

HVAC Control & Balancing Dampers

Models VCD, ICD, FBH, FBV, MBD and RBD

• Selection • Construction • Performance



 **GREENHECK**
Building Value in Air.

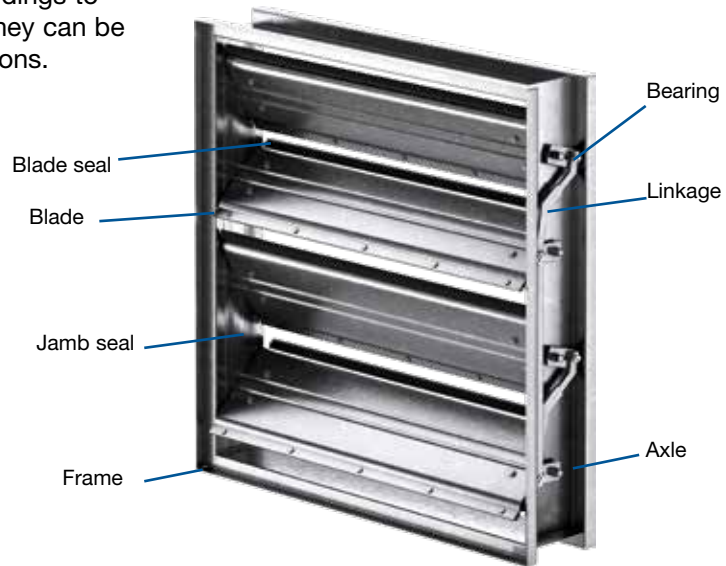


May
2023

Commercial Control Dampers are used in buildings to regulate the flow of air in an HVAC system. They can be used in intake, exhaust, or mixed air applications.

There are two categories of control dampers:

- Volume Control (pages 2-15)
- Balancing (pages 16-19)



Frame - Tog-L-Loc® Advantage

Greenheck control dampers utilize a 5 in. x 1 in. (127 mm x 25 mm) hat channel frame. Each frame is built with four separate pieces of material and joined by our Tog-L-Loc® process. The Tog-L-Loc process provides a more rigid frame that resists “racking” better than welded construction.

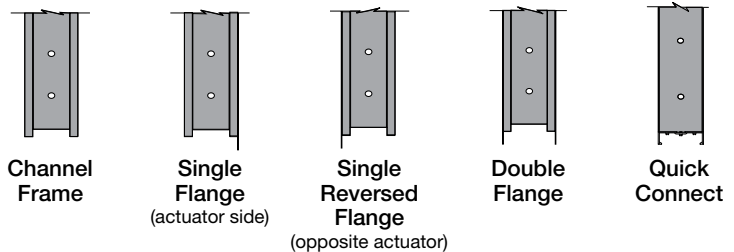


Tog-L-Loc®
Reinforced Corner

Frame Options

There are five frame options available:

- **Channel (standard)** - allows damper to be insert mounted into an opening or duct
- **Single flange or single reversed flange** - can be insert mounted or directly mounted to the wall or mating surfaces such as a plenum wall
- **Double flange** - allows damper to be mounted on both sides directly to wall or duct
- **Quick connect (VCD-43, -43V; ICD series)** - designed to match up to a TDC, TDF, or Ductmate connection

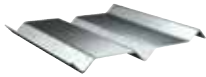


Maximize Performance - Low Profile Frame

On dampers that are 17 in. (432 mm) high or less, Greenheck uses a low profile top and bottom frame section to maximize free area which allows for lower pressure drop and increases damper performance.



Blades



3V Blade

- Fabricated from single thickness galvanized steel or stainless steel
- Three V-type grooves running the full length of the blade to increase strength
- Low to medium velocity and pressure applications



Steel Airfoil Blade

- Constructed of double-skin galvanized steel or stainless steel
- Airfoil blade results in lower resistance to airflow and increased strength
- High velocity and pressure applications



Aluminum Airfoil Blade

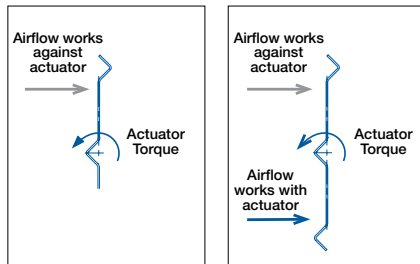
- Constructed of heavy gauge extruded aluminum
- This blade design results in lower resistance to airflow and increased strength
- High velocity and pressure applications



ICD Blade

- Extruded aluminum airfoil blades with thermal breaks and insulated with polyurethane foam
- Used in harsh environments/high temperature differentials

Variable Symmetric Blade Design (VSB) - a Greenheck Exclusive!



Unbalanced Blade
Requires Higher Torque

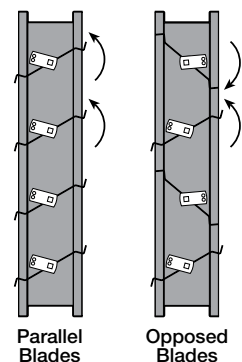
Balanced Blade
Requires Less Torque

- Blades are symmetric about their axis
- Combination of 4, 5, 6, and 7 in. (102, 127, 152, and 178 mm) blade widths are used in a single damper
- Reduces the need for closure strips which optimize pressure drop performance
- Damper is bidirectional airflow rated
- Extensive testing has shown that utilizing various blade sizes will reduce the required actuator torque, which leads to reduction in the size and quantity of actuators needed to operate a damper. This ultimately results in lower initial costs for the building owner, as well as a reduction in ongoing electrical power consumption.

Parallel Versus Opposed Blade Operation

Greenheck control dampers are offered with either parallel or opposed blades. Each style has distinguishing characteristics in regard to the type of operation required.

- **Parallel blade operation** - This configuration requires the damper blades to rotate in the same direction, parallel to one another. Parallel blade orientation is typically used when the damper operates in two positions, open or closed.
- **Opposed blade operation** - Adjacent damper blades rotate opposite one another under opposed blade configuration. Opposed blade configuration is typically used on dampers that modulate airflow.



Parallel Blades

Opposed Blades

Seals

Seals are used for low leakage applications.

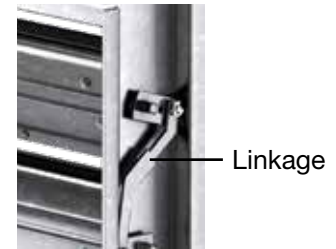
- **Blade seals:** Thermoplastic Elastomer (TPE) is standard. For extreme temperatures, select silicone seals.
- **Sweep seals:** Sweep seals are used on bottom of damper blades to eliminate the use of closure strips (size dependent).
- **Jamb seals:** Jamb seals are constructed of 304SS jamb seal to help reduce leakage along the blade ends. The ICD series have silicone jamb seals available for cold temperature applications.



Jamb Seal

Linkage

Greenheck control dampers have blade linkages concealed in the frame to prevent additional pressure drop and unwanted noise. The linkage is engineered to accurately control each and every blade without need for adjustment.



Bearings

Synthetic - Standard on VCD series and ICD-44

304SS - Optional, used for extreme temperatures or environment

316SS - Used on SEVCD series

The ICD-45 uses a dual bearing with inner sleeve and flanged outer bearing that features no metal-to-metal or metal-to-plastic contact.



Synthetic



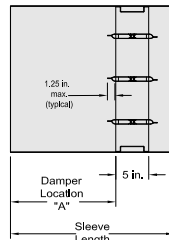
304SS

Options and Accessories



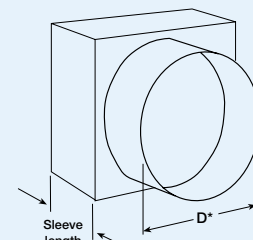
Open Closed Indicator—OCI

The OCI provides positive open and closed signals when used in conjunction with remote indicator lights. Switches are physically linked to a damper blade and therefore give a true representation of the damper's position.



Factory Sleeve Option

Greenheck control dampers are available with factory-furnished sleeves in lengths up to 48 in. (1219 mm). When dampers are installed in factory sleeves, the "A" dimension specifies the location of the damper within the sleeve.



Round Transition

Greenheck control dampers can be supplied with a round transition option in applications where dampers require installation into round openings. The sleeve is transitioned at each end to the appropriate round size.



Security Bars

When security becomes an issue, Greenheck offers optional factory-installed security bars. Security bars are factory welded into a 10 ga. (3.5 mm) sleeve.



Paint Finishes

A wide variety of paint finishes are available.

See color charts on www.greenheck.com for standard color offering.



QR Codes

Greenheck has added QR (Quick Response) codes to the labels on commercial control and air measuring dampers.

Scanning the QR code will link you to the Installation Instructions on www.greenheck.com.

Actuators may be installed at the factory or shipped loose with the necessary linkage and brackets required for mounting. Each unit is tested for operation before shipping when factory-installed actuators are ordered.

Manual Hand Quadrant

- ✓ Location
 - Internal or External

Pull Chain

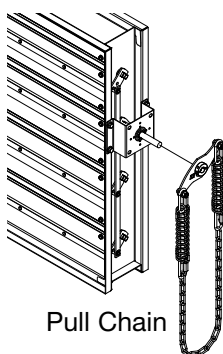
- ✓ Location
 - Internal or External
 - 20 foot loop

Electric Actuator Checklist

- ✓ Power Supply
 - 24VDC, 24VAC, 120VAC, 240VAC
- ✓ Operation
 - Spring Return: spring will drive damper to original starting point
 - Power Open or Power Closed
- ✓ Operating Mode
 - Two-position: damper position is open or closed
 - Modulating: damper position determined by modulating control signal
 - Floating: damper can be stopped anywhere between open or closed
- ✓ Fail Direction (for signal return only)
 - Open or Closed
- ✓ Location
 - Internal or External
- ✓ Control Signal (for modulating only)
 - 0-10 VDC, 2-10 VDC, or 4-20 mA_{dc}
- ✓ NEMA Enclosure
 - 1, 3, 4, 4X, or 7 (specify one per application)
- ✓ Accessories
 - Auxiliary Switches
 - Transformers



Manual Quadrant



Pull Chain



Electric -
External Mount

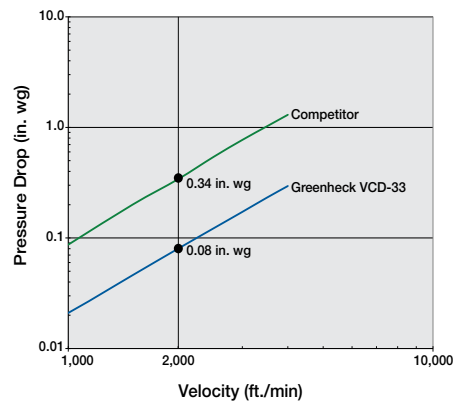


Electric -
Internal Mount

Pressure Drop Comparison

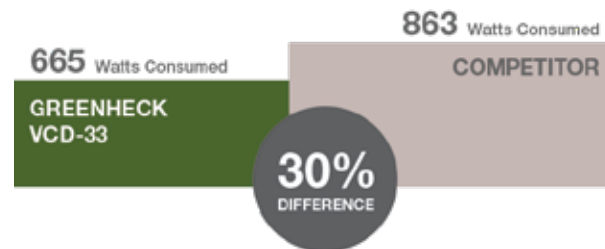
Greenheck compared the AMCA licensed pressure drop data of a VCD-33 12 in. wide x 12 in. high (305 mm x 305 mm) versus a competitor's equivalent 12 in. wide x 12 in. high (305 mm x 305 mm) damper. Both dampers were tested in a fully ducted system. The chart at the right shows the results at a velocity of 2,000 ft./min. The results are dramatic!

AMCA Licensed Pressure Drop Data



AMCA Figure 5.3
12 in. x 12 in.
Fabricated Airfoil Damper

To illustrate the cost saving benefits of a damper with lower pressure loss, we put our VCD-33 control damper to the test. Greenheck's VCD-33 requires 30% less energy consumption to achieve the same CFM as our competitor. Based on an energy rate of \$.10 per kWh, continuous operation (24 hours per day, 365 days per year) for one damper, a realized savings of \$173.76 can be obtained.



Pressure Drop Performance

Pressure drop testing was conducted in accordance with AMCA Standard 500-D using the three configurations shown. All data has been corrected to represent standard air at a density of .075 lb/ft³ (1.2 kg/m³).

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

Figure 5.3 illustrates a fully ducted damper. This configuration has the lowest pressure drop of the three test configurations because entrance and exit losses are minimized by straight duct runs upstream and downstream of the damper.

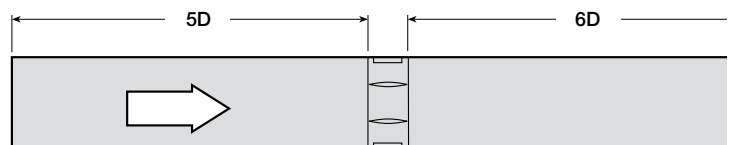


Figure 5.3

Figure 5.2 illustrates a ducted damper exhausting air into an open area. This configuration has a lower pressure drop than Figure 5.5 because entrance losses are minimized by a straight duct run upstream of the damper.

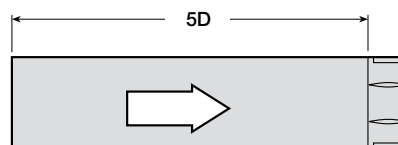


Figure 5.2

Figure 5.5 illustrates a plenum mounted damper. This configuration has the highest pressure drop because of high entrance and exit losses due to the sudden changes of area in the system.

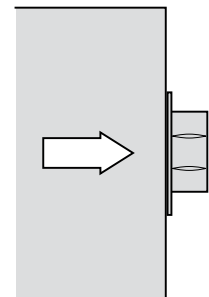


Figure 5.5

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

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



Greenheck Fan Corporation certifies that the model VCD-20 and VCD-40 shown herein are 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.



Greenheck Fan Corporation certifies that the model VCD-23, 33, 34, 43, SEVCD-23 and 33 shown herein are 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.



Greenheck Fan Corporation certifies that the model ICD-44 and ICD-45 shown herein are 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.

ICD-44 and ICD-45

- Extruded aluminum airfoil blades with thermal breaks and insulated with polyurethane foam
- Extruded frame (ICD-44) with thermal breaks (ICD-45)

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.03	.01	.05	.02	.01	.05	.01	.01	.04	.01	.01	.04	.03	.01	.05
1000	.11	.04	.23	.08	.03	.21	.05	.02	.14	.06	.02	.18	.14	.06	.22
1500	.25	.09	.52	.19	.08	.47	.11	.04	.33	.14	.06	.42	.32	.14	.51
2000	.45	.17	.93	.34	.14	.84	.21	.08	.58	.25	.10	.74	.57	.25	.90
2500	.71	.26	1.44	.53	.22	1.32	.33	.12	.91	.40	.17	1.16	.89	.40	1.41
3000	1.03	.38	2.08	.77	.32	1.90	.47	.18	1.31	.57	.24	1.68	1.29	.58	2.04
3500	1.40	.52	2.83	1.05	.43	2.59	.64	.24	1.79	.78	.33	2.28	1.76	.79	2.78
4000	1.83	.67	3.70	1.37	.57	3.39	.84	.32	2.34	1.02	.43	2.98	2.30	1.03	3.70



VCD-20, 23

- Galvanized 3V blade
- Blade and jamb seals (VCD-23)

SEVCD-23

- 316 stainless steel 3V blades
- 316 stainless steel construction
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03
1000	.05	.03	.13	.03	.02	.12	.02	.02	.12	.04	.03	.12	.03	.03	.12
1500	.11	.08	.30	.06	.04	.26	.05	.03	.28	.08	.07	.27	.07	.06	.28
2000	.19	.13	.53	.10	.07	.47	.09	.06	.50	.15	.12	.47	.12	.10	.49
2500	.29	.20	.82	.16	.11	.75	.14	.09	.78	.22	.18	.75	.18	.16	.77
3000	.41	.29	1.19	.23	.16	1.04	.19	.13	1.12	.32	.26	1.07	.26	.22	1.12
3500	.55	.40	1.62	.30	.21	1.41	.27	.19	1.53	.43	.36	1.45	.36	.30	1.53
4000	.72	.51	2.10	.40	.28	1.90	.35	.25	2.00	.56	.46	1.91	.47	.39	2.01



VCD-33 and 34

- Galvanized airfoil blade
- Insulated airfoil (VCD-34)
- Blade and jamb seals

SEVCD-33

- 316 stainless steel airfoil blade
- 316 stainless steel construction
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.01	.01	.03	.01	.01	.03	.01	.01	.02	.01	.01	.03	.01	.01	.03
1000	.03	.02	.12	.03	.01	.11	.02	.01	.09	.03	.02	.11	.02	.02	.11
1500	.07	.05	.27	.06	.03	.26	.04	.02	.21	.07	.04	.24	.04	.04	.24
2000	.13	.08	.48	.10	.05	.45	.07	.04	.38	.11	.08	.43	.08	.07	.44
2500	.19	.12	.74	.15	.09	.71	.11	.06	.58	.17	.12	.67	.12	.11	.68
3000	.26	.17	1.07	.21	.13	1.02	.15	.08	.85	.23	.17	.96	.16	.15	.97
3500	.35	.23	1.46	.28	.17	1.40	.20	.12	1.15	.31	.22	1.31	.21	.20	1.32
4000	.45	.30	1.91	.36	.22	1.89	.26	.15	1.52	.39	.29	1.71	.27	.25	1.73



VCD-40

- Extruded aluminum airfoil blades
- Blades contained within the frame
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.08	.05	.10	.01	.01	.03	.01	.01	.03	.01	.01	.03	.06	.03	.08
1000	.31	.20	.40	.05	.02	.12	.04	.02	.11	.05	.03	.12	.23	.13	.29
1500	.69	.45	.88	.11	.05	.29	.09	.04	.26	.11	.07	.27	.52	.29	.63
2000	1.19	.76	1.54	.19	.10	.52	.16	.07	.46	.20	.12	.49	.91	.51	1.12
2500	1.84	1.19	2.41	.30	.15	.80	.24	.10	.72	.30	.19	.76	1.43	.81	1.76
3000	2.67	1.70	3.45	.43	.22	1.14	.35	.15	1.04	.43	.26	1.11	2.05	1.16	2.52
3500	3.59	2.29	4.75	.58	.30	1.60	.48	.20	1.43	.59	.36	1.53	2.82	1.59	3.40
4000	4.64	2.97	6.09	.76	.40	2.14	.62	.27	1.87	.77	.46	2.00	3.69	2.09	4.52



VCD-43

- Extruded aluminum airfoil blade
- Aluminum frame
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.01	.01	.04	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03
1000	.06	.03	.14	.04	.02	.12	.03	.01	.10	.06	.03	.11	.03	.02	.11
1500	.13	.07	.31	.10	.04	.27	.06	.02	.22	.13	.06	.25	.06	.04	.26
2000	.23	.14	.55	.18	.08	.48	.12	.04	.39	.23	.11	.46	.10	.08	.46
2500	.35	.21	.86	.28	.13	.75	.18	.06	.61	.36	.17	.72	.16	.12	.72
3000	.50	.29	1.23	.40	.19	1.07	.26	.09	.87	.51	.25	1.05	.23	.18	1.02
3500	.68	.39	1.67	.54	.26	1.47	.35	.13	1.19	.71	.34	1.43	.30	.24	1.40
4000	.88	.51	2.19	.70	.34	1.91	.46	.17	1.56	.93	.45	1.87	.39	.31	1.83



VCDR-50 and 53

- Insert type round single blade
- Blade seals VCDR-53

Dimension inches	12			24		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg					
500	.01	.01	.02	.01	.01	.02
1000	.06	.02	.10	.04	.01	.09
1500	.13	.05	.22	.08	.03	.20
2000	.23	.08	.38	.15	.06	.36
2500	.37	.13	.60	.23	.09	.56
3000	.53	.19	.86	.33	.13	.81



VCDRM-53

- Insert type round multiblade
- Blade seals

Dimension inches	12			24			36		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg								
500	.04	.03	.05	.03	.02	.04	.05	.05	.06
1000	.15	.11	.19	.13	.10	.15	.19	.20	.25
1500	.33	.25	.42	.29	.21	.33	.42	.44	.57
2000	.59	.45	.75	.51	.38	.59	.75	.79	1.01
2500	.93	.70	1.18	.79	.60	.92	1.18	1.23	1.58



VCD-23V

- Vertical 3V blades
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03
1000	.05	.03	.13	.03	.02	.12	.02	.02	.12	.03	.03	.12	.04	.03	.12
1500	.11	.08	.30	.06	.04	.26	.05	.03	.28	.07	.06	.28	.08	.07	.27
2000	.19	.13	.53	.10	.07	.47	.09	.06	.50	.12	.10	.49	.15	.12	.47
2500	.29	.20	.82	.16	.11	.75	.14	.09	.78	.18	.16	.77	.22	.18	.75
3000	.41	.29	1.19	.23	.16	1.04	.19	.13	1.12	.26	.22	1.12	.32	.26	1.07
3500	.55	.40	1.62	.30	.21	1.41	.27	.19	1.53	.36	.30	1.53	.43	.36	1.45
4000	.72	.51	2.10	.40	.28	1.90	.35	.25	2.00	.47	.39	2.01	.56	.46	1.91



VCD-33V and VCD-34V

- Vertical galvanized airfoil blades
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03
1000	.05	.03	.13	.03	.02	.12	.02	.02	.12	.03	.03	.12	.04	.03	.12
1500	.11	.08	.30	.06	.04	.26	.05	.03	.28	.07	.06	.28	.08	.07	.27
2000	.19	.13	.53	.10	.07	.47	.09	.06	.50	.12	.10	.49	.15	.12	.47
2500	.29	.20	.82	.16	.11	.75	.14	.09	.78	.18	.16	.77	.22	.18	.75
3000	.41	.29	1.19	.23	.16	1.04	.19	.13	1.12	.26	.22	1.12	.32	.26	1.07
3500	.55	.40	1.62	.30	.21	1.41	.27	.19	1.53	.36	.30	1.53	.43	.36	1.45
4000	.72	.51	2.10	.40	.28	1.90	.35	.25	2.00	.47	.39	2.01	.56	.46	1.91



VCD-42

- Extruded aluminum airfoil blade
- Galvanized steel frame
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.05	.03	.07	.01	.01	.04	.01	.01	.02	.01	.01	.03	.03	.02	.05
1000	.18	.12	.28	.05	.03	.17	.04	.02	.12	.01	.04	.18	.11	.06	.19
1500	.43	.28	.62	.12	.06	.37	.09	.05	.28	.14	.09	.40	.25	.14	.44
2000	.76	.49	1.11	.22	.11	.66	.17	.08	.50	.25	.16	.72	.44	.25	.78
2500	1.19	.77	1.73	.34	.17	1.04	.26	.13	.78	.39	.25	1.12	.69	.39	1.21
3000	1.71	1.11	2.50	.49	.24	1.50	.38	.19	1.13	.57	.36	1.62	1.0	.57	1.75
3500	2.33	1.51	3.41	.66	.33	2.04	.51	.26	1.53	.77	.49	2.21	1.36	.77	2.38
4000	3.04	1.98	4.45	.87	.43	2.66	.67	.34	2.01	1.01	.64	2.88	1.78	1.01	3.11



VCD-43V

- Vertical extruded aluminum airfoil blade
- Aluminum frame
- Blade and jamb seals

Dimension inches	12x12			24x24			36x36			12x48			48x12		
AMCA figure	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5	5.2	5.3	5.5
Velocity (ft/min.)	Pressure Drop in. wg														
500	.01	.01	.04	.01	.01	.03	.01	.01	.03	.01	.01	.03	.01	.01	.03
1000	.06	.03	.14	.04	.02	.12	.03	.01	.10	.03	.02	.11	.06	.03	.11
1500	.13	.07	.31	.10	.04	.27	.06	.02	.22	.06	.04	.26	.13	.06	.25
2000	.23	.14	.55	.18	.08	.48	.12	.04	.39	.10	.08	.46	.23	.11	.46
2500	.35	.21	.86	.28	.13	.75	.18	.06	.61	.16	.12	.72	.36	.17	.72
3000	.50	.29	1.23	.40	.19	1.07	.26	.09	.87	.23	.18	1.02	.51	.25	1.02
3500	.68	.39	1.67	.54	.26	1.47	.35	.13	1.19	.30	.24	1.40	.71	.34	1.40
4000	.88	.51	2.19	.70	.34	1.91	.46	.17	1.56	.39	.31	1.83	.93	.45	1.83



Air leakage is based on operation between 32° and 120°F (0 and 49°C).

Tested for leakage in accordance with ANSI/AMCA Standard 500-D, Figure 5.5.

Tested for air performance in accordance with ANSI/AMCA Standard 500-D, Figures 5.2, 5.3 and 5.5.

Torque

Data is based on a torque of 5.0 in-lb/ft² (0.56 N·m) applied to close and seat the damper during the test.

VCD-23, SEVCD-23	Leakage Class*		
Maximum Damper Width	1 in. wg (0.25 kPa)	4 in. wg (1 kPa)	5 in. wg (1.2 kPa)
48 in. (1219 mm)	1A	1	1

VCD-43	Leakage Class*		
Maximum Damper Width	1 in. wg (0.25 kPa)	4 in. wg (1 kPa)	8 in. wg (2 kPa)
60 in. (1524 mm)	1A	1	1

Data is based on a torque of 7.0 in-lb/ft² (0.79 N·m) applied to close and seat the damper during the test.

VCD-33, VCD-34, SEVCD-33	Leakage Class*		
Maximum Damper Width	1 in. wg (0.25 kPa)	4 in. wg (1 kPa)	8 in. wg (2 kPa)
60 in. (1524 mm)	1A	1	1

Data is based on a torque of 9.0 in-lb/ft² (1.02 N·m) applied to close and seat the damper during the test.

ICD-44, 45	Leakage Class*		
Maximum Damper Width	1 in. wg (0.25 kPa)	4 in. wg (1 kPa)	8 in. wg (2 kPa)
48 in. (1219 mm)	1A	1	1

*Leakage Class Definitions

The **maximum** allowable leakage is defined by AMCA as the following:

- Leakage Class 1A - 3 cfm/ft² @ 1 in. wg (Class 1A is only defined at 1 in. wg).
- Leakage Class 1 - 4 cfm/ft² @ 1 in. wg
 - 8 cfm/ft² @ 4 in. wg
 - 11 cfm/ft² @ 8 in. wg
 - 12.6 cfm/ft² @ 10 in. wg

Maximum Leakage cfm/sq. ft. (cmh/sq.m)		
Model	Pressure	
	@ 1 in. wg (0.25 kPa)	@ 4 in. wg (1 kPa)
VCD-23V, 33V, 34V, 43V, VCD-40	Class 1A	Class 1
VCDR-53, VCDRM -53	Class 1	Class 1

ICD - Insulated Control Damper

Greenheck's ICD dampers were developed for applications where it is necessary to minimize thermal transfer and reduce condensation. ICD series dampers can be used in applications down to -70°F (-56°C) and up to 200°F (93°C) for:

- Cold food storage warehouses
- Buildings/warehouses
- Rooftop intake or exhaust



Cross section of thermally broken frame and blade

AMCA Certified Energy Efficiency Performance

Greenheck Model ICD-44 has a Thermal Efficiency Ratio of 593%.

Greenheck Model ICD-45 has a Thermal Efficiency Ratio of 941%.

A damper's Thermal Efficiency Ratio (E) is a comparison of the thermal performance of the tested damper with that of a standard reference damper, which is a 3V blade damper with blade and jamb seals. A damper with the same thermal efficiency as the reference damper would have an E of 0%. A damper that is twice as efficient as the reference damper would have an E of 100%.



Face & Bypass Dampers

The face and bypass dampers are used in applications where two dampers are connected together allowing one damper to open while the other damper closes.

X = Standard O = Optional		FBH-23	FBH-33	FBH-43	FBV-23	FBV-33	FBV-43
F & B Style	Horizontal	X	X	X			
	Vertical				X	X	X
Blade Profile	3V	X			X		
	Airfoil		X	X		X	X
Mate- rial	Galvanized	X	X		X	X	
	Aluminum			X			X
Blade Seals	TPE	X	X	X	X	X	X
	Silicone	O	O	O	O	O	O
Bearings	Synthetic	X	X	X	X	X	X
	316 Stainless Steel	O	O	O	O	O	O
Axles	Steel	X	X	X	X	X	X
	316 Stainless Steel	O	O	O	O	O	O
Linkage Material	Steel	X	X	X	X	X	X
	316 Stainless Steel	O	O	O	O	O	O
Sizing (mm) inches	Minimum Size	8x6 (203x152)	8x6 (203x152)	8x6 (203x152)	8x6 (203x152)	8x6 (203x152)	8x6 (203x152)
	Maximum Single Section Size	48x74 (1219x1880)	60x74 (1524x1880)	60x74 (1524x1880)	48x74 (1219x1880)	60x74 (1524x1880)	60x74 (1524x1880)
	Maximum Multiple Section Size (Face Only)	96 x 74 (2438 x 1880)	96 x 74 (2438 x 1880)	96 x 74 (2438 x 1880)	96 x 74 (2438 x 1880)	120 x 74 (3048 x 1880)	120 x 74 (3048 x 1880)
Ratings	Max. Velocity ft/min. (m/s)	3000 (15.2)	4000 (20.3)	6000 (30.5)	3000 (15.2)	4000 (20.3)	6000 (30.5)
	Max. Pressure in. wg (kPa)	5 (1.2)	8 (2)	8 (2)	5 (1.2)	8 (2)	8 (2)



FBV



FBH

Three common energy code standards that pertain to dampers are:

- ASHRAE Standard 90.1 - Energy Standard for Buildings except Low-Rise Residential Buildings
- California Title 24
- IECC - International Energy Conservation Code

The primary requirements for dampers based on each standard:

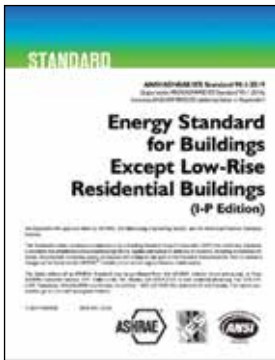
ASHRAE Standard 90.1 (2019 edition) states that maximum damper leakage at 1 in. wg for a:

- non-motorized damper is 20 cfm/ft² or
- motorized damper is 4 cfm/ft² (see Table 6.4.3.4.3 from ASHRAE Standard 90.1)

California Title 24 (2021 edition, section 140.4.4) states that the dampers shall be certified in accordance with AMCA Publication 511 to have a maximum leakage of 10 cfm/ft² at 1 in. wg. The dampers have been tested and are able to open and close against the rated airflow and pressure of the system after 60,000 damper opening and closing cycles.

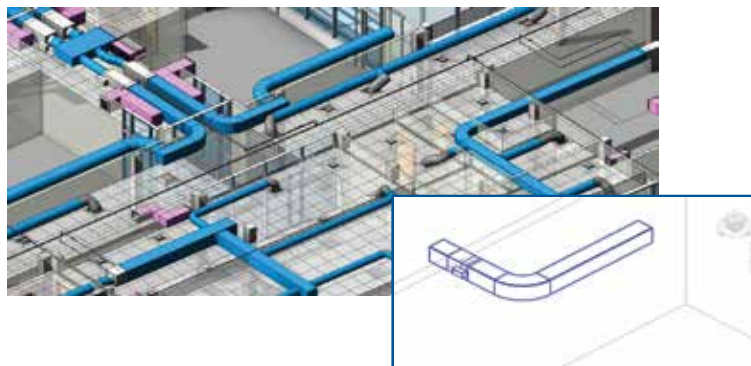
IECC (2021, section C403.7.7) states that the outdoor air supply and exhaust opening be supplied with Class 1A motorized dampers with a maximum leakage rate of 4 cfm/ft² at 1 in. wg when tested in accordance with AMCA 500D.

Greenheck's volume control dampers meet the requirements of ASHRAE, California Title 24, and IECC.



Revit®

The latest edition of ASHRAE 90.1 mandates specific fan power limits based on cfm. By using Greenheck's Revit models with the most accurate and lowest certified pressure loss performance in the industry, engineers can analyze their designs to minimize system effects. Contact your local Greenheck representative to calculate the actual pressure loss based on your cfm or velocity.



Control Dampers Quick Selection Chart



X = Standard 0 = Optional		ICD-44	ICD-45	VCD-20	VCD-23	VCD-23V	VCD-33	VCD-33V	VCD-34	VCD-34V
Blade Profile	Single Blade									
	3V			X	X					
	3V-Vertical Blade					X				
	Airfoil						X			
	Airfoil-Vertical Blade							X		
	Airfoil-Insulated								X	
	Airfoil - Insulated Vertical Blade									X
	Insulated Thermally Broken Airfoil	X	X							
Frame Material	Galvanized			X	X	X	X	X	X	X
	304 Stainless Steel			0	0	0	0	0	0	0
	Aluminum	X								
	Insulated Thermally Broken Aluminum		X							
Blade Material	Galvanized			X	X	X	X	X	X	X
	304 Stainless Steel			0	0	0	0	0	0	0
	316 Stainless Steel									
	Aluminum	X	X							
Frame Gauge	16			X	X	X	X	X	X	X
	12			0	0	0	0	0	0	0
	Aluminum .125 (3 mm)									
Blade Seals	TPE				X	X	X	X	X	X
	Silicone	X	X		0	0	0	0	0	0
Jamb Seals	Stainless Steel	X			X	X	X	X	X	X
	Silicone		X							
Bearings	Synthetic			X	X	X	X	X	X	X
	316 Stainless Steel			0	0	0	0	0	0	0
	Dual Bearing with Acetal Inner Sleeve	X	X							
Axles	Steel	X	X	X	X	X	X	X	X	X
	316 Stainless Steel			0	0	0	0	0	0	0
Linkage Material	Steel	X	X	X	X	X	X	X	X	X
	316 Stainless Steel			0	0	0	0	0	0	0
Accessories	Sleeves			0	0	0	0	0	0	0
	Transitions			0	0	0	0	0	0	0
	Actuators*	0	0	0	0	0	0	0	0	0
	Flanges**	0	0	0	0	0	0	0	0	0
	Retaining Angles			0	0	0	0	0	0	0
	Security Bars			0	0	0	0		0	0
Sizing inches (mm)	Minimum Size	8 x 7 (203 x 178)	8 x 7 (203 x 178)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)
	Maximum Single Section Size	60 x 78 (1524 x 1981)	60 x 78 (1524 x 1981)	48x74 (1219x1880)	48x74 (1219x1880)	74x48 (1880x1219)	60x74 (1524x1880)	74x60 (1880x1524)	60x74 (1524x1880)	60x74 (1524x1880)
	Maximum Multi-Section Size	180 x 156 (4572 x 3962)	180 x 156 (4572 x 3962)	Unlimited	Unlimited	148x96 (3759x2438)	Unlimited	148x120 (3759x3048)	Unlimited	148x120 (3759x3048)
Ratings	Max. Velocity ft/min. (m/s)	4000 (20.3)	4000 (20.3)	3000 (15.2)	3000 (15.2)	3000 (15.2)	4000 (20.3)	4000 (20.3)	4000 (20.3)	4000 (20.3)
	Max. Pressure in. wg (kPa)	8 (2)	8 (2)	5 (1.2)	5 (1.2)	5 (1.2)	8 (2)	8 (2)	8 (2)	8(2)

* Actuators include manual, 24V, 120V, and 240V.

** Flanges include single, single reversed, and double flange.

On ICD-44 and ICD-45, sizing is shown for channel frame. When sizing quick connect frame, see www.greenheck.com

Control Dampers Quick Selection Chart



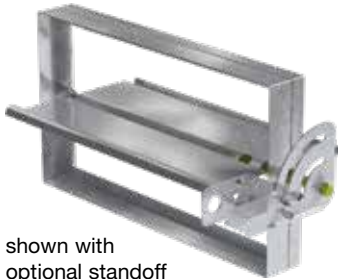
X = Standard O = Optional		VCD-40	VCD-42	VCD-43	VCD-43V	SEVCD-23	SEVCD-33	VCDR-50	VCDR-53	VCDRM-53
Blade Profile	Single Blade							X	X	
	3V					X				X
	Airfoil	X	X	X			X			
	Airfoil-Vertical Blade				X					
Frame Material	Galvanized		X					X	X	X
	304 Stainless Steel							O	O	O
	316 Stainless Steel					X	X			
	Aluminum	X		X	X					
Blade Material	Galvanized							X	X	X
	304 Stainless Steel							O	O	O
	316 Stainless Steel					X	X			
	Aluminum	X	X	X	X					
Frame Gauge	20							X	X	
	16		X			X	X	O	O	
	14									X
	12		O							
	10									O
	Aluminum	.125 (3.2)		.125 (3.2)	.125 (3.2)					
Blade Seals	EPDM								X	Vinyl
	TPE	X	X	X	X	X	X			
	Silicone	O	O	O	O	O	O		O	
Jamb Seals	Stainless Steel	X	X	X	X					X
	316 Stainless Steel					X	X			
Bearings	Synthetic	X	X	X	X					
	Bronze							X	X	X
	316 Stainless Steel	O	O	O	O	X	X	O	O	O
Axles	Steel	X	X	X	X			X	X	X
	316 Stainless Steel	O	O	O	O	X	X	O	O	O
Linkage Material	Steel	X	X	X	X					X
	316 Stainless Steel	O	O	O	O	X	X			O
Accessories	Sleeves		O	O	O	O	O			
	Transitions		O			O	O			
	Actuators*	O	O	O	O	O	O	O	O	O
	Flanges**	O	O	O	O	O	O			
	Retaining Angles	O	O			O	O			
	Security Bars		O							
Sizing (mm)	Minimum Size	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	6x6 (152x152)	4 (102)	4 (102)	10 (254)
	Maximum Single Section Size	60x74 (1524x1880)	60x74 (1524x1880)	60x78 (1524x1981)	78x60 (1981x1524)	48x74 (1219x1880)	60x74 (1524x1880)	24 (610)	24 (610)	36 (914)
	Maximum Multi-Section Size	Unlimited	Unlimited	288 x 234 (7315 x 5944)	156x120 (3962x3048)	Unlimited	Unlimited	NA	NA	NA
Ratings	Max. Velocity ft/min. (m/s)	6000 (30.5)	6000 (30.5)	6000 (30.5)	6000 (30.5)	3000 (15.2)	4000 (20.3)	3000 (15.2)	3000 (15.2)	2500 (12.7)
	Max. Pressure in. wg (kPa)	6 (1.5)	6 (1.5)	8 (2)	8 (2)	5 (1.2)	8 (2)	4 (1)	4 (1)	5 (1.2)

* Actuators include manual, 24V, 120V, and 240V.

** Flanges include single, single reversed, and double flange.

Manual balancing dampers are control dampers that regulate the flow of air but are not intended to be used in applications as a positive shut-off or for automatic control. These dampers are shipped with manual hand quadrants that can be locked in place.

There are three balancing damper models available.



* shown with optional standoff bracket

MBD-10

- Single blade
- Manual quadrant shipped as a kit for field installation



MBD-15

- Multiblade
- Manual quadrant shipped as a kit for field installation

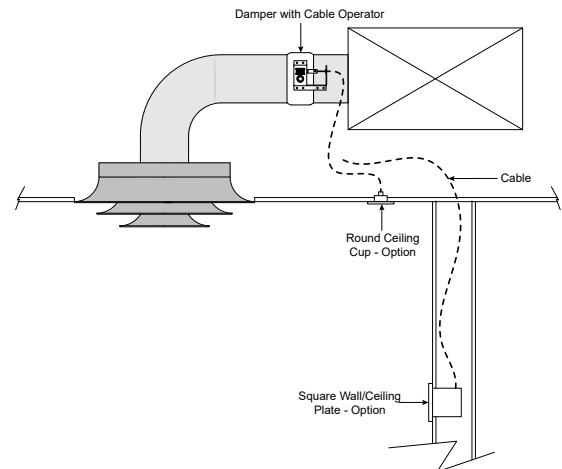


MBDR-50

- Round blade
- Factory-mounted manual quadrant

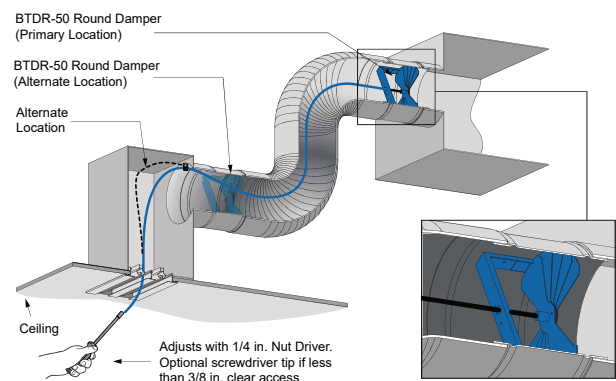
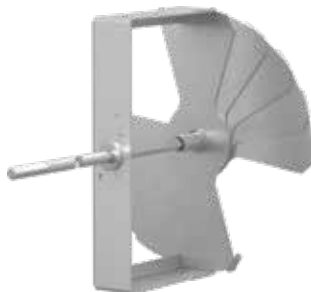
Cable Operator Option

The cable operator is ideal for applications where it is difficult to get access to manually adjust the damper and balance airflow. They are adjusted via cable actuation using a 1/4 in. nut driver at the ceiling or wall.



Bowtie Damper

The BTDR-50 is a cable operated radial blade balancing damper (also known as a bowtie damper) that is designed for easy airflow adjustment at an air outlet or plenum neck. They are adjusted using a nut driver or screwdriver.



Remote balancing dampers offer the same function as a manual balancing damper plus the added benefit of controlling the damper remotely at a diffuser or wall plate. These remote balancing dampers are ideal for applications where it is difficult to gain access to manually adjust the dampers to balance airflow. The “EZ Balance” remote control operates the damper motor by connecting to the wall, ceiling, or diffuser mounted RJ11 connector.

There are three remote balancing damper models available.



RBD-10

- Single blade
- Actuator shipped as a field kit for installation



RBD-15

- Multiblade
- Actuator shipped as a field kit for installation



RBDR-50

- Round blade
- Factory-mounted actuator

Accessories

A wide variety of accessories are available for the RBD and RBDR series.



Plenum rated cables



Round ceiling plate



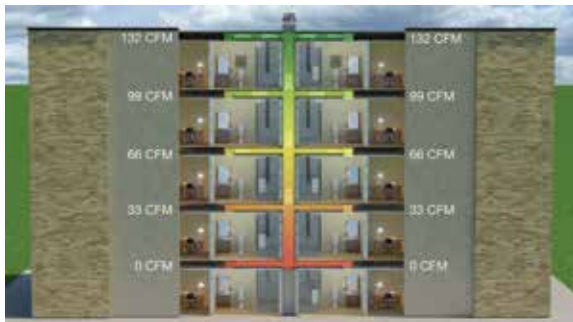
Wall plates with ports



EZ Balance remote

Automatic Balancing Dampers

The automatic balancing dampers (ABD) automatically adjust to system pressure changes to maintain a constant airflow to compensate for changes in pressure reducing the amount of energy required to ventilate a space while improving the indoor air quality.



Traditional Balancing System

Stand-alone balancing damper cannot adjust to changes in pressure resulting in incorrect airflows.



Balanced System

Automatic balancing dampers automatically adjust the airflow to changes in the system pressure.

ABD

Model ABD is an automatic balancing damper designed to maintain constant airflow volume in HVAC applications. The damper blade is calibrated to automatically adjust to changing pressures. This damper can be used in supply or exhaust applications.



ABD-FD

Model ABD-FD is an automatic balancing damper with a UL 555 rated 1½ or 3 hour static fire damper. The ABD-FD is designed to maintain a constant airflow volume in HVAC applications. The damper blade is calibrated to automatically adjust to changing pressures. The assembly will include a UL 2043 rated ABD, flanged sleeve, UL 555 rated curtain fire damper (FD-150 or FD-350), and optional grille.



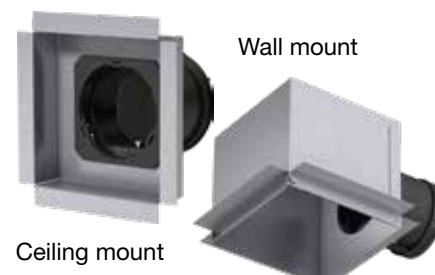
ABD-T

Model ABD-T is an automatic balancing damper with a square transition. The transition can be removed and flipped to the other side of the damper using a factory-supplied quick adapter plate. The ABD-T can be used in both supply and exhaust applications.



ABD-RB

Model ABD-RB combines an automatic balancing damper (model ABD) with the convenience of a factory-supplied register box. The ABD-RB can be configured for supply or exhaust applications and can be mounted in both walls and ceilings. In addition, the ABD can be mounted in either the side or the back of the register box. All ABD models maintain a constant CFM independent of the system pressure to prevent over or under ventilation. The ABD-RB is also available with a factory-supplied grille.



ABD-Z1

Model ABD-Z1 is designed to provide on/off control to a ventilation system. The ABD-Z1 has a shutoff damper with an electric actuator, automatic balancing damper (ABD), and a plenum box as one assembly.



ABD-Z2

The ABD-Z2 is an automatic balancing damper that includes a two-position actuator which allows the unit to toggle between two user defined constant CFM set point minimum and a boosted on demand CFM. The ABD-Z2 is ideal for helping achieve the requirements of ASHRAE 62.2 for acceptable indoor air quality.

Optional return/exhaust grille is available.



ABD Installation for Supply and Exhaust Applications

The ABD may be installed with a UL 555C rated ceiling radiation damper (CRD). This allows for a compact assembly designed to maintain a constant airflow volume in HVAC applications, while also limiting the radiant heat transfer through openings in the ceiling membrane of fire resistance-rated floor/ceiling assemblies of three hours or less.



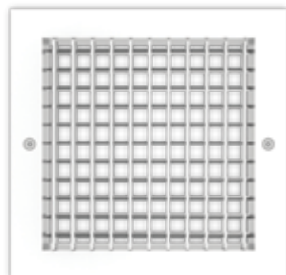
Grilles

The following grilles are available on ABD-FD, ABD-RB, ABD-Z1, and ABD-Z2:

**Return/Exhaust Grille
Surface Mount**



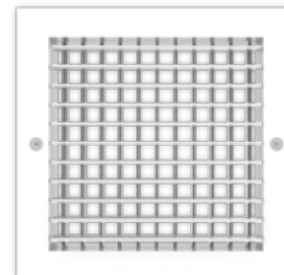
**Double Deflection Grille
Vertical Blades**



**Single Deflection
Grille Vertical Blades**



**Double Deflection Grille
Horizontal Blades**



Ratings

		ABD	ABD-FD	ABD-RB	ABD-T	ABD-Z1	ABD-Z2
Pressure Rating	0.2 in. wg to 2 in. wg (0.05 kPa to 0.5 kPa)	✓	✓	✓	✓	✓	✓
Volume	25 cfm to 425 cfm (.012 m³/s to .201 m³/s)	✓		✓	✓		
	25 cfm to 275 cfm (.012 m³/s to .130 m³/s)		✓			✓	✓
Temperature	25°F to 150°F (-4°C to 65°C)	✓	✓	✓	✓	✓	✓

Airflow Range by Size

ABD Diameter in. (mm)	Individual Set Points	Airflow Range CFM* (m³/s)	ABD	ABD-FD	ABD-RB	ABD-T	ABD-Z1	ABD-Z2
4 (102)	20	25 to 130 (.012 to .061)	✓	✓	✓	✓	✓	✓
5 (127)	20	25 to 130 (.012 to .061)	✓		✓	✓		
6 (152 mm)	24	50 to 275 (.024 to .130)	✓	✓	✓	✓	✓	✓
8 (203) Exhaust	26	125 to 400 (.059 to .189)	✓		✓	✓		
8 (203) Supply	26	105 to 425 (.050 to .201)	✓		✓	✓		

* Note: Airflow range determined through +/- 10% of average airflow over the pressure range.

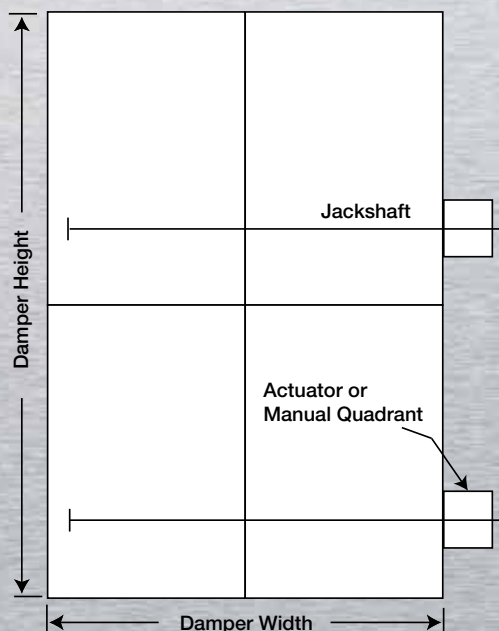
Drive Arrangement Definition

Each damper is given a drive arrangement code to help describe the construction of the damper. The following breaks down what each number and letter represents.

22-2FER-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

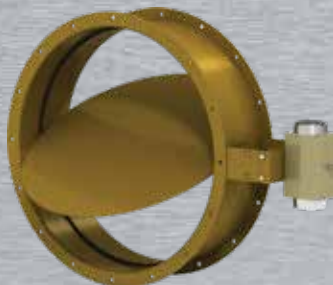


Heavy-Duty Industrial Control Dampers

Industrial control dampers are for control and shut-off applications. There is a wide variety of configurations, options, accessories, and actuators available. These control dampers are capable of pressures up to 30 in. wg and velocities up to 7000 fpm.



HCD Series



HCDR Series



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Our Commitment

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

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

