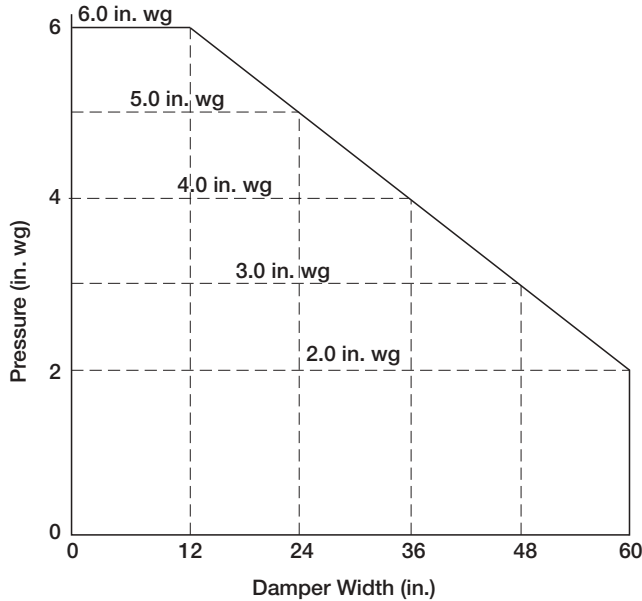
Leakage testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

**VCD-40**

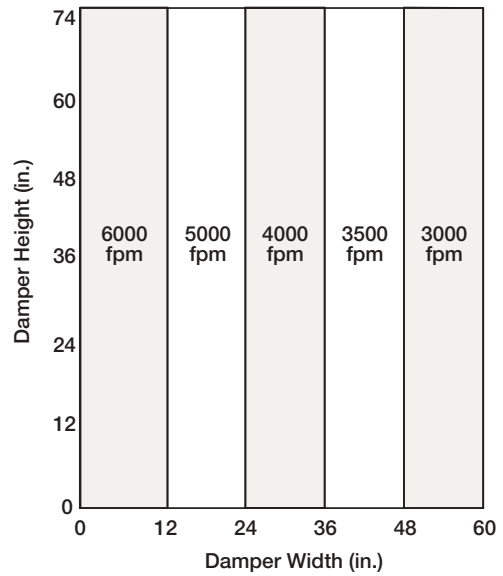


**PRESSURE & VELOCITY LIMITS FOR VCD-40**

**Pressure Limitations**



**Velocity Limitations**

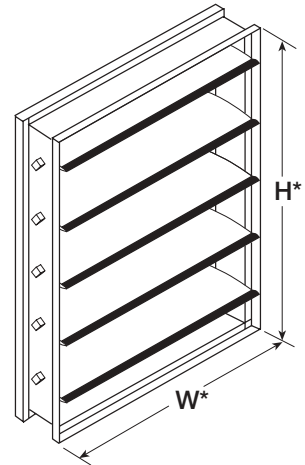


NOTE: VCD-40 will withstand higher pressures and velocities. Displayed ratings are conservative to prevent misapplication. Consult Greenheck if you have an application outside these limitations. Temperatures in excess of 180°F require special consideration.

## Application and Design

### VCD-42, VCD-43

The VCD-42 and VCD-43 are extremely low leakage dampers designed to meet the highest standards established for commercial control dampers. The VCD-42 and VCD-43 are intended for applications in medium to high pressure and velocity systems.



\* W&H dimension furnished approximately 1/8 in. undersize.

## Standard Construction

### Frame: VCD-42

5 in. x 1 in. x 16 ga. galvanized steel hat channel. Low profile head and sill on dampers 16 in. high and smaller.

### VCD-43

5 in. x 1 in. aluminum hat channel, 0.125 in. min. wall thickness. Low profile head and sill on dampers 16 in. high and smaller.

**Blades:** Heavy gauge extruded aluminum, airfoil shape with metal blade to blade overlap. 6 in. maximum depth.

**Linkage:** Side linkage out of airstream (concealed in frame)

**Seals:** Extruded silicone rubber blade seals  
Stainless steel compression type jamb seals

**Axles:** 1/2 in. dia. plated steel. Removable control shaft extends 6 in. beyond frame.

**Bearings:** Synthetic (acetal) sleeve

**Minimum Size:** One Blade 6 in. W x 6 in. H  
Two Blade 6 in. W x 10 in. H

**Maximum Size:** Single Section 60 in. W x 74 in. H  
Multiple section size unlimited

**Temperature:** 180°F

## Performance Data

### PRESSURE LOSS COEFFICIENT

VCD-42, 43	12 x 12	24 x 24	36 x 36	12 x 48	48 x 12
Fig. 5.2	3.05	0.87	0.67	1.01	1.28
Fig. 5.3	1.98	0.43	0.34	0.64	0.86
Fig. 5.5	4.46	2.67	2.01	2.89	3.09

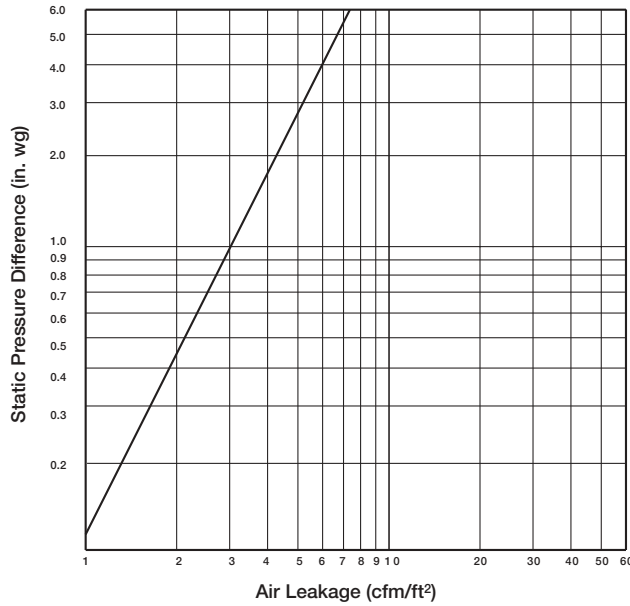
See page 10 for Figures 5.2, 5.3, and 5.5.

Pressure Loss testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

**LEAKAGE DATA**

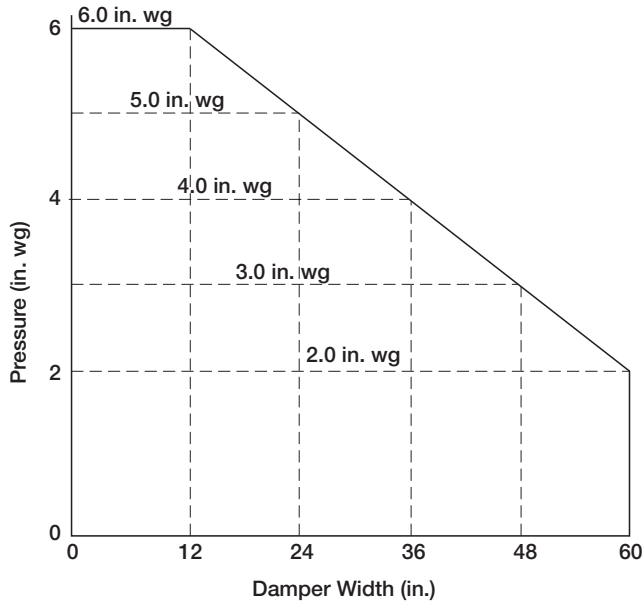
Leakage testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

**VCD-42, VCD-43**

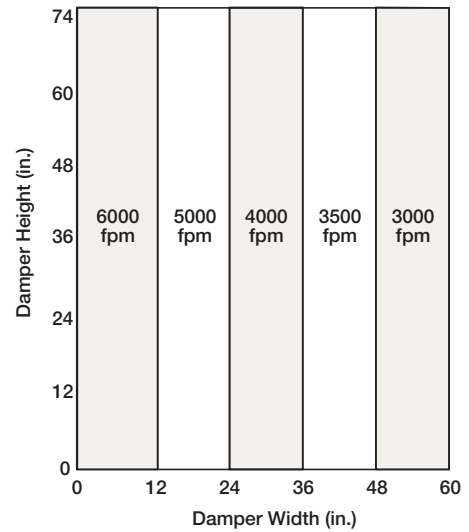


**PRESSURE & VELOCITY LIMITS FOR VCD-42, VCD-43**

**Pressure Limitations**



**Velocity Limitations**



NOTE: VCD-42, and 43 will withstand higher pressures and velocities. Displayed ratings are conservative to prevent misapplication. Consult Greenheck if you have an application outside these limitations. Temperatures in excess of 180°F require special consideration.

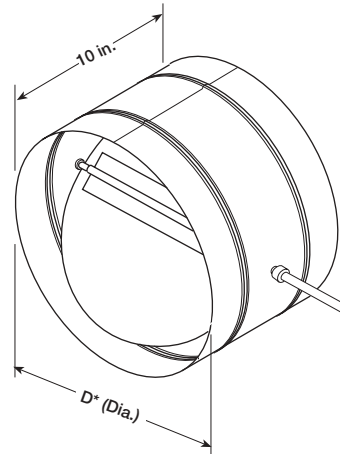
## Application and Design

### VCDR-50

The VCDR-50 series is a round control damper intended for applications in low to medium pressure and velocity systems.

### VCDR-53

The VCDR-53 series is a low leakage round control damper intended for applications in low to medium pressure and velocity systems.



**VCDR-50 / VCDR-53**

\*D dimension furnished approximately 1/8 in. undersize.

## Standard Construction

**Frame:** Through 12 in. dia.- Reinforced 20 ga. galvanized steel.

Above 12 in. dia.- Reinforced 18 ga. galvanized steel.

**Blades:** 20 gauge galvanized steel

**Seals:** VCDR-50

None

VCDR-53

Silicone rubber blade seals

**Axles:** 1/2 in. dia. plated steel

**Bearings:** Oil impregnated bronze sleeve

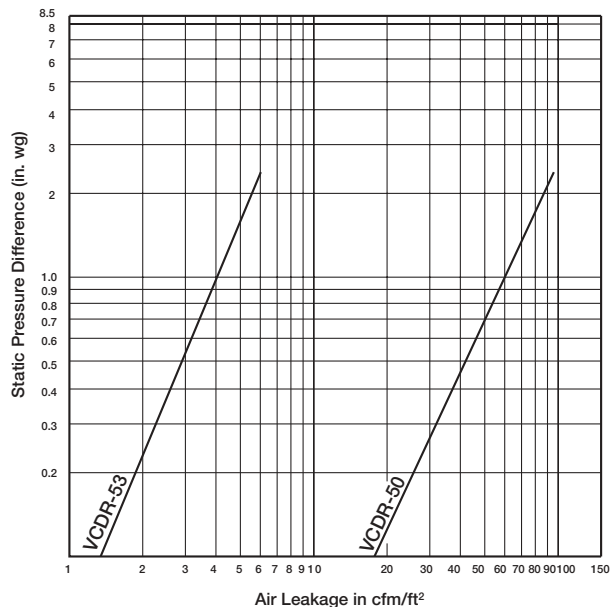
**Minimum Size:** 5 in. diameter

**Maximum Size:** 24 in. diameter

**Temperature:** 180°F

## Performance Data

### Leakage Data VCDR-50, VCDR-53



### Pressure Loss Coefficient

VCDR-50, 53	12 Dia.	24 Dia.	36 Dia.
Fig. 5.2	0.94	0.59	0.53
Fig. 5.3	0.33	0.23	0.18
Fig. 5.5	1.54	1.45	1.41

Leakage and Pressure Loss testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft³.

See page 10 for Figures 5.2, 5.3, and 5.5.

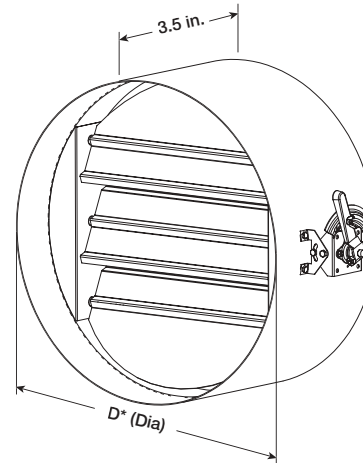
## Application and Design

### VCDRM-50

The VCDRM-50 series is an insert type multi-blade round control damper intended for applications in low to medium pressure and velocity systems.

### VCDRM-53

The VCDRM-53 series is an insert type low leakage multi-blade round control damper intended for applications in low to medium pressure and velocity systems.



**VCDRM-50 / VCDRM-53**

\*D dimension furnished approximately 1/8 in. undersize.

## Standard Construction

**Frame:** Through 22 in. dia.- 3 1/2 in. x 14 ga. galvanized steel.

Above 22 in. dia.- 3 1/2 in. x 1/8 galvanized steel.

**Blades:** 16 gauge galvanized steel

**Linkage:** Side linkage out of airstream (concealed in frame)

**Seals:** VCDRM-50 - None  
VCDRM-53 - Vinyl blade seals with silicone rubber on top and bottom blade radius.

**Axles:** 1/2 in. dia. plated steel.  
Removable control shaft extends 6 in. minimum beyond frame.

**Bearings:** Oil impregnated bronze sleeve

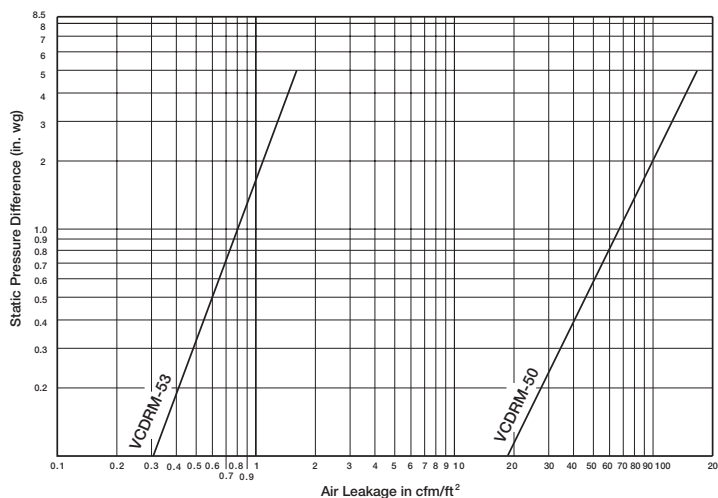
**Minimum Size:** 10 in. diameter

**Maximum Size:** 36 in. diameter

**Temperature:** 180°F

## Performance Data

### Leakage Data VCDRM-50, VCDRM-53



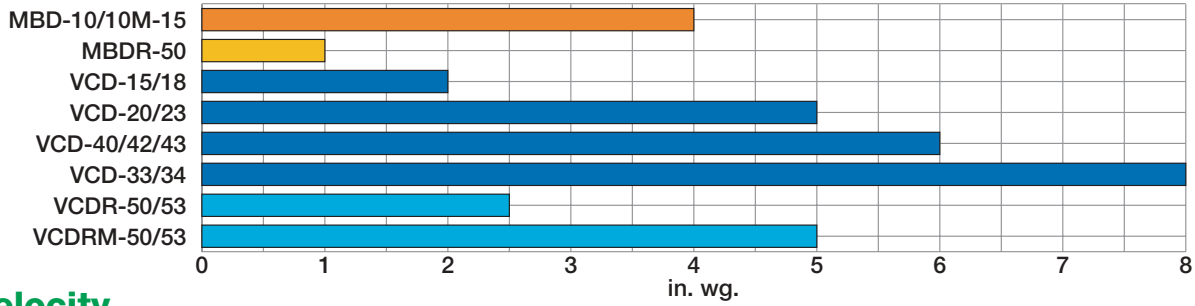
### Pressure Loss Coefficient

VCDRM-50, 53	12 Dia.	24 Dia.	36 Dia.
Fig. 5.2	2.38	2.04	3.02
Fig. 5.3	1.81	1.53	3.16
Fig. 5.5	3.02	2.36	4.05

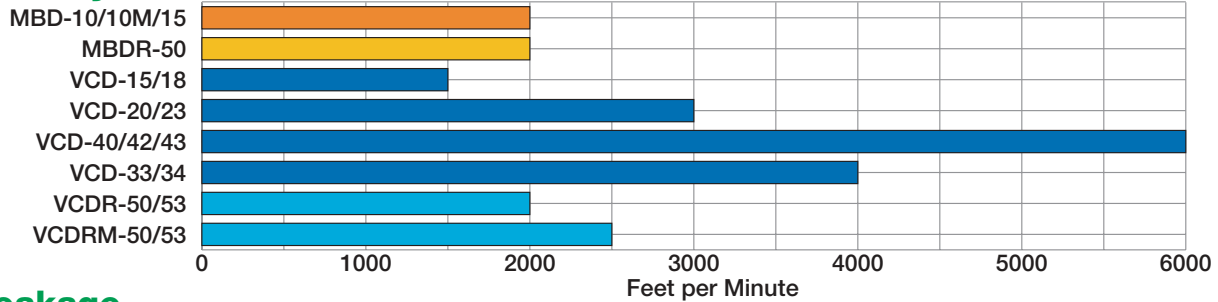
Leakage and Pressure Loss testing was conducted in accordance with AMCA Standard 500D. All data has been corrected to represent standard air at a density of 0.075 lb/ft³.

See page 10 for Figures 5.2, 5.3, and 5.5.

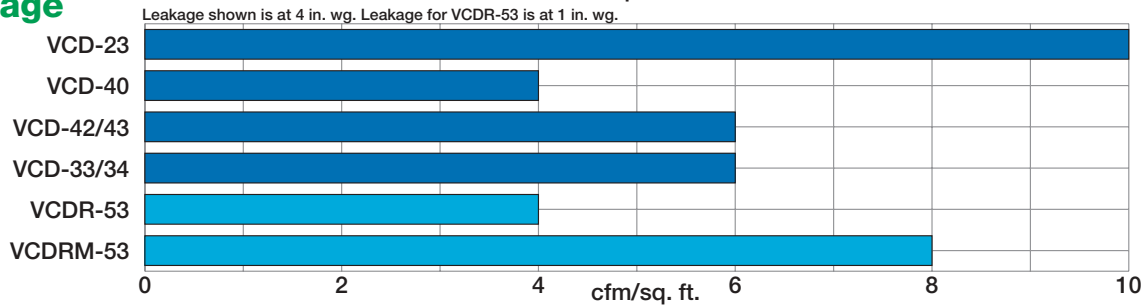
## Pressure



## Velocity



## Leakage



## Construction

x - Standard  
o - Optional

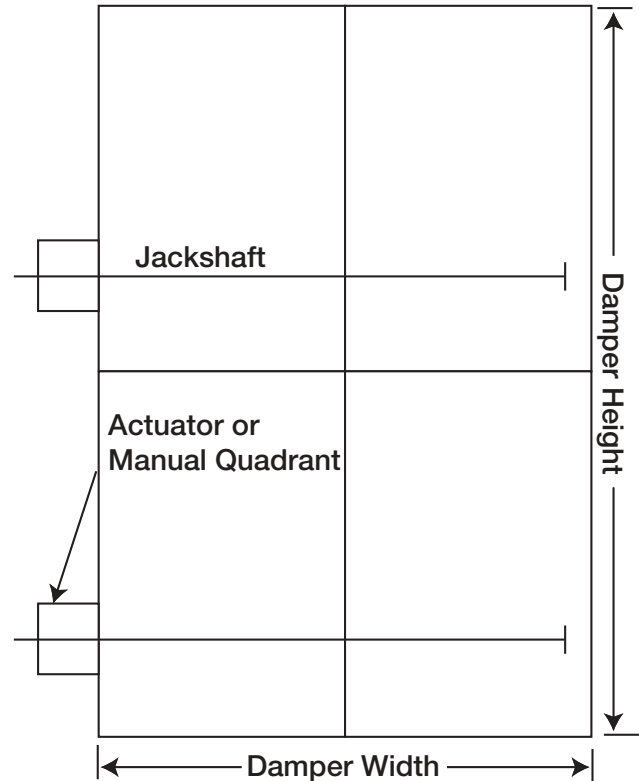
		MBD-10	MBD-10M	MBD-15	MBDR-50	VCD-15	VCD-18	VCD-20	VCD-23	VCD-40	VCD-42	VCD-43	VCD-33	VCD-34	VCDR-50	VCDR-53	VCDRM-50	VCDRM-53
Blade Profile	Straight	x	x		x										x	x		
	3V			x		x	x	x	x								x	x
	Airfoil									x	x	x	x					
	Airfoil-Insulated													x				
Material	Galvanized	x	x	x	x	x	x	x	x		x		x	x	x	x	x	x
	Stainless							o	o				o	o	o	o	o	o
	Aluminum							o	o	x		x		o				
Frame Gauge	20				x	x	x								x	x		
	18	x	x												x	x		
	16			x				x	x				x	x				
	14							o	o		x		o	o			x	x
	12							o	o	0.125	o	0.125	o	o			x	x
Blade Seals	Vinyl					x		x										x
	Silicone							o	x	x	x	x	x			x		
	EPDM					o		o		o	o	o	o	o				
Jamb Seals	Aluminum					x		x				x	x					x
	Stainless							o	x	x	x	o	o					
Bearings	Synthetic			x	x	x	x	x	x	x	x	x	x	x				
	Bronze			o		o	o	o	o	o	o	o	o	o	x	x	x	x
	Stainless					o	o	o	o	o	o	o	o	o	o	o	o	o
Axles	Steel			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Stainless							o	o	o	o	o	o	o	o	o	o	o
Linkage Material	Steel			x		x	x	x	x	x	x	x	x	x			x	x
	Stainless							o	o	o	o	o	o	o			o	o

## Drive Arrangement Definition

# 22-2FEL-2

① ② ③ ④ ⑤ ⑥ ⑦

- ① Number of sections wide
- ② Number of sections high
- ③ Number of actuators or manual quadrants
- ④ Who supplies the actuators or manual quadrants  
F - Factory  
C - Customer Supplied (field mounted)
- ⑤ Actuator or manual quadrant mounting  
E - External  
I - Internal  
B - Both internal and external
- ⑥ Actuator or manual quadrant location  
L - Left hand drive  
R - Right hand drive  
B - Both right and left
- ⑦ Number of jackshafts



## HCD Series Industrial Control Dampers

### Application and Design

Industrial control dampers are heavy duty flanged frame style dampers with various blade styles. They are designed to control airflow and provide shut off in HVAC or industrial process control systems.

### Options

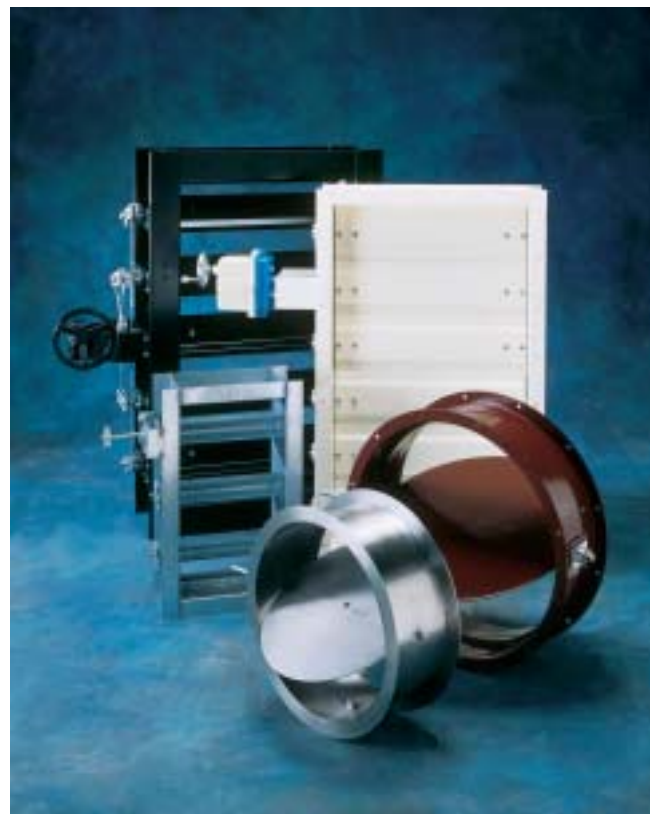
A variety of optional features are available that make these industrial control dampers extremely versatile, allowing their capabilities to be tailored to the application.

### HCD (Rectangular)

There are numerous rectangular industrial control dampers to fit your applications with pressure and velocity capabilities up to 45 in. wg and 6000 fpm, respectively. Consult Greenheck if specifications require higher limits.

### HCDR (Round)

The round industrial control dampers have pressure and velocity capabilities up to 15 in. wg and 6500 fpm. Consult Greenheck if specifications require higher limits.



# Greenheck Dampers & Louvers

**Greenheck has the solution to all your Damper & Louver needs!**



- Commercial and Industrial Control Dampers
- Fire, Smoke, and Combination Fire Smoke Dampers
- Ceiling Radiation Dampers
- Backdraft Dampers
- Pressure Relief Dampers
- Manual Balancing Dampers
- Access Doors

- Mechanical and Architectural Louvers
- Combination Louver Dampers
- Custom Louver Penthouses
- Architectural Equipment Screens
- Custom Grilles and Brick Vents
- Architectural Sunshades
- Specialty Shapes



## Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Greenheck shall not be liable for damages resulting from misapplication or misuse of its products. Greenheck will not be responsible for any installation or removal costs. Greenheck will not be responsible for any service work or backcharges without prior written authorization.

Actuators are warranted by the actuator manufacturer. Should actuators furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized actuator service station.

Due to continuing research, Greenheck reserves the right to change specifications without notice.



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Fans and Ventilators



Energy Recovery Ventilators & Make-Up Air Units



Kitchen Ventilation Systems



Dampers and Louvers

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