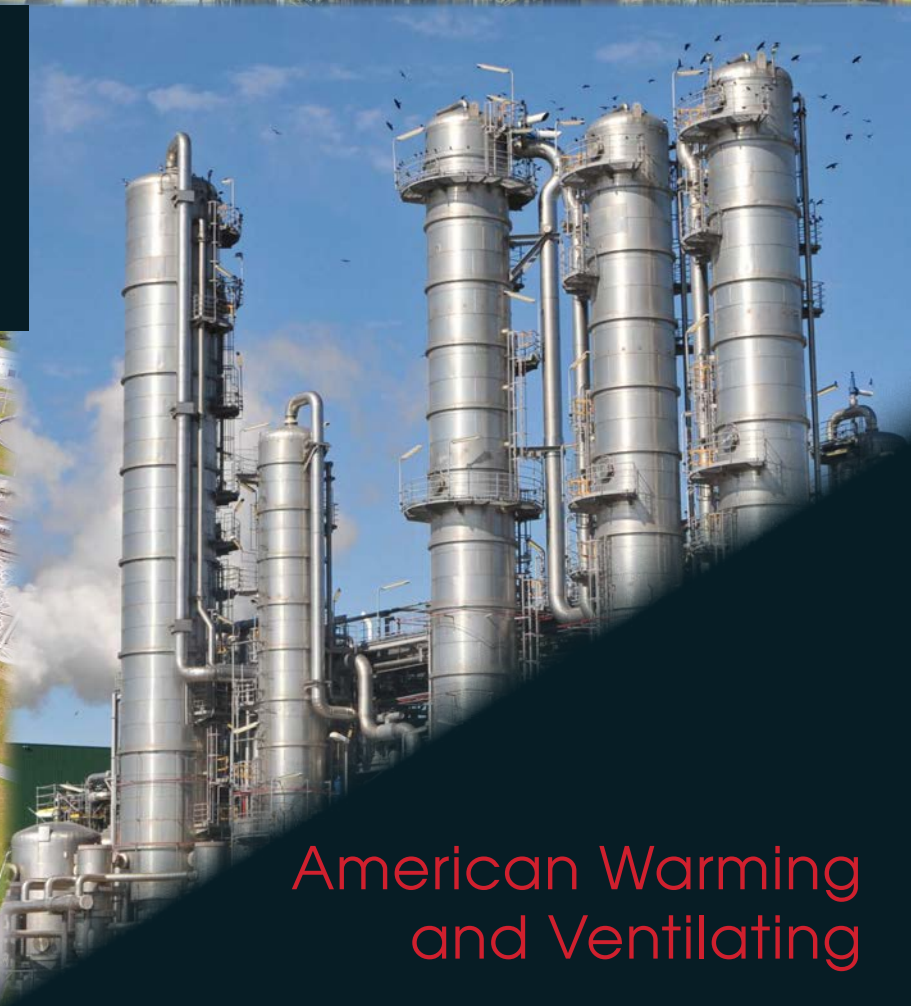
awv

AMCA MEMBER



American Warming and Ventilating

A Mestek Company

Quality Air Control Dampers

awv american warming and ventilating

Over a century of dedication to quality products and customer satisfaction has enabled American Warming and Ventilating to become an industry leader in the design and manufacture of commercial, industrial and heavy-duty dampers.

A division of MESTEK, INC., American Warming and ventilating (AWV) is backed by the finest collection of engineers and state-of-the-art production equipment servicing a variety of markets: Tunnel Ventilation, Fossil Fuel, Petroleum, Pulp & Paper, Chemical, Nuclear, Marine, Military, as well as HVAC requirements for commercial office buildings, hospitals, schools, prisons, etc.

All requirements, simple to complex, are welcomed at AWV with the same enthusiasm and dedication to quality and performance. Our commitment to provide our customers with quality products and customer service has kept us a leader in the damper industry.

Our nationwide network of representatives, combined with our dedicated customer service professionals, work together to bring you the best in solutions for your requirements.

American Warming and Ventilating's Quality Assurance Program has been developed to meet the intent of 10CFR50 Appendix B, American National Standards Institute (ANSI) N45.2, American Society of Mechanical Engineers (ASME) NQA-1, and Military Specifications MIL-I-45208A (Quality Program) and MIL-STD-45662A (Calibrations).

Weld procedure and welder performance qualifications can be provided to meet the requirements of American Welding Society Codes D1.1, D1.2, D1.3 and American Society of Mechanical Engineers Section IX.

For all of your damper requirements, visit us at www.awv.com for technical specifications and the name of our representative nearest you.

QUICK REFERENCE INDEX

Model	Description	Max. Face Velocity	Max. Pressure	Max. Temperature	Page
VOLUME CONTROL • RECTANGULAR IN-DUCT MOUNT					
VC-1 (Parallel) VC-2 (Opposed)	Hat channel frame, single thick blades, galv. steel constr.	**2000 fpm** (10 m/s) **2000 fpm** (15 m/s)	**4 in. wg** (1000 Pa)	**200°F** (95°C) w/o seals	4-7
VC-8 (Rectangular) VC-9 (Round)	Hat channel frame, single thick blades, balancing damper, galv. steel const.	**1500 fpm** (8 m/s) **1500 fpm** (8 m/s)	**1 in. wg** (250 Pa) **1 in. wg** (250 Pa)	**150°F** (65°C) **150°F** (65°C)	8 8
VC-20 (Parallel) VC-21 (Opposed)	Hat channel frame, single thick blades, galv. steel constr.	**3000 fpm** (15 m/s)	**2 in. wg** (500 Pa)	**200°F** (95°C) w/o seals **150°F** (65°C) w/seals	9-11
VC-26 (Parallel) VC-27 (Opposed)	Hat channel frame,low leakage airfoil blades, galv. steel constr.	**4000 fpm** (20 m/s)	**6 in. wg** (1500 Pa)	**150°F** (65°C)	12-13
VC-28 (Parallel) VC-29 (Opposed)	Hat channel frame, airfoil blades; aluminum constr.	**4000 fpm** (20 m/s)	**6 in. wg** (1500 Pa) through **48"** (1219) W; **3 in. wg** (750 Pa) above **48"** (1219) W.	**150°F** (65°C)	14-15
CR-58 (Parallel)	Hat channel frame, airfoil blades;	**3100 fpm** (15 m/s)	**8 in. wg** (1985 Pa)	**200°F** (93°C)	16-17
VC-30 (Parallel) VC-31 (Opposed)	Hat channel frame, airfoil blades; galv. steel constr.	**3000 fpm** (15 m/s)	**4 in. wg** (1000 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	18-19
VC-140	Single thick blades, galv. steel constr.	**3000 fpm** (15 m/s)	**4 in. wg** (1000 Pa)		20
VOLUME CONTROL • ROUND IN-DUCT MOUNT					
VC-22	Channel frame, single thick blades, galv. steel constr.	**3000 fpm** (15 m/s)	**2 in. wg** (500 Pa)	**180°F** (82°C) w/o seals **150°F** (65°C) w/seals	21-23
VC-22-BD	Single thick blades, galv. steel constr.	**3000 fpm** (15 m/s)	**2 in. wg** (500 Pa)	**180°F** (82°C) w/o seals	21-23
VC-23	Channel frame, single thick blades, galv. steel constr.; vol. control or shut off use	**3000 fpm** (15 m/s)	**2 in. wg** (500 Pa)	**180°F** (82°C) w/o seals **150°F** (65°C) w/seals	21-23
VC-24	Channel frame, single thick parallel or opposed blades; galv. steel constr.	**3000 fpm** (15 m/s)	**2 in. wg** (500 Pa)	**180°F** (82°C) w/o seals **150°F** (65°C) w/seals	22-23
VC-25	Sleeve frame, double thick blades, low leakage, galv. steel constr.	**3000 fpm** (15 m/s)	**6 in. wg** (1500 Pa)	**150°F** (65°C)	22-23
VOLUME CONTROL • RECTANGULAR DUCT FLANGE MOUNT					
VC-411	Channel frame, single thick parallel or opposed, blades, galv. steel constr.	**3000 fpm** (15 m/s)*	**10 in. wg** (2500 Pa)	**250°F** (120°C)	24-25, 28-31
VC-412	(same as VC-411 above)	**5000 fpm** (25 m/s)*	**15 in. wg** (3725 Pa)	**250°F** (120°C)	24-25, 28-31
VC-413	Channel frame, parallel or opposed single thick blades, galv. steel constr.	**6000 fpm** (30 m/s)*	**20 in. wg** (4965 Pa)	**250°F** (120°C)	24-25, 28-31
VC-421	Channel frame, airfoil type, parallel or opposed blades, galv. steel constr.	**3500 fpm** (15 m/s)*	**15 in. wg** (3725 Pa)	**250°F** (120°C)	26-31
VC-422	(same as VC-421 above)	**5000 fpm** (25 m/s)*	**30 in. wg** (7475 Pa)	**250°F** (120°C)	26-31
VC-423	(same as VC-421 above)	**6000 fpm** (30 m/s)*	**45 in. wg** (11170 Pa)	**250°F** (120°C)	26-31

*Velocities differ based on blade length. Design parameters shown in the table are for standard construction. Dampers can be modified for higher velocities, pressures, and temperatures.

QUICK REFERENCE INDEX

Model	Description	Max. Face Velocity	Max. Pressure	Max. Temperature	Page
FAN OUTLET CONTROL					
FO-411	Single thickness blades, steel constr.	**5000 fpm** (25 m/s)	**25 in. wg** (6225 Pa)	**800°F** (427°C)	32-33
FO-412	Single thickness blades, steel constr.	**6000 fpm** (30 m/s)	**30 in. wg** (7470 Pa)	**800°F** (427°C)	
FO-413	Single thickness blades, steel constr.	**6000 fpm** (30 m/s)	**40 in. wg** (9960 Pa)	**800°F** (427°C)	
FO-421	Airfoil blades, steel construction	**5000 fpm** (25 m/s)	**25 in. wg** (6225 Pa)	**800°F** (427°C)	34-35
FO-422	Airfoil blades, steel construction	**6000 fpm** (30 m/s)	**30 in. wg** (7470 Pa)	**800°F** (427°C)	
FO-423	Airfoil blades, steel construction	**6000 fpm** (30 m/s)	**40 in. wg** (9960 Pa)	**800°F** (427°C)	
DIFFUSERS					
DF-45/45F	Two and four way diffuser; individually adjustable airfoil blades, galv. steel constr.	**3000 fpm** (15 m/s)	**1 in.wg** (250 Pa)	**250°F** (120°C)	36
DF-46/46F	Two and four way diffuser; individually adjustable single thick blades, galv. steel constr.	**2000 fpm** (10 m/s)	**1 in.wg** (250 Pa)	**250°F** (120°C)	36
DF-78	Heavy-Duty Radial Diffuser, single thick blades, carbon steel constr.	**2000 fpm** (10 m/s)	**4 in.wg** (1000 Pa)	**250°F** (120°C)	37
INDUSTRIAL ROUND DAMPERS • ROUND DUCT FLANGE MOUNT					
VC-561	Rolled steel channel frame, round industrial damper	**3900 fpm** (20 m/s)	**5 in. wg** (1250 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	38-41
VC-562	(same as VC-561 above)	**5150 fpm** (26 m/s)	**8.5 in. wg** (2150 Pa)	(same as VC-561 above)	38, 40-41
VC-563	(same as VC-561 above)	**6400 fpm** (32 m/s)	**13.5 in. wg** (3375 Pa)	(same as VC-561 above)	39-41
VC-564	(same as VC-561 above)	**6400 fpm** (32 m/s)	**20 in. wg** (4965 Pa)	(same as VC-561 above)	39-41
VC-565	(same as VC-561 above)	**6400 fpm** (32 m/s)	**30 in. wg** (7450 Pa)	(same as VC-561 above)	39-41
ROUND ISOLATION DAMPER					
VC-56-ISO	Round isolation damper	**4000 fpm** (20 m/s)	**10 in. wg** (2500 Pa)	**150°F** (65°C)	41
INLET VANES					
VC-81	Channel frame, single thick blades, carbon steel constr., light-duty	**3000 fpm** (15 m/s)	**7 in. wg** (1750 Pa)	**250°F** (120°C)	42-43
VC-82	Channel frame single thick blades, carbon steel constr., medium-duty	**4000 fpm** (20 m/s)	**10 in. wg** (2500 Pa)	**250°F** (120°C)	42-43
VC-83	Channel frame single thick blades, carbon steel constr., heavy-duty	**10000 fpm** (50 m/s)	**15 in. wg** (3750 Pa) to **90 in. wg** (22500 Pa)	**250°F** (120°C)	43
VC-84	Channel frame single thick blades, carbon steel constr., heavy-duty	**9500 fpm** (48 m/s)	**105 in. wg** (26000 Pa)	**250°F** (120°C)	43
BACKDRAFT DAMPERS					
BD-40	Galv. steel hat channel frame, single thick alum. blades, independent blade operation	**1000 fpm** (5 m/s)	**.5 in. wg** (125 Pa) [Dampers will start to open at approx. **.05 in. wg** (12.5 Pa)]	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	44
BD-41	(same as BD-40 above except unit has blade to blade linkage)	**3000 fpm** (15 m/s)	**.5 in. wg** (125 Pa) [Dampers will start to open at **150°F** (65°C) w/seals approx. **.05 in. wg** (12.5 Pa)]	**250°F** (120°C) w/o seals	44
BD-41-HD	(same as BD-40 above except heavy-duty constr.)	**3000 fpm** (15 m/s)	**3 in. wg** (745 Pa) [Dampers will start to open at **.05 in wg** (12.5 Pa)]	**250°F** (120°C) w/o seals	44
BD-51	Channel frame, single thick blades, galv. steel constr.	**3900 fpm** (20 m/s)	**5 in. wg** (1250 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	45-47
BD-52	Channel frame, end pivoted airfoil blades, galv. steel constr.	**5150 fpm** (26 m/s)	**8.5 in. wg** (2100 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	45-47
BD-53	(same as BD-52 above)	**6400 fpm** (32 m/s)	**13.5 in. wg** (3350 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	45-47
PRESSURE RELIEF DAMPERS					
PR-10	Hat channel frame, single thick tri-formed blades, galv. steel const.	**3000 fpm** (15 m/s)	**2 in. wg** (500 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	48-49
PR-11	Channel frame, single thick blades, galv. steel constr.	**3900 fpm** (20 m/s)	**5 in. wg** (1250 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	48-49
PR-12	Channel frame, end pivoted airfoil blades, galv. steel constr., flanged duct mount.	**5150 fpm** (26 m/s)	**8.5 in. wg** (2100 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	48,50
PR-13	Channel frame, end pivoted airfoil blades, galv. steel constr., flanged duct mount.	**6400 fpm** (32 m/s)	**13.5 in. wg** (3350 Pa)	**250°F** (120°C) w/o seals **150°F** (65°C) w/seals	48,50

SPECIALTY AND CUSTOM DAMPERS • SEE INFORMATION ON PAGES 50 THROUGH 53.

*Velocities differ based on blade length. Design parameters shown in the table are for standard construction. Dampers can be modified for higher velocities, pressures, and temperatures.

Rectangular In-Duct Mount

VC-1 and VC-2 Galvanized Steel Dampers

Volume control dampers are designed for two primary functions; two position (open/closed) or proportional (modulating). AWV has developed a complete line of volume control dampers that meet a variety of applications. These standard designs are available for "quick ship" programs of two weeks or less. Also, we can design volume control dampers to meet your specific requirements.

The VC-1 parallel blade damper is recommended for constant pressure drop applications such as mixing air, multi-zone, face and by-pass as well as normal open/closed applications. The VC-2 opposed blade damper is recommended for varying pressure drop applications such as volume control.

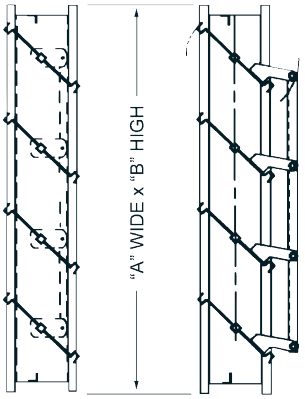
VC-1 and VC-2 dampers are designed for "in-duct" mounting. The single thickness, roll-formed blades and roll-formed frame are capable of withstanding differential pressures of **4 in. wg** (1000 Pa) and **3000 fpm** (15 m/s) at its maximum panel width.

VC-1 Parallel Blade

VC-2 Opposed Blade

OPTIONS:

- On-blade linkage
- Vertical blades
- Blade widths
- OIB and stainless steel bearings
- Vinyl, elastomer, silicone on-blade seals
- Stainless steel jamb seals
- Manual, electric and pneumatic actuators mounted internally or externally
- Factory assembled jackshafting up to 48 sq. ft.
- On-blade drive bracket for internal operation
- Mounting holes



STANDARD In-jamb linkage **OPTIONAL** On-blade linkage

Flat head and sill on all dampers under 14" in height. On-blade linkage with parallel blades is not available in these sizes.

STANDARD SPECIFICATIONS FOR VC-1 AND VC-2 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**2000 fpm** (10 m/s) [3000 fpm (15 m/s) available when specified]
Max. Differential Pressure:	**4 in. wg** (1000 Pa)
Max. Temperature:	**200°F** (95°C)
Dimensions:	"A" and "B" dimensions are opening sizes. Dampers will be fabricated 1/4" (6.35)undersize
Max. Panel Size:	See Next Page
Frame:	**5 1/2"** (140) x **7/8"** (22.2) x 16 Ga. (1.52) galvanized steel hat channel. Flat **16 Ga.** (1.52) galvanized head and sill for maximum free area on dampers under **14"** (356)H
Blades:	**16 Ga.** (1.52) galvanized steel, **8**" (203) maximum width
Axles:	1/2" (12.7) square plated steel, stub
Bearings:	Non-metallic nylon
Linkage:	Plated steel angle and crank plates with stainless steel pivots, in-jamb type
Stops:	Galvanized steel angle
Finish:	Mill
Actuator:	A 1/2" (12.7) diameter removable extended shaft (refer to page 6 for multiple panel arrangements)

PERFORMANCE DATA FOR VC-1 AND VC-2 VOLUME CONTROL DAMPERS

LEAKAGE IN SCFM

SCFM at 1 in.wg (250 Pa)

Damper Height in. and (mm)	WITHOUT SEALS Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)	WITH SEALS* Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)
12" (305)	80	97	113	130	7	8	19	12
19" (483)	125	150	175	201	9	11	14	16
27" (686)	176	209	243	276	12	15	18	21
34" (864)	221	263	305	347	14	18	21	25
48" (1219)	304	354	404	454	17	22	26	30
55" (1397)	349	407	466	524	20	25	30	35
63" (1600)	400	466	533	600	22	28	33	39
70" (1778)	445	520	595	670	24	31	37	43
72" (1829)	496	579	662	746	27	34	41	48

[*] With vinyl blade edge seals and stainless steel jamb seals.

To convert SCFM Leakage Values to m^3/s:
Multiply SCFM x .000472

Leakage for the VC-1 & VC-2 with optional seals (vinyl on blade edges and stainless steel on jamb) shall not exceed 2.0 scfm per sq. ft. at 1 in. wg differential pressure and a temperature of 70°F with a minimum of .85" pounds of torque applied to the damper shaft. Data based on a 48" square sample tested in accordance with AMCA Standard 500, fig. 5.4 or 5.5.

Values shown in the chart above are derived from tests performed in accordance with AMCA Standard 500 and are stated in scfm at 1 in. wg. For leakage values at greater pressures, use the conversion factors in the table below.

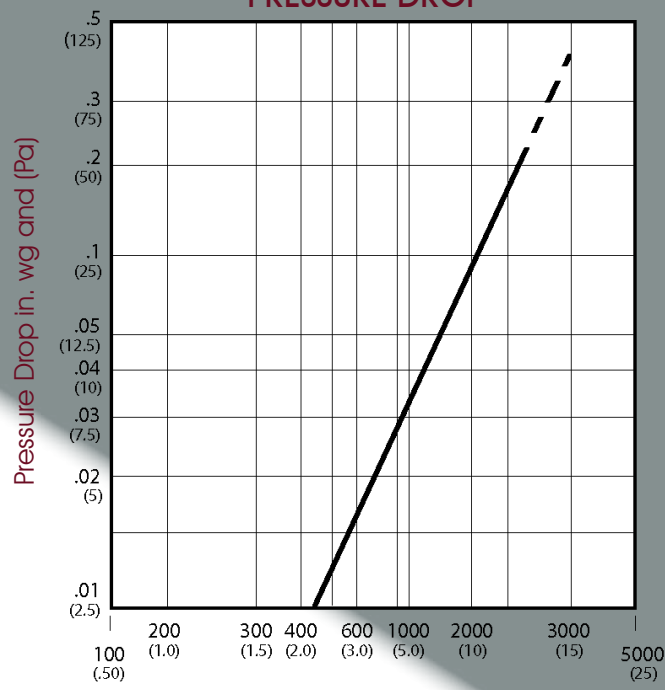
Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00

The torque required to operate a VC-1 and VC-2 control damper is the greatest torque value that the damper will see in operation. The table shown gives torque values for various face velocities, differential pressures, and sealing requirements. The torque required for a damper without seals is the torque due to velocity or pressure, whichever is greater. The torque required for a damper with seals is the torque due to velocity or pressure or sealing the damper, whichever is greater.

MAXIMUM PANEL SIZES

MAX. PANEL SIZE	LINKAGE	SEALS
36" (914)W x 72" (1829)H	In-jamb	With
48" (1219)W x 72" (1829)H	In-jamb	Without
48" (1219)W x 72" (1829)H	On-blade	With
48" (1219)W x 72" (1829)H	On-blade	Without

PRESSURE DROP



Face Velocity fpm and (m/s)
Tested per AMCA Standard 500, fig. 5.3
Size tested 24" x 24"

TORQUE DATA

Torque values are given in in.-lbs. and (Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)	PRESSURE TORQUE Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)	SEALING TORQUE Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)
12" (305)	1 (1)	1 (1)	2 (1)	3 (1)	1 (1)	3 (1)	4 (1)	5 (1)	21 (3)	31 (4)	41 (5)	52 (6)
18" (457)	1 (1)	3 (1)	4 (1)	6 (1)	2 (1)	4 (1)	5 (1)	7 (1)	30 (4)	44 (5)	58 (7)	71 (9)
24" (610)	1 (1)	2 (1)	5 (1)	6 (1)	2 (1)	5 (1)	8 (1)	11 (2)	38 (5)	56 (7)	73 (9)	90 (11)
30" (762)	2 (1)	4 (1)	6 (1)	8 (1)	3 (1)	7 (1)	10 (2)	14 (2)	47 (6)	68 (8)	89 (11)	109 (13)
36" (914)	2 (1)	4 (1)	7 (1)	9 (2)	4 (1)	8 (1)	12 (2)	16 (2)	56 (7)	80 (10)	104 (12)	129 (15)
42" (1067)	2 (1)	5 (1)	8 (1)	11 (2)	4 (1)	9 (2)	14 (2)	19 (3)	65 (8)	93 (11)	120 (14)	148 (17)
48" (1219)	3 (1)	6 (1)	9 (2)	13 (2)	5 (1)	10 (2)	16 (2)	22 (3)	74 (9)	105 (12)	136 (16)	167 (19)
54" (1372)	4 (1)	10 (2)	15 (2)	20 (3)	6 (1)	12 (2)	19 (3)	26 (3)	85 (10)	122 (14)	159 (19)	197 (23)
60" (1524)	4 (1)	10 (2)	15 (2)	20 (3)	6 (1)	12 (2)	19 (3)	26 (3)	91 (11)	128 (15)	165 (19)	203 (23)
66" (1676)	5 (1)	11 (2)	17 (2)	23 (3)	6 (1)	14 (2)	22 (3)	29 (4)	101 (12)	143 (17)	185 (21)	226 (26)
72" (1829)	6 (1)	12 (2)	19 (3)	26 (3)	7 (1)	16 (2)	25 (3)	33 (4)	111 (13)	157 (18)	204 (24)	250 (29)

Above values based on 1000 fpm (5 m/s) face velocity. Use multipliers below for other face velocities.

Face Velocity fpm (m/s)	Multiplier
1500 (8)	2.25
2000 (10)	4.00
2500 (13)	6.25
3000 (15)	9.00

Above values based on differential pressure of 1 in. wg. (250 Pa). Use multipliers below for other differential pressures.

Diff. Pressure in. wg (Pa)	Multiplier
1 (250)	1
2 (500)	2
3 (750)	3
4 (1000)	4

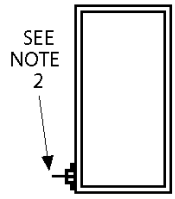
Above values based on the use of dual durometer vinyl seals on the blade and metallic compression seals at the jambs.

See page 6 for multi-panel jackshafting arrangements.

Rectangular In-Duct Mount

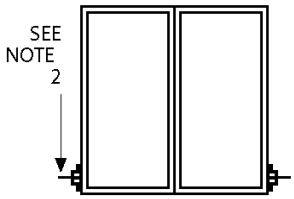
MULTI-PANEL ARRANGEMENTS FOR VC-1 AND VC-2 VOLUME CONTROL DAMPERS (With Jackshafting Details)

1



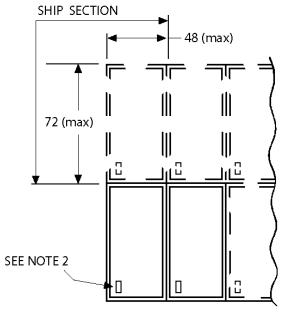
Single panel

2



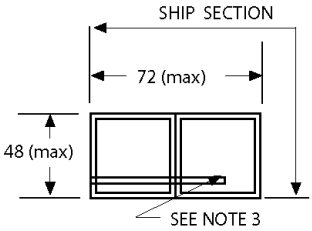
Double panel with no interconnection.

3



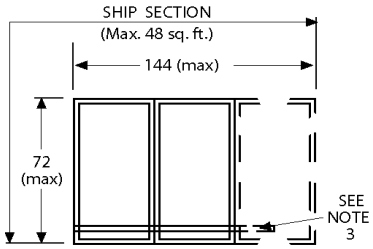
Three or more panels with no interconnection.

4



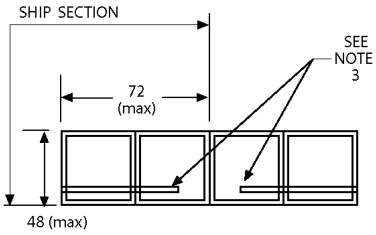
Double panel with 1/2" diameter jackshafting. Jackshafting and panels to be factory assembled. For two panel wide assemblies only.

5



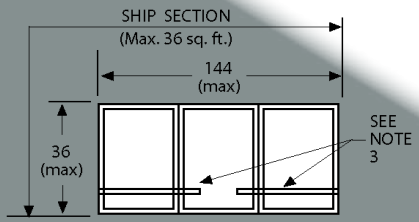
Double panel assembly larger than detail 4 or triple panels with heavy duty jackshafting. Jackshafting and panels to be factory assembled as long as the assembly does not exceed 48 sq. ft. face area. For double or triple panels that exceed 48 sq. ft. face area, panels and jackshafting factory assembled then disassembled after operational checks.

6



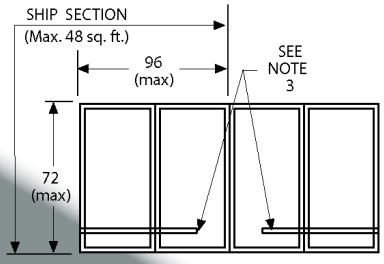
Construction of each ship section

6a



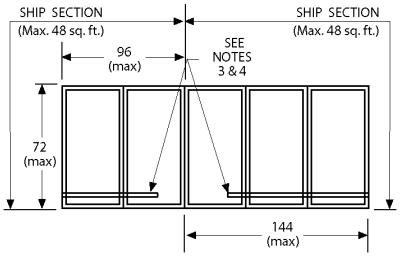
Triple panel with left and right 1/2" diameter jackshafting to be factory assembled requires two actuators.

7



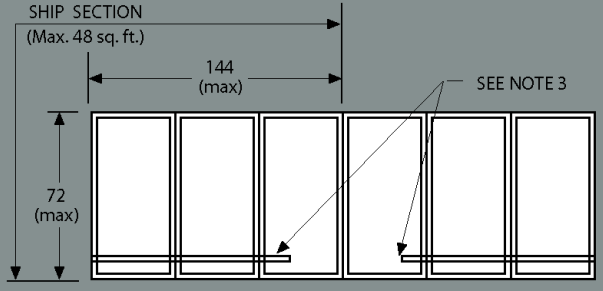
Construction of each ship section identical to detail 5.

8



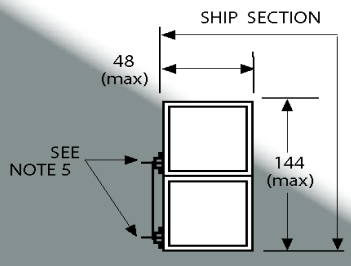
Construction of each ship section identical to detail 5.

9



Construction of each ship section identical to detail 5.

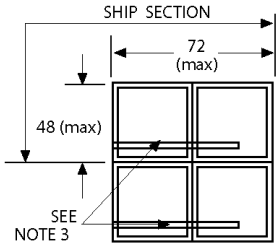
10



Double panel to be factory assembled.

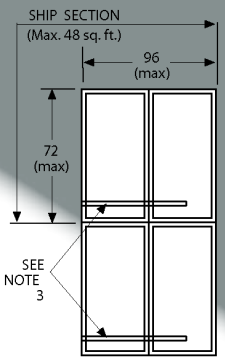
MULTI-PANEL ARRANGEMENTS FOR VC-1 AND VC-2 VOLUME CONTROL DAMPERS (With Jackshafting Details)

11



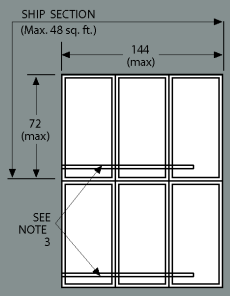
Construction of each ship section identical to detail 4.

12



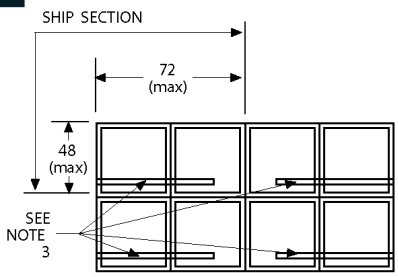
Construction of each ship section identical to detail 5.

13



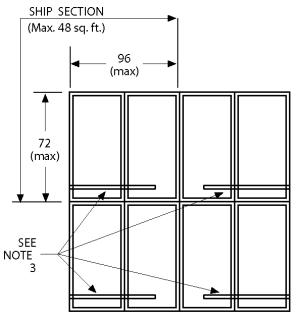
Construction of each ship section identical to detail 5.

14



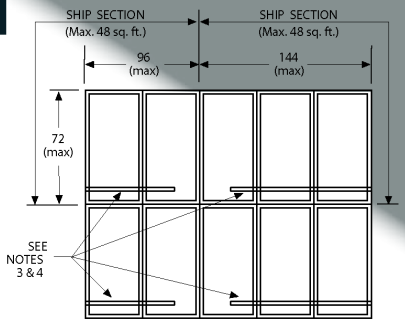
Construction of each ship section identical to detail 4.

15



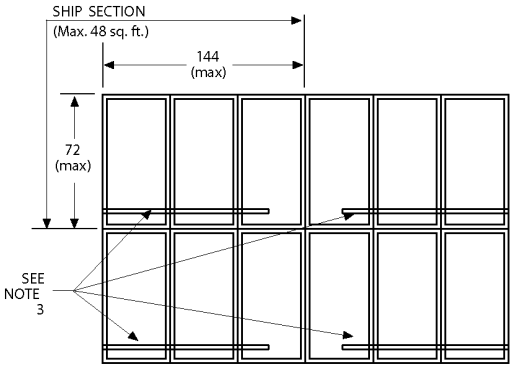
Construction of each ship section identical to detail 5.

16



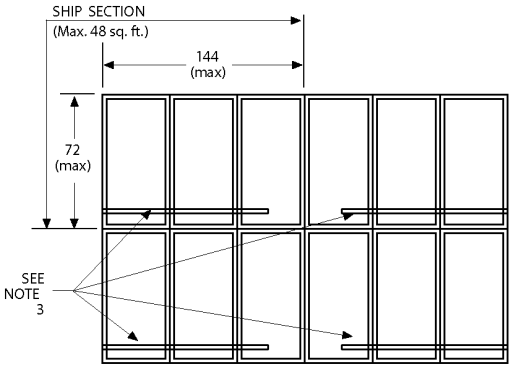
Construction of each ship section identical to detail 5.

17



Construction of each ship section identical to detail 5.

18



Construction of each ship section identical to detail 5.

1. Details 1 through 18 illustrate standard panel interconnections. Customer specified actuator selection, velocities, etc. may require different panel interconnections. Typically, the drive blade will be the bottom blade on 1 and 2 bladed dampers and the third blade up from the sill on all dampers with 3 or more blades. Drive axle is double screwed to the drive blade.

2. For single and double panel wide assemblies where jackshafting is not specified, an axle kit which includes an extended axle will be supplied. An on-face drive bracket mounted on the left end of the drive blade can be supplied at no charge in lieu of the extended axle kit. Three panel and wider assemblies where jackshafting is not specified, will be supplied with the on-face drive bracket.

3. Length of jackshafting to be 6" longer than required to connect end panel so customer has option of extending jackshafting for external actuator connection. One drive arm provided as standard.

4. Both ship sections to be supplied with heavy duty jackshafting even though two panel ship sections may fall within limitations of 1/2" dia. jackshafting.

5. Two extended axle kits, two interconnect arms, one interconnect angle and one drive arm provided as standard.

Rectangular In-Duct Mount

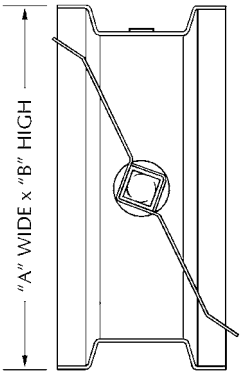
VC-8 and VC-9 Galvanized Steel Balancing Dampers

VC-8 Rectangular Blade

The VC-8 and VC-9 dampers are designed for low velocity, low pressure clean air systems. They were developed specifically for use in branch ducts to balance air flow.

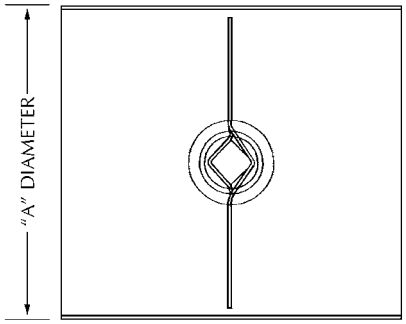
OPTIONS:

- Aluminum frame and blades (with stainless steel axles and bearings)
- Polyfoam frame stops
- 304 and 316 stainless steel construction



VC-8 Section View

VC-9 Round Blade



VC-9 Section View

STANDARD SPECIFICATIONS FOR VC-8 AND VC-9 Inches are shown, numbers in ( ) are mm

Product:	VC-8	VC-9
Max. Face Velocity:	**1500 fpm** (8 m/s)	**1500 fpm** (8 m/s)
Max. Diff. Pressure:	**1 in. wg** (250 Pa)	**1 in. wg** (250 Pa)
Max. Temperature:	**150°F** (65°C)	**150°F** (65°C)
Dimensions:	"A" and "B" dimensions are opening sizes. "A" diameter dimension is opening size. Damper will be fabricated 1/4" (6.35) undersize and can be ordered in **1"** increments only	"A" diameter dimension is opening size. Damper will be fabricated 1/4" (6.35) undersize and can be ordered in 1" increments only
(Min. Panel Size):	**6"** (152)W x **4"** (101)H	Min. Dia.: **4"** (101)
(Max. Panel Size):	**36"** (914)W x **12"** (305)H	Max. Dia.: **24"** (610)
Frame:	**3 1/2"** (88.9) x **5/8"** (15.9) x **16 Ga.** (1.52) galvanized steel hat channel	**4 1/2"** (114) **20 Ga.** (.91) galv. steel [**4"** (101) through **18"** (457) dia.]. **20 Ga.** (.91) galv. steel with reinforcing beads, or **18 Ga.** (1.32) galv. steel [**19"** (482) through **24"** (610) dia.]
Blades:	**20 Ga.** (.91) galvanized steel, single thickness	Galvanized steel, single thickness **22 Ga.** (.76) /**4"** (101) to **12"** (305) dia. **20 Ga.** (.91) /**13"** (330) to **18"** (457) dia. **16 Ga.** (1.52) /**19"** (482) to **24"** (610) dia.
Axles:	**3/8"** (9.53) square plated steel stub, with lanced retainers	**3/8"** (9.53) square plated steel stub, with lanced retainers
Bearings:	Nylon	Nylon
Finish:	Mill	Mill
Actuator:	**3/8"** (9.53) square manual locking quadrant. Shipped loose for field mounting	**3/8"** (9.53) square manual locking quadrant. Shipped loose for field mounting

Rectangular In-Duct Mount

VC-20 and VC-21 Galvanized Steel Dampers

These dampers are used as an alternate selection to Models VC-1 and VC-2 when heavier gauges, larger axles or different alloys are required. Unlike roll formed products, blade widths can vary maximizing free area and lowering pressure drop.

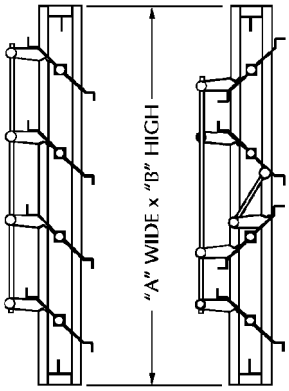
These models allow flexibility to change frame styles and depths for different mounting applications. Corrosive or spark resistant applications are common uses for these models.

VC-20 Parallel Blade

VC-21 Opposed Blade

OPTIONS:

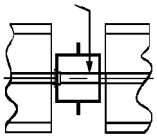
- Stainless steel frame and blades
- Aluminum frame and blades
- Stainless steel axles and linkage
- Bearings: OIB, stainless steel, Teflon® sleeve, press fit ball
- Seals: vinyl blade, metallic compression jamb
- Mounting holes



VC-20 Parallel blade

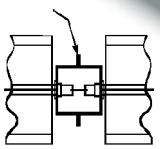
VC-21 Opposed blade

Through shaft drive axle only



Factory assembled mullion when jackshafting is not used.

Bolts not supplied



Field assembled mullion

STANDARD SPECIFICATIONS FOR VC-20 AND VC-21 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**3000 fpm** (15 m/s)
Max. Differential Pressure:	**2 in. wg** (500 Pa)
Max. Temperature:	**200°F** (95°C); without seals **150°F** (65°C); with seals
Dimensions:	"A" and "B" dimensions are opening sizes. Dampers will be fabricated 1/4" (6.35) undersize
Max. Panel Size:	**48"** (1219) W x **96"** (2438) H (without seals) **48"** (1219) W x **72"** (1829) H (with seals)
Min. Panel Size:	**6"** (152.4) W x **12"** (304.8) H (Parallel) **6"** (152.4) W x **12"** (304.8) H (Opposed)
Frame:	**3 1/2"** (88.9) x 5/8" (15.9) x **16 Ga.** (1.52) galv. steel hat channel. Dampers **9** sq. ft. and smaller have a **5 1/2"** (139.7) x 7/8" (15.9) x **16 Ga.** (1.52) galvanized steel hat channel over **9** sq. ft. under **13"** high will be fabricated with a **10 Ga.** galv. steel plate at head and sill
Blades:	**16 Ga.** (1.52) galv., **9 1/2"** (241) max. width; **6"** (152) min. width
Axles:	1/2" (12.7) plated steel stub
Bearings:	Heavy-duty self-lubricating nylon (200°F)
Linkage:	Plated steel brackets, brass barrels and 5/16" Dia. plated steel rod. Dampers with seals have double linkage on panels over **36"** wide
Stops:	Galvanized steel angle
Finish:	Mill with touch-ups on welds
Actuator:	An extendable shaft is standard

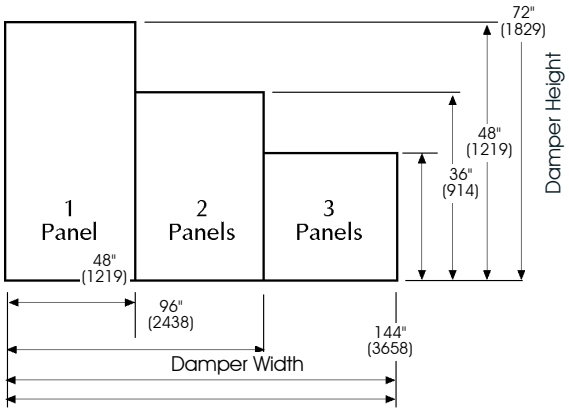
Rectangular In-Duct Mount

PERFORMANCE DATA FOR VC-20 AND VC-21 VOLUME CONTROL DAMPERS

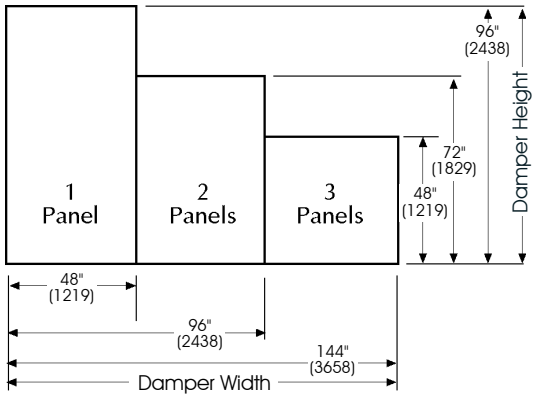
JACKSHAFTING

Jackshafting on dampers with or without seals is required if a single actuator is used on multi-panel dampers that are larger than those shown below. AWV provides a substantial jackshafting arrangement to eliminate the twist found in many light duty designs.

MAXIMUM FACTORY ASSEMBLED SIZES



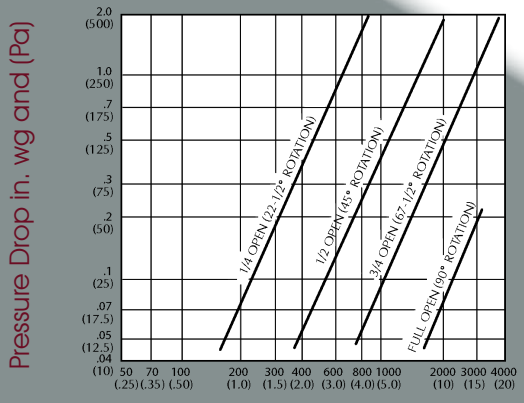
WITH SEALS
(Not requiring jackshafting)



WITHOUT SEALS
(Not requiring jackshafting)

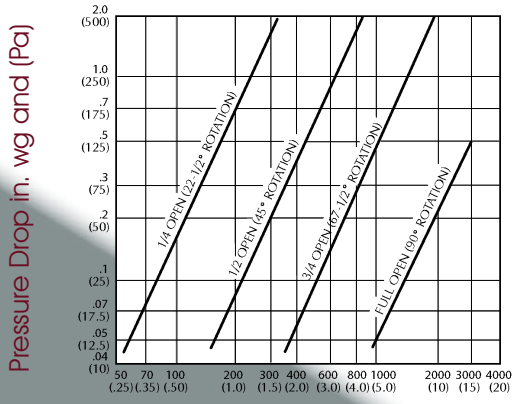
PRESSURE DROP

VC-20



Face Velocity fpm and (m/s) Tested per AMCA Standard 500, fig. 5.3 Size tested 24" x 24"

VC-21



Face Velocity fpm and (m/s) Tested per AMCA Standard 500, fig. 5.3 Size tested 24" x 24"

PERFORMANCE DATA FOR VC-20 AND VC-21 VOLUME CONTROL DAMPERS

Quantities are derived from tests performed in accordance with AMCA 500; quantities shown are at 1 in. wg differential pressure. For 2 in. wg, multiply by 1.4.

To convert SCFM Leakage Values to m3/s:
Multiply SCFM x .000472

LEAKAGE IN SCFM

Damper Height in. and (mm)	WITHOUT SEALS				WITH SEALS			
	Damper Width in. and (mm)							
	12″ (305)	24″ (610)	36″ (914)	48″ (1219)	12″ (305)	24″ (610)	36″ (914)	48″ (1219)
12″ (305)	75	105	140	170	7	10	13	17
24″ (610)	160	200	245	290	13	20	27	33
36″ (914)	245	300	355	405	18	27	35	43
48″ (1219)	335	395	460	525	23	33	43	53
60″ (1524)	420	505	590	675	30	43	57	70
72″ (1829)	505	605	700	795	35	50	65	80
84″ (2134)	605	720	840	955				
96″ (2438)	690	815	945	1075				

TORQUE DATA
Torque values are given in in.-lbs. and (Nm)

Damper Height in. and (mm)	BLADE QUANTITY	BLADE WIDTH	FACE VELOCITY TORQUE DAMPER WIDTH IN. AND (MM)				PRESSURE TORQUE DAMPER WIDTH IN. AND (MM)				SEALING TORQUE DAMPER WIDTH IN. AND (MM)			
			12″ (305)	24″ (610)	36″ (914)	48″ (1219)	12″ (305)	24″ (610)	36″ (914)	48″ (1219)	12″ (305)	24″ (610)	36″ (914)	48″ (1219)
12″ (305)	2	5.5	2 (1)	3 (1)	4 (1)	6 (1)	2 (1)	3 (1)	5 (1)	6 (1)	16 (2)	24 (3)	32 (4)	40 (5)
24″ (610)	3	7.0625	3 (1)	6 (1)	9 (2)	11 (2)	3 (1)	6 (1)	9 (2)	12 (2)	32 (4)	48 (6)	64 (8)	80 (10)
36″ (914)	4	8.4375	4 (1)	9 (2)	13 (2)	17 (2)	5 (1)	9 (2)	14 (2)	18 (3)	44 (5)	64 (8)	84 (10)	104 (12)
48″ (1219)	5	9.25	6 (1)	11 (2)	17 (2)	23 (3)	6 (1)	12 (2)	18 (3)	24 (3)	56 (7)	80 (10)	104 (12)	128 (15)
60″ (1524)	7	8.4375	7 (1)	14 (2)	21 (3)	28 (4)	7 (1)	15 (2)	24 (3)	30 (4)	72 (9)	104 (12)	136 (16)	168 (19)
72″ (1829)	8	8.9375	17 (2)	17 (2)	25 (3)	34 (4)	9 (2)	18 (3)	27 (4)	36 (5)	84 (10)	121 (14)	156 (18)	192 (22)
84″ (2134)	9	9.3125	10 (2)	20 (3)	30 (4)	39 (5)	10 (2)	22 (3)	31 (4)	42 (5)				
96″ (2438)	11	8.8125	11 (2)	23 (3)	34 (4)	45 (6)	12 (2)	24 (3)	36 (5)	48 (6)				

Above values based on 1000 fpm (5 m/s) face velocity. Use multipliers below for other face velocities.

Above values based on differential pressure of 1 in. wg. (250 Pa). Use multipliers below for other differential pressures.

Above values based on the use of dual durometer vinyl seals on the blade and metallic compression seals at the jambs.

The torque required to operate a VC-20 control damper is the greatest torque value that the damper will see in operation. The tables shown give torque values for various face velocities, differential pressures, and sealing requirements. The torque required for a damper without seals is the torque due to velocity or pressure, whichever is greater. The torque required for a damper with seals is the torque due to velocity or pressure or sealing the damper, whichever is greater.

Face Velocity fpm (m/s)	Multiplier	Diff. Pressure in. wg (Pa)	Multiplier
1500 (8)	2.25	1 (250)	1
2000 (10)	4	2 (500)	2
2500 (13)	6.25		
3000 (15)	9.00		

Rectangular In-Duct Mount

VC-26 and VC-27 Galvanized Steel Dampers

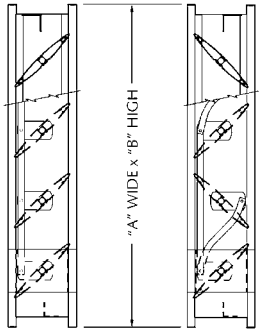
These dampers are designed for "in duct" mounting. The airfoil roll formed blades and roll formed frame are capable of withstanding differential pressures of 6 in. wg (1500 Pa) and velocities up to 4,000 fpm (20 m/s) at its maximum panel width. For higher pressures and velocities, refer to limitation table.

VC-26 Parallel Blade

VC-27 Opposed Blade

OPTIONS:

- Bearings: OIB , stainless steel
- Actuators: manual, electric and pneumatic actuators mounted either side, and inside or outside the air stream
- Factory assembled jackshafting up to 48 sq. ft.
- On-blade drive bracket for internal operation
- Mounting holes



VC-26
Parallel blade

VC-27
Opposed blade

STANDARD SPECIFICATIONS FOR VC-26 AND VC-27 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**4000 fpm** (20 m/s)
Max. Differential Pressure:	**6 in. wg** (1500 Pa)
Max. Temperature:	**150°F** (65°C)
Dimensions:	"A" and "B" dimensions are opening sizes. Dampers will be fabricated **1/4" (6.35)** undersize
Max. Panel Size:	**48"** (1219)W x **60"** (1524) H
Min. Panel Size:	**8"** (203) W x **8"** (203) H (Parallel) **8"** (203) W x **12"** (305) H (Opposed)
Maximum Size:	Single Section: **48"** (1219) W x **60"** (1524) H. Multiple Section: **96"** (2438) W x 60" (1524) H (2W x 1H) or **48"** (1219) W x **120"** (3048) H. (1W x 2H)
Max. Configuration Per Actuator:	Two sections high or two sections wide
Frame:	**5 1/2"** (140) x **7/8"** (22.2) x **16 Ga.** (1.52) galvanized steel hat channel
Blades:	Double skin galvanized steel construction with single-lock seam, airfoil shaped stronger than **14 Ga.** (1.9) equivalent, **6 1/4"** (159) wide including edge seals) by a minimum of **1/2"** (12.7) thick at the center. Depending upon the damper height, a variable width blade may be required which will extend to a maximum of **3 1/4"** (83) from either the front or back of the damper. If the exact dimension of this variable blade is critical, contact AWV.
Seals:	Dual durometer vinyl (high impact PVC) on blade edges and metallic compression type at jambs
Axles:	**1/2"** (12.7) square plated steel stub, mechanically locked to the blades
Bearings:	Non-metallic nylon
Linkage:	In-jamb type, plated steel angle and crank plates, and stainless steel pivots
Stops:	Galvanized steel angle
Finish:	Mill
Actuator:	**6"** (152) extended shaft. Dampers more than one panel wide or high, and operated with one actuator, must be jackshafted

PERFORMANCE DATA FOR VC-26 AND VC-27 VOLUME CONTROL DAMPERS

LEAKAGE IN SCFM

WITH SEALS

Damper Width in. and (mm)

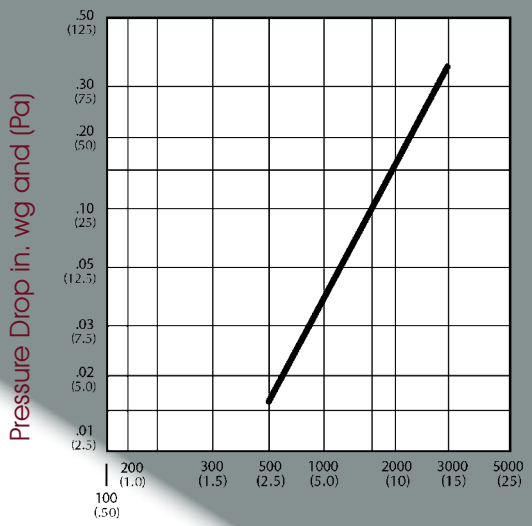
Damper Height in. and (mm)	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)
12" (305)	4	6	8	10	12	14	13
18" (457)	6	9	12	15	18	21	24
24" (610)	8	12	16	20	24	28	32
30" (762)	10	15	20	25	30	35	40
36" (914)	12	18	24	30	36	42	48
42" (1067)	14	21	28	35	42	49	56
48" (1219)	16	24	32	40	48	56	64
54" (1372)	18	27	36	45	54	63	72
60" (1524)	20	30	40	50	60	70	80

Values shown in the leakage chart above are derived from tests performed in accordance with AMCA Standard 500 and are stated in scfm @ 1 in. wg. (250 Pa). For leakage values at greater pressures, use the conversion factors in the table below.

To convert SCFM Leakage Values to m3/s:
Multiply SCFM x .000472

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00

PRESSURE DROP



Face Velocity fpm and (m/s)
Tested per AMCA Std. 500; fig. 5.3
Size Tested 24" x 24"

For pressures of 2 in. wg and less, and where face velocities do not exceed 1000 fpm, the torque values shown in the "Sealing Torque" table below include the maximum amount of torque required for all values. When pressures or velocities exceed these amounts, the maximum torque may exceed these values. Consult the "Velocity Torque" or "Pressure Torque" tables to determine the maximum torque in these instances.

TORQUE DATA

Torque values are given in in.-lbs. and (Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE DAMPER WIDTH IN. AND (MM)							PRESSURE TORQUE DAMPER WIDTH IN. AND (MM)							SEALING TORQUE DAMPER WIDTH IN. AND (MM)						
	12" (305)	18" (305)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	12" (305)	18" (305)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	12" (305)	18" (305)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)
12" (305)	2 (1)	2 (1)	3 (1)	4 (1)	5 (1)	5 (1)	6 (1)	5 (1)	5 (1)	7 (1)	9 (1)	11 (2)	12 (2)	14 (2)	16 (2)	19 (3)	21 (3)	23 (3)	25 (3)	28 (4)	30 (4)
18" (305)	2 (1)	2 (1)	3 (1)	4 (1)	5 (1)	5 (1)	6 (1)	5 (1)	8 (1)	11 (2)	13 (2)	16 (2)	19 (3)	21 (3)	22 (3)	25 (3)	27 (4)	29 (4)	31 (4)	34 (4)	36 (5)
24" (610)	2 (1)	3 (1)	4 (1)	5 (1)	6 (1)	7 (1)	8 (1)	7 (1)	11 (2)	14 (2)	18 (2)	21 (3)	25 (3)	28 (4)	31 (4)	34 (4)	37 (5)	41 (5)	44 (5)	47 (6)	51 (6)
30" (762)	2 (1)	3 (1)	5 (1)	6 (1)	7 (1)	8 (1)	9 (2)	9 (1)	13 (2)	18 (2)	22 (3)	27 (3)	31 (4)	35 (4)	39 (5)	43 (5)	48 (6)	52 (7)	57 (7)	61 (7)	66 (8)
36" (914)	3 (1)	4 (1)	5 (1)	7 (1)	8 (1)	10 (2)	11 (2)	11 (2)	16 (2)	21 (3)	27 (3)	32 (4)	37 (5)	42 (5)	47 (6)	53 (6)	58 (7)	64 (8)	70 (8)	75 (9)	81 (10)
42" (1067)	3 (1)	5 (1)	6 (1)	8 (1)	9 (2)	11 (2)	13 (2)	12 (2)	19 (3)	25 (3)	31 (4)	37 (5)	43 (5)	50 (6)	55 (7)	62 (8)	69 (8)	76 (9)	82 (10)	89 (11)	96 (11)
48" (1219)	4 (1)	5 (1)	7 (1)	9 (2)	11 (2)	12 (2)	14 (2)	14 (2)	21 (3)	28 (4)	35 (4)	42 (5)	50 (6)	57 (7)	64 (8)	71 (8)	79 (9)	87 (10)	95 (11)	103 (12)	111 (13)
54" (1372)	4 (1)	6 (1)	8 (1)	10 (2)	12 (2)	14 (2)	16 (2)	16 (2)	24 (3)	32 (4)	40 (5)	48 (6)	56 (7)	64 (8)	72 (9)	81 (10)	90 (11)	99 (12)	108 (13)	117 (14)	126 (15)
60" (1524)	4 (1)	7 (1)	9 (1)	11 (2)	13 (2)	15 (2)	17 (2)	18 (2)	27 (3)	35 (4)	44 (5)	53 (6)	62 (7)	71 (8)	80 (10)	90 (11)	100 (12)	110 (13)	120 (14)	130 (15)	141 (16)

MAXIMUM DIFFERENTIAL PRESSURE AND FACE VELOCITY

Damper Width	Maximum System Pressure	Maximum System Velocity
48" (1219)	6.3 in. wg (1575 Pa)	4000 fpm (20 m/s)
36" (914)	8.4 in. wg (2100 Pa)	4000 fpm (20 m/s)
24" (610)	10.8 in. wg (2700 Pa)	5000 fpm (25 m/s)
12" (305)	13.0 in. wg (3250 Pa)	6000 fpm (30 m/s)

Above values are based on 1000 fpm (5 m/s) face velocity. Use multipliers below for greater velocities.

Face Velocity fpm (m/s)	Multiplier
1500 (8)	2.25
2000 (10)	4.00
2500 (13)	6.25
3000 (15)	9.00
3500 (18)	12.25
4000 (20)	16.00

Above values are based on 2 in. wg (500 Pa) differential pressure. Use multipliers below for greater pressures.

Diff. Press. in. wg (Pa)	Multiplier
3 (750)	1.5
4 (1000)	2.0
5 (1250)	2.5
6 (1500)	3.0

Note: Care should be taken in designing systems requiring higher pressures and higher velocities which, in turn, will elevate the operating torque of the dampers. When damper torque exceeds the design limits of extended shaft operation, (250 in. lbs. max.), the use of "in-duct" or jack-shafted actuators is required.

Rectangular In-Duct Mount

VC-28 and VC-29 Aluminum Airfoil Blade Dampers

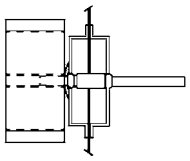
The VC-28 and VC-29 are designed for two position or proportional control of clean air flow in medium pressure, medium velocity systems. The VC-28 parallel blade unit is recommended for constant pressure drop applications such as mixing air, multi-zone, face and bypass as well as normal open/closed applications. The VC-29 opposed blade is recommended for varying pressure drop applications such as volume control.

VC-28 Parallel Blade

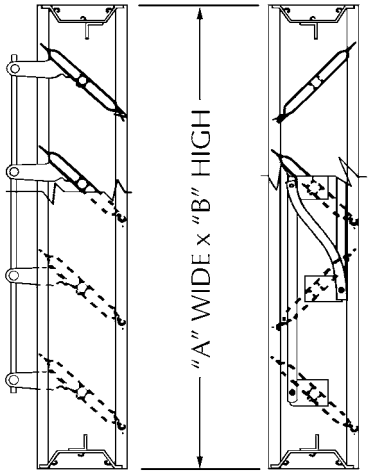
VC-29 Opposed Blade

OPTIONS:

- On-blade linkage for VC-28
- Stainless steel axles
- Bearings: stainless steel, OIB bearings
- Stainless steel on-blade linkage
- Silicone blade seals
- Special finishes
- Insulated frames and blades



Extended Axle Detail



VC-28
Parallel blade
Optional on-blade linkage

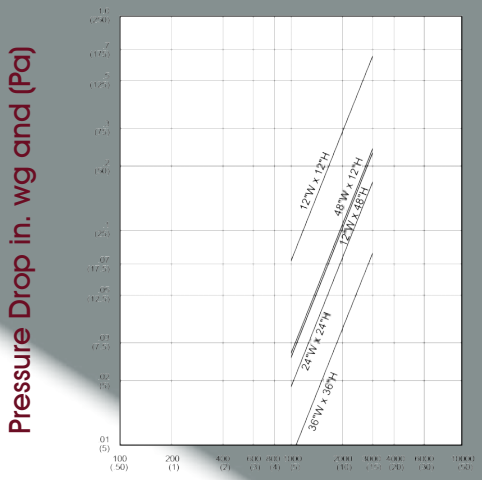
VC-29
Opposed blade
Standard in-jamb linkage

STANDARD SPECIFICATIONS FOR VC-28 AND VC-29 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**4000 fpm** (20 m/s)
Max. Differential Pressure:	**6 in. wg** (1500 Pa) through **48"** (1219) W; **3 in. wg** (750 Pa) above **48"** (1219) W
Max. Temperature:	**150°F** (65°C)
Dimensions:	"A" and "B" dimensions are opening sizes. Dampers will be fabricated 1/4" (6.35) undersize
Max. Panel Size:	**60"** (1524) W x **72"** (1828) H
Min. Panel Size:	**6"** (152.4) W x **6"** (152.4) H (Parallel) (single blade) **8"** (152.4)W x **9"** (228.6) H (Opposed) Min. height with jackshafting - **12"** (304.8)
Frame:	**5 1/2"** (140) x **.125** (3.2) thick 6063-T5 extruded aluminum hat channel
Blades:	**6 3/32"** (154.8) x **.070** (1.8) thick extruded aluminum hat channel
Axles:	**3/8"** (9.5) square plated steel
Bearings:	Nylon
Linkage:	Plated steel bar and concealed in-jamb type arms
Seals:	Extruded santoprene on blade edges with stainless steel compression at jambs
Finish:	Mill with touch-ups on welds
Actuator:	**6"** Extended shaft. Dampers more than one panel wide or high and operated with one actuator must be jackshafted. Factory supplied actuators are shipped loose to be mounted externally with extended shaft kit as standard.

Performance is based on AMCA Standard 500, Figure 5.3 (in-duct mount), operating temperatures between 50°F and 104°F and a standard air density of 0.75 lb/ft^3. Actual pressure drop performance will vary based on damper size and exact installation configuration. The curves shown on the right are parallel blade results, opposed blade results are similar.

PRESSURE DROP



Face Velocity fpm and (m/s)
Test Figure 5.3 (in duct)

TORQUE DATA						
Closing Torque Applied to Extend Shaft		Torque Multipliers for Pressures Greater than 2 in. wg				
Damper Width	Closing Torque (in-lbs/sq. ft.)	Damper Width	Static Pressure (in. wg)			
			3 in. wg	4 in. wg	5 in. wg	6 in. wg
1A	3 (15.2)	48" W Maximum	1.43 in. wg	2.86 in. wg	2.86 in. wg	2.86 in. wg
1	4 (20.3)	60" W Maximum	Maximum Pressure is 2 in. wg			
2	10 (50.8)					
3	40 (203)					

Leakage

VC-28 and VC-29 are rated for Class IA leakage as tested to AMCA Standard 511-99: Certified Ratings Programs for Air Control Devices. Class IA leakage is defined as 3 CFM/sq. ft. of damper face area at 1 in. wg. Closing torques followed the rules described below. Leakage is based on temperature ranges from 40 density of 0.75 lb/ft^3.

LEAKAGE, cfm/sqft (l/s/sqm)		
Pressure / Class	Required Ratings	
	1 in. wg (0.25 kPa)	4 in. wg (1.0 kPa)
1A	3 (15.2)	N/A
1	4 (20.3)	8 (40.6)
2	10 (50.8)	20 (102)
3	40 (203)	80 (406)

AWV certifies that the model VC-28/29 damper 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 Program. The AMCA Certified Ratings Seal applies to air performance ratings and Air Leakage ratings.

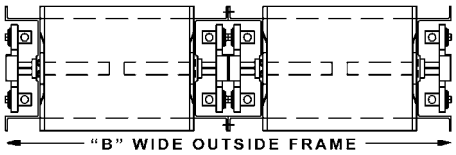
Extruded Aluminum Thermal Break

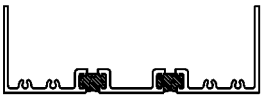
CR-58 and CR-59 Aluminum Airfoil Blade Damper

CR-59 Opposed Blade

The CR-58, parallel blade and CR-59, opposed blade are designed to be used in those application where temperature transfer is not allowed in the airflow system. Damper is thermally performance tested to ASTM C-1363-97.

Thermally Insulated, Thermally Broken Airfoil Blades. The blades are an extruded aluminum airfoil design that minimizes turbulent airflow and reduces pressure drop across the face of the unit. The airfoil blade is insulated with high-density foam injected polyurethane. Each blade is thermally broken on the entering and leaving edges of the blade; preventing temperature transfer when the damper is in the fully closed position.



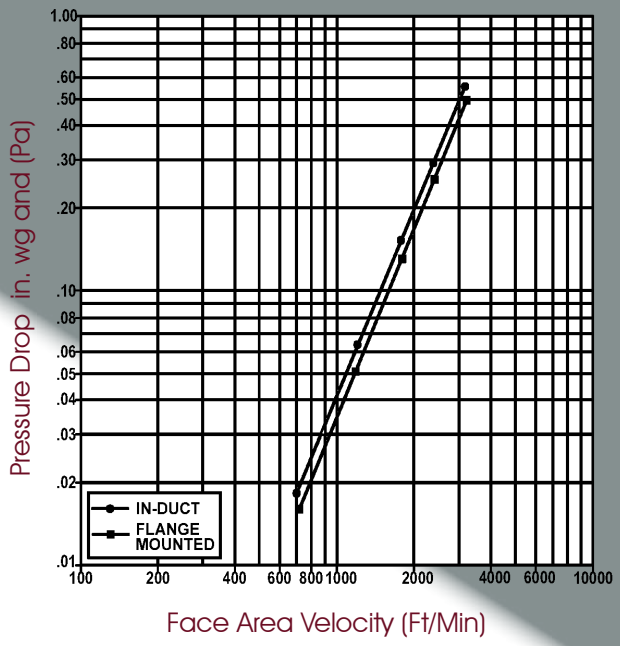


Optional Reverse Frame

STANDARD SPECIFICATIONS FOR CR-58 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**3100 fpm** (15 m/s)
Max. Differential Pressure:	**8 in. wg** (1985 Pa)
Max. Temperature:	**-70°F** (-57°C) to **200°F** (93C), with thermal break frame
Min. Temperature:	**-40°F** (-40°C) to **200°F** (93C), without thermal break frame
Max. Panel Size CR-58:	**60**" (1524) W x **72**" (1828) H, (parallel/opposed)
Min. Panel Size CR-58:	**8**" (203) W x **10 7/8**" (276) H, (single)
Max. Panel Size CR-59:	**60**" (1524) W x **72**" (1828) H, (parallel/opposed)
Min. Panel Size CR-59:	**6**" (152) W x **8 7/8**" (225) H (single)
Frame:	**5**" (127), 6063-T6/T52 extruded alum. "hat shaped" channel, .080" nominal, .125" optional wall thickness
Optional Thermal Break Frame:	**6**" (152) W x **1 7/8**" (48) H, 6063-T6/T52 extruded alum. "hat shaped" channel, .080" nominal wall thickness, and two thermal breaks filled with polyurethane and debridged for thermal isolation
Blade:	**6**" (152) W, 6063-T-6/T52 extruded aluminum .080" nominal wall thick Airfoil profile injected with two part polyurethane (CFC) free foam and debridged for thermal isolation
Axle:	**1/2**" (13) Dia. extruded alum. "pin-lock" design, interlocking into blade section
Bearings:	"Double-Sealed" type with celcon inner bearing riding inside polycarbonate outer bearing positively locked into frame, designed that there be no metal-to-metal or metal-to-bearing riding surfaces
Linkage:	Concealed in jamb of heavy aluminum. Crank arm permanently locked to blade axle by two stainless steel fasteners. The crank arm contains **1/2**" dia. metal pivot riding in a celcon bearing. A **1/4 -20** set screw with locking patch ties the **5/16**" dia. alum. linkage rod. The linkage of each damper is individually adjusted
Seals:	Extreme low temp. seal system, extruded silicone rubber blade edge seal that fits into a ribbed groove insert in blades with an extruded polycarbonate seal at jambs
Finish:	Mill

PRESSURE DROP



Pressure drop ratings are based on AMCA Standard 500-D-97 using test setup figure 5.3 for damper installed with duct upstream and downstream. Static pressures are corrected to 0.75 Lb./Cu. Ft. air density.

LEAKAGE IN SCFM

Damper Height in. and (mm)	WITH SEALS Damper Width in. and (mm)				
	12" (305)	24" (610)	36" (914)	48" (1219)	60" (1524)
12" (305)	2 (1)	4 (1)	6 (1)	8 (1)	10 (1)
18" (457)	3 (1)	6 (1)	9 (1)	12 (1)	15 (1)
24" (610)	4 (1)	8 (1)	12 (1)	16 (1)	20 (2)
30" (762)	5 (1)	10 (1)	15 (1)	20 (2)	25 (2)
36" (914)	6 (1)	12 (1)	18 (2)	24 (2)	30 (2)
42" (1067)	7 (1)	14 (1)	21 (2)	28 (2)	35 (2)
48" (1219)	8 (1)	16 (1)	24 (1)	32 (1)	40 (1)
54" (1372)	9 (1)	18 (1)	27 (1)	36 (1)	45 (1)
60" (1524)	10 (1)	20 (1)	30 (1)	40 (1)	50 (2)
66" (1676)	11 (1)	22 (1)	33 (1)	44 (2)	55 (2)
72" (1829)	12 (1)	24 (1)	36 (2)	48 (2)	60 (2)

Leakage ratings are based on AMCA standard 500-D-97 using test set-up Fig. 5.4 data is based on a closing torque of 5 In-Lb./Sq.Ft. for dampers less than 6 Sq. Ft. having a closing torque of 40 In-Lb. Damper closing torque is applied to damper operating shaft.

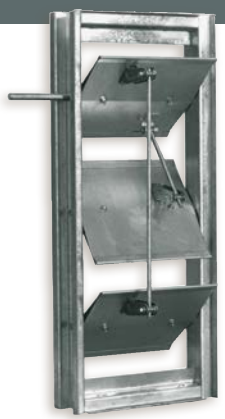
Rectangular In-Duct Mount

VC-30 and VC-31 Galvanized Steel Dampers

These dampers are used as an alternate selection to the VC-26 and VC-27 when heavier gauges, larger axles or different alloys are required. Unlike roll formed products, blade widths can vary maximizing free area and lowering pressure drop.

These models allow flexibility to change frame styles and depths for different mounting applications. Corrosive or spark resistant applications are common uses for these models.

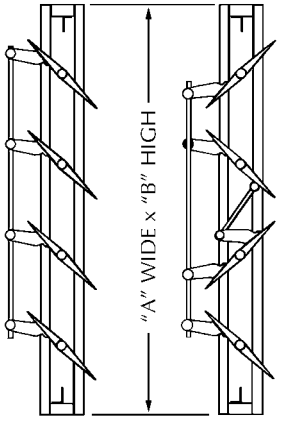
VC-30
Parallel Blade



VC-31
Opposed Blade

OPTIONS:

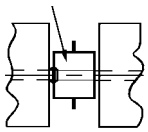
- Bearings: stainlesssteelsleeve,Teflon®sleeve,O.I.B.,press fit ball bearings
- Seals: EPT blade, metallic compression jamb
- Stainless steel linkage and axles
- Mounting holes



VC-30
Parallel Blade

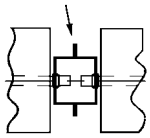
VC-31
Opposed Blade

Through shaft drive axle only



Factory assembled mullion
when jackshafting is not used.

Bolts (Not supplied)



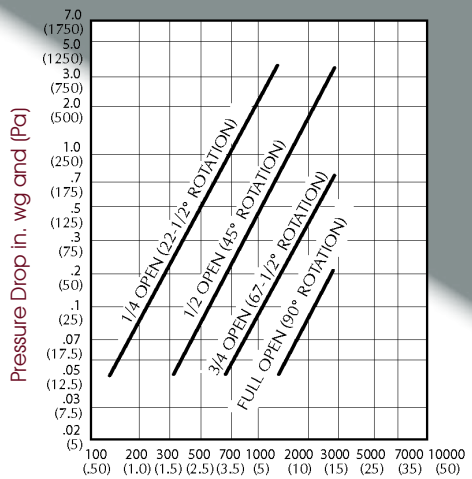
Field Assembled
Mulllion

STANDARD SPECIFICATIONS FOR VC-30 AND VC-31 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**3000 fpm** (15 m/s)
Max. Differential Pressure:	**4 in. wg** (1000 Pa)
Max. Temperature:	**200°F** (120°C) without seals **150°F** (65°C). with seals
Dimensions:	"A" and "B" dimensions are opening sizes. Dampers will be fabricated 1/4" (6.35) undersize
Max. Panel Size:	**48**" (1219) W x **96**" (2438) H (without seals) **48**" (1219) W x **72**" (1829) H (with seals)
Min. Panel Size:	**6**" (152) W x **6**" (152)H (Parallel blade VC-30) **6**" (152) W x **12**" (305)H (Opposed blade VC-31)
Frame:	**5 1/2**" (140) x **7/8**" (22.2) x **16 Ga.** (1.52) galv. steel hat channel. Dampers with a "B" dimension of **13**" (330) or less will have a flat **10 Ga.** (3.42) galvanized steel plate at head and sill
Blades:	**18 Ga.** (1.21) galv. steel, **9 1/2**" (241) max. width
Axles:	**1/2**" (12.7) diameter plated steel full length through **33**" (838) wide. **3/4**" (19) diameter plated steel full length, above **33**" (838) wide
Bearings:	Heavy-duty self-lubricating nylon
Linkage:	Plated steel brackets, brass barrels, and **5/16**" (7.94) dia. plated steel rod. Dampers with seals have double linkage on panels over **36**" (914) wide
Stops:	Extruded santoprene on blade edges with stainless steel compression at jambs
Finish:	Mill
Actuator:	An extended shaft is standard

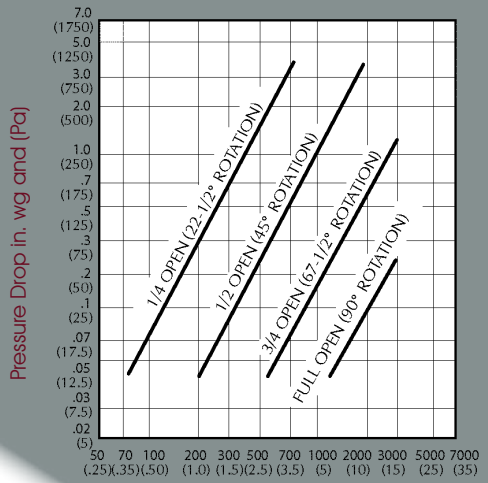
PERFORMANCE DATA FOR VC-30 AND VC-31 VOLUME CONTROL DAMPERS

PRESSURE DROP VC-30



Face Velocity fpm and (m/s)
Tested per AMCA Std. 500; fig. 5.3
Size Tested 24" x 24"

PRESSURE DROP VC-31



Face Velocity fpm and (m/s)
Tested per AMCA Std. 500; fig. 5.3
Size Tested 24" x 24"

Values shown in the chart on the right are derived from tests performed in accordance with AMCA Standard 500 and are stated in scfm at 1 in. wg. For leakage values at greater pressures, use the conversion factors in the small table above.

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00

LEAKAGE IN SCFM

Damper Height in. and (mm)	WITHOUT SEALS Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)	WITH SEALS Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)
12" (305)	85	95	105	115	7	10	13	17
24" (610)	205	250	295	335	13	20	27	33
36" (914)	315	370	425	475	18	27	35	43
48" (1219)	425	490	555	620	23	33	43	53
60" (1524)	540	630	715	800	30	43	57	70
72" (1829)	650	750	845	940	35	50	65	80
84" (2134)	760	870	975	1080	To convert SCFM Leakage Values to m3/s: Multiply SCFM x .000472			
96" (2438)	875	1005	1135	1260				

TORQUE DATA
Torque values are given in in.-lbs. and (Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)	PRESSURE TORQUE Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)	SEALING TORQUE Damper Width in. and (mm) 12" (305)	24" (610)	36" (914)	48" (1219)
12" (305)	1 (1)	1 (1)	2 (1)	3 (1)	1 (1)	3 (1)	4 (1)	5 (1)	24 (3)	39 (5)	54 (7)	69 (8)
24" (610)	2 (1)	3 (1)	5 (1)	7 (1)	2 (1)	5 (1)	7 (1)	10 (2)	45 (6)	71 (8)	96 (11)	121 (14)
36" (914)	3 (1)	6 (1)	10 (2)	14 (2)	3 (1)	8 (1)	12 (2)	16 (2)	68 (8)	106 (12)	144 (17)	182 (21)
48" (1219)	4 (1)	10 (2)	15 (2)	20 (3)	5 (1)	11 (2)	16 (2)	22 (3)	90 (11)	140 (16)	190 (22)	182 (21)
60" (1524)	5 (1)	11 (2)	17 (2)	24 (3)	6 (1)	13 (2)	21 (3)	28 (4)	111 (13)	171 (20)	232 (27)	293 (34)
72" (1829)	7 (1)	14 (2)	22 (3)	30 (4)	7 (1)	16 (2)	25 (3)	34 (4)	132 (15)	205 (24)	277 (32)	350 (40)
84" (2134)	8 (1)	18 (2)	27 (4)	37 (5)	9 (1)	19 (3)	29 (4)	40 (5)				
96" (2438)	9 (1)	19 (3)	30 (4)	40 (5)	10 (2)	22 (3)	34 (4)	46 (6)				

Above values are based on 1000 fpm (5 m/s) face velocity. Use multipliers below for other face velocities.

Above values are based on 1 in. wg (1000 Pa) diff. pressure. Use multipliers to the right for other pressures.

Face Velocity fpm (m/s)	Multiplier	Diff. Pressure in. wg (Pa)	Multiplier
1500 (8)	2.25	2 (500)	2
2000 (10)	4	3 (750)	3
2500 (13)	6.25	4 (1000)	4
3000 (15)	9	5 (1250)	5

The torque required to operate a VC-30 type air control damper is dependent on the largest torque value that the damper will see in actual operation. The torque tables give torque values for various face velocities, differential pressures, and sealing requirements. The torque required for a damper without seals is the largest value of torque due to velocity or pressure. The torque required for a damper with seals is the largest value of torque due to velocity, pressure or sealing the damper.

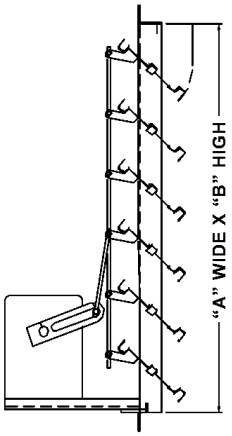
Rectangular In-Duct Mount

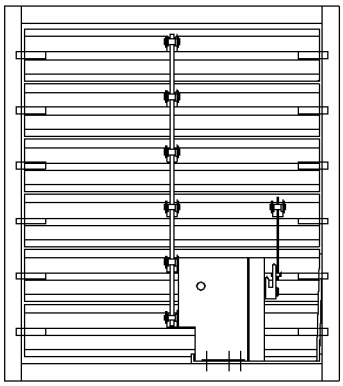
VC-140 Galvanized Steel Damper

The VC-140 is designed to be used in an air intake or exhaust shutter application. It is a heavy-duty design of the VC-10 standard duty damper. The primary application is in conjunction wall mounted propeller fans and power rood ventilators. Operating is by a power open – spring closed motoring or manual pull chain operators.

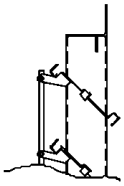
VC-140 Face View

VC-140 Rear View

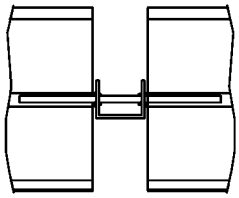




Face View



Optional Reverse Frame



Mullion Detail

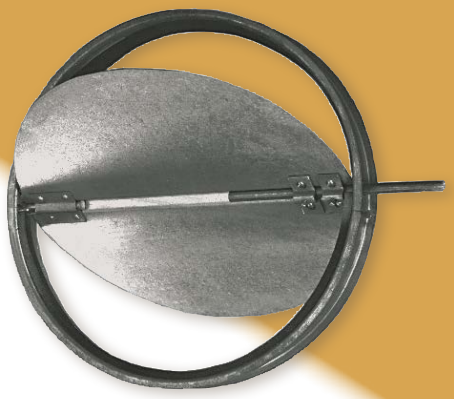
STANDARD SPECIFICATIONS FOR VC-140 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**3000 fpm** (15 m/s)
Max. Differential Pressure:	**4 in. wg** (1000 Pa)
Max. Temperature:	**136°F** (58°C) **-40°F** (-40°C)
Dimensions:	"A" and "B" are inside frame dimensions, (standard and reverse flange). Wall openings must be **1**" larger than "A" dimension to allow for axle clearance, and **1/4**" larger than "B" dimension
Max. Panel Size:	**48**" (1219) W x **96**" (2438) H
Min. Panel Size:	**12**" (305) W x **12**" (305) H
Frame:	**2**" (50.8) x **1 1/2**" (38.1) flange (standard and reverse)
Blades:	**16 Ga.** (1.52) galv. steel, **6**" (152.4) max. width
Axles:	**1/2**" (12.7) Square plated. Steel stub, with drive through axle
Bearings:	Heavy-duty molded nylon
Linkage:	Plated steel brackets, brass barrels, and **5/16**" (7.94) dia. rod
Stops:	**16 Ga.** galvanized steel angle head and sill
Finish:	Mill with touch-ups on welds
Actuator:	115 VAC motor with built in end switch

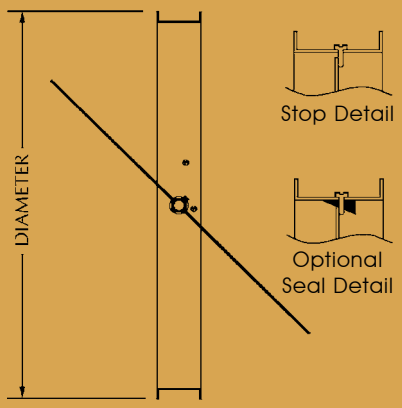
Round In-Duct Mount

Models VC-22, VC-22-BD, VC-23 Galvanized Steel Dampers

The VC-22 volume control damper is designed for all types of round duct applications such as variable air volume systems, etc. Available in sizes of 6" (152) diameter through 18" (457) diameter.

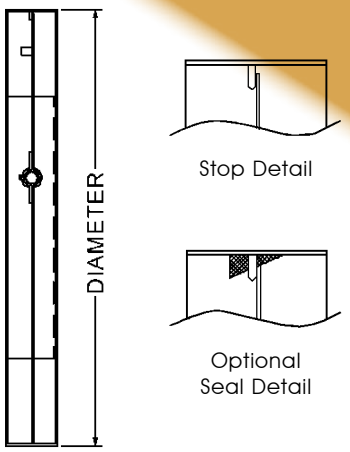


VC-22



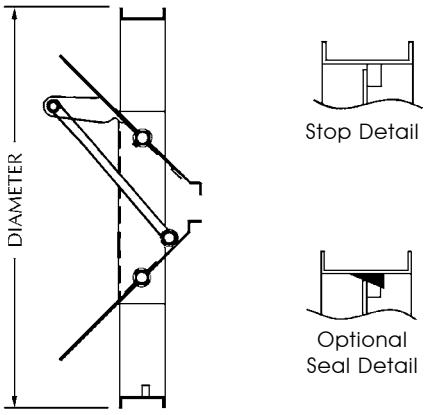
The VC-22-BD Designed to be used for round in-duct applications as a gravity operated backdraft damper. Available in sizes 6" (152) diameter Through 18" (457) diameter. Can be installed for vertical or horizontal airflow.

VC-22-BD



The VC-23 comes with two opposed blades and covers a range of sizes larger than those available in the VC-22. Designed for volume control and/or shut-off use in round ducts from 12" (305) through 28" (711) diameter. It can also be used in applications where limitations in the depth of the space envelope precludes the use of single blade dampers. For diameters exceeding 28" (711), see the model VC-24.

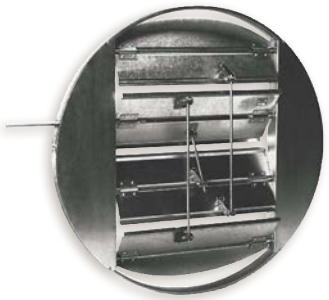
VC-23



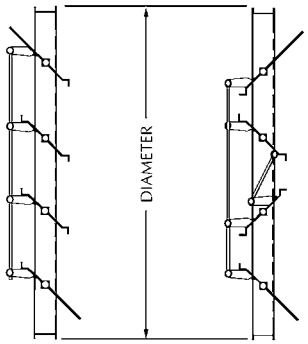
Round In-Duct Mount

Models VC-24, VC-25 Galvanized Steel Dampers

Designed for two position or proportional control of low pressure, low velocity applications where a round damper is required which exceeds the maximum size limitations of the VC-22 or VC-23. The VC-24 parallel blade is recommended for constant pressure drop applications such as fresh and return air dampers. The VC-24 opposed blade is designed for varying pressure drop applications. Available in sizes of 20" (508) diameter through 50" (1270) diameter.



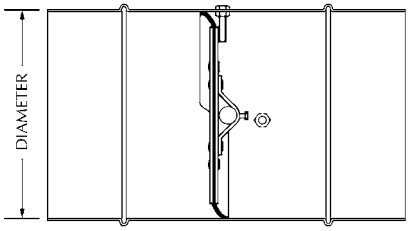
VC-24



Parallel Blades Opposed Blades

The VC-25 is designed for all types of low leakage, round duct applications. Available in sizes of 4" (102) diameter through 24" (610) diameter. For diameters exceeding 24" (610), contact factory.

VC-25

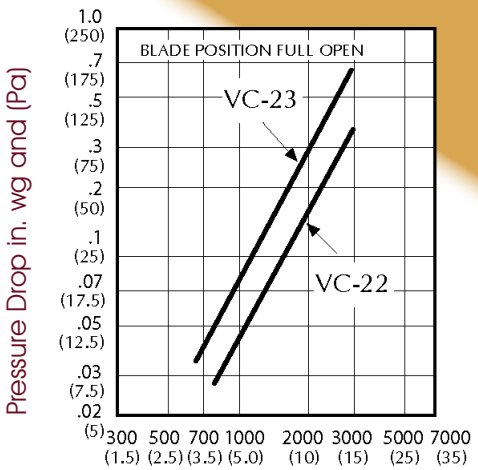


STANDARD SPECIFICATIONS FOR MODELS VC-22, 23, 24 AND 25

Inches are shown, numbers in ( ) are mm
Damper diameters are 1/8" (3.18) undersized

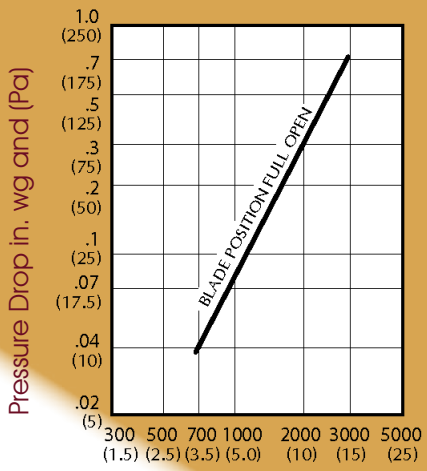
Product:	VC-22	VC-23	VC-24	VC-25
Max. Face Velocity:	**3000 fpm** (15 m/s)	**3000 fpm** (15 m/s)	**3000 fpm** (15 m/s)	**3000 fpm** (15 m/s)
Max. Differential Pressure:	**2 in. wg** (500 Pa)	**2 in. wg** (500 Pa)	**2 in. wg** (500 Pa)	**6 in. wg** (1500 Pa)
Max. Temperature:	**180°F** (82°C) without seals **150°F** (65°C) with seals	**180°F** (82°C) without seals **150°F** (65°C) with seals	**180°F** (82°C) without seals **150°F** (65°C) with seals	**150°F** (65°C)
Min Diameter: Max Diameter:	**6"** (152) **18"** (457)	**12"** (305) **28"** (711)	**24"** (610) **50"** (1270)	**4"** (101) **24"** (610)
Frame:	**2"** (51) x **1/2"** (12.7) x **14 Ga.** (1.9) galv. steel channel	**2"** (51) x **1/2"** (12.7) x **14 Ga.** (1.9) galv. steel channel	**2"** (51) x **1/2"** (12.7) x **14 Ga.** (1.9) galv. steel channel	**20 Ga.** (.91) galv. steel, **10"** (254) deep [through **18"** (457) diameter] **18 Ga.** (1.21) galv. steel, **10"** (254) deep [over **18"** (457) diameter]
Inner frame:		**16 Ga.** (1.52) galv. steel angle	**14 Ga.** (1.9) galv. steel angle	
Blades:	**16 Ga.** (1.52) galv. steel	**16 Ga.** (1.52) galv. steel	**16 Ga.** (1.52) galv. steel	Double thickness galv. steel, **14 Ga.** (1.9) equiv. thickness
Axles:	**1/2"** (12.7) dia. plated steel stub	**1/2"** (12.7) dia. plated steel stub	**1/2"** (12.7) dia. plated steel stub	**1/2"** (12.7) dia. plated steel stub
Bearings:	Nylon sleeve with stainless steel thrust washers	Nylon sleeve with stainless steel thrust washers	Nylon sleeve with stainless steel thrust washers	Oil impregnated bronze
Seals:	Optional	Optional	Optional	Ameriprene, one piece, enclosed in a 2-piece blade construction
Linkage:		Plated steel brackets, brass barrels, and a **5/16"** (7.94) diameter plated steel rod	Plated steel brackets, brass barrels, and a **5/16"** (7.94) diameter plated steel rod	
Stops:	#10 plated sheet metal screws for the open and closed positions	#10 plated sheet metal screws for the open and closed positions		#10-16 bolt with locknut at open and closed
Finish:	Mill	Mill	Mill	Mill
Actuator:	An extendable shaft **6"** (152) beyond the frame is standard	An extendable shaft **6"** (152) beyond the frame is standard	An extendable shaft **6"** (152) beyond the frame is standard	An extendable shaft **6"** (152) beyond the frame is standard

PRESSURE DROP VC-22 & VC-23



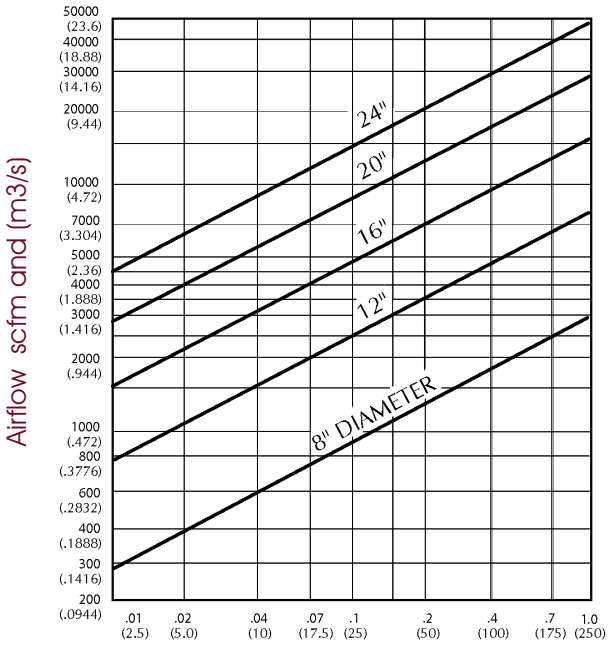
Face Velocity fpm and (m/s)
Tested per AMCA Std. 500; fig. 5.3
Size tested 18" dia.

PRESSURE DROP VC-24



Face Velocity fpm and (m/s)
Tested per AMCA Std. 500; fig. 5.3
Size tested 48" dia.

PRESSURE DROP VC-25



Pressure in. wg and (Pa)
Tested per AMCA Std. 500, fig. 5.3

LEAKAGE IN SCFM

Damper Dia. in. and (mm)	VC-22	VC-23	VC-24	VC-25
4" (102)				0.94
6" (152)	8			1.41
8" (203)	9			1.88
10" (254)	9			2.36
12" (305)	10	15		2.83
14" (356)	10	16		3.3
16" (406)	11	16		3.8
18" (457)	12	17		4.24
20" (508)		18		4.71
22" (508)		18		4.71
24" (610)		19	35	5.7
26" (660)		20	40	
28" (711)		22	45	
30" (762)			50	
36" (914)			60	
42" (1067)			80	
48" (1219)			100	
50" (1270)			105	

Table above depicts leakage through models VC-22, VC-23, VC-24 and VC-25 at 1 in. wg differential pressure tested per AMCA Std. 500, Figure 5.4.

To convert SCFM Leakage Values to m3/s: Multiply SCFM x .000472

Rectangular Duct Flange Mount

Model 400 Series - Single Thickness Blade

Parallel Blade

Opposed Blade

American Warming and Ventilating's 400 Series single thickness blade volume control dampers are designed for a steady range of pressures and velocities.

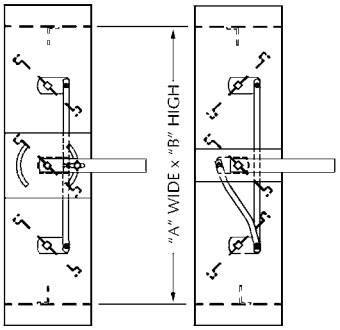
The performance of the parallel or opposed blade design for clean air systems allows superior performance in both constant and varying pressure drop applications.

The parallel blade unit is recommended for constant pressure drop applications such as mixing air, multi-zone, face and bypass as well as normal open/closed applications.

The opposed blade unit is recommended for varying pressure drop conditions such as volume control or as a blower outlet.

OPTIONS:

- Axles and Linkage construction: 304 and 316 stainless steel (VC-412 & 413)
- Bearings: stainless steel sleeve (all units); (VC-412) stainless steel ball with cadmium plated races, (VC-412 & VC-413) Teflon® sleeve
- Seals: vinyl blade (VC-411), EPT blade and silicone blade (VC-411, VC-412 & 413), stainless steel jamb
- Special flange width 4"(102) max
- 304 and 316 stainless steel construction (VC-412 & 413)
- Actuator: manual quadrant and lever arm available in 304 and 316 stainless steel
- Mounting holes



STANDARD SPECIFICATIONS FOR MODELS VC-411, VC-412 AND VC-413 Inches are shown, numbers in ( ) are mm

Product:	VC-411	VC-412	VC-413
Max. Face Velocity:	**3000 fpm** (15 m/s)*	**5000 fpm** (25 m/s)*	**6000 fpm** (30 m/s)*
Max. Differential Pressure:	**10 in. wg** (2500 Pa)	**15 in. wg** (3725 Pa)*	**20 in. wg** (4965 Pa)*
Max. Temperature:	**250°F** (120°C)	**250°F** (120°C)	**250°F** (120°C)
Dimensions:	"A" (width) and "B" (height) dimensions are inside damper frame. Dampers will be fabricated to exact size		
Max. Panel Size:	**48"** (1219) W x **72"** (1829) w/o seals **36"** (914) W x **72"** (1829) with seals	**48"** (1219) W x **96"** (2438) w/o seals **48"** (1219) W x **72"** (1829) with seals	**60"** (1524) W x **96"** (2438) w/o seals **60"** (1524) W x **72"** (1829) with seals
Min. Panel Size:	**6"** (152) W x **8"** (203) H (Parallel) **6"** (152) W x **12"** (305) H (Opposed)	**6"** (152) W x **8"** (203) H (Parallel) **6"** (152) W x **12"** (305) H (Opposed)	**6"** (152) W x **8"** (203) H (Parallel) **6"** (152) W x **12"** (305) H (Opposed)
Frame:	**8"** (203) x **2"** (51) x **14 Ga.** (1.9) galv. steel through **72"** (1829)H; **12 Ga.** (2.67) through **96"** (2438)	**8"** (203) x **2"** (51) x **12 Ga.** (2.67) galv. steel	**8"** (203) x **2"** (51) x **12 Ga.** (2.67) galv. steel
Blades:	**16 Ga.** (1.52) galv. steel, single thickness, **8"** (203) max. width	**14 Ga.** (1.9) galv. steel through **36"** (914) wide, single thickness; **12 Ga.** (2.67) galv. steel through 48" (1219) wide single thickness, **8"** (203) max. width	**12 Ga.** (2.67) galv. steel, single thickness, **8"** (203) max. width
Axles:	½" (12.7) sq. plated steel, stub	¾" (19) dia. plated steel, stub	**1"** (25) dia. plated steel, stub
Bearings:	Oil impregnated bronze	Oil impregnated bronze	Oil impregnated bronze
Linkage:	Heavy-duty plated steel arms, stainless steel pivots and galvanized steel angle, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel angle, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel bar, external type
Stops:	Galvanized steel angle	Galvanized steel angle	Galvanized steel angle
Finish:	Mill	Mill	Mill
Actuator:	An extendable shaft **7"** (178) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard

LEAKAGE DATA (IN SCFM) FOR MODELS VC-411, VC-412 AND VC-413

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4* (1000)	2.00
5* (1250)	2.24
6* (1500)	2.45
7* (1750)	2.65

* See Pressure Limitations Chart on Page 23.

Quantities are derived from tests performed in accordance with AMCA Standard 500. The values shown in the leakage chart are stated in scfm at 1 in. wg. Use of the conversion factors above will give leakage values at greater pressures. For lower leakages, contact factory.

To convert SCFM Leakage Values to m3/s: Multiply SCFM x .000472

VC-411

Damper Height in. and (mm)	WITHOUT SEALS (1 in. wg) Damper Width in. and (mm) 12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	WITH SEALS (1 in. wg) Damper Width in. and (mm) 12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)
12" (305)	103	116	128	141	153	166	178	9	10	11	12	14	15	16
18" (457)	150	167	183	200	217	233	250	11	13	14	16	17	19	20
24" (610)	182	198	215	232	248	265	282	12	14	15	17	18	20	21
30" (762)	223	244	265	286	306	327	348	14	16	18	20	22	24	25
36" (914)	259	284	309	334	359	384	409	17	19	21	23	25	27	30
42" (1067)	312	337	362	387	412	437	462	18	20	22	25	27	29	31
48" (1219)	359	388	417	446	476	505	534	20	23	25	28	30	33	35
54" (1372)	411	444	477	511	544	578	611	23	26	29	32	34	37	40
60" (1524)	411	444	477	511	544	578	611	23	26	29	32	34	37	40
66" (1676)	457	495	533	570	608	645	683	25	29	32	35	38	41	44
72" (1829)	509	551	593	635	676	718	760	28	32	35	39	42	46	49

(See Leakage Statement above)

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00
5 (1250)	2.24
6 (1500)	2.45
7* (1750)	2.65
8* (2000)	2.83
9* (2250)	3.00
10* (2500)	3.16

* See Pressure Limitations Chart on Page 23.

VC-412

Damper Height in. and (mm)	WITHOUT SEALS (1 in. wg) Damper Width in. and (mm) 12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	WITH SEALS (1 in. wg) Damper Width in. and (mm) 12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)
12" (305)	60	70	80	90	100	112	128	15	18	20	22	24	28	32
18" (457)	90	105	120	135	150	168	192	22	24	28	32	36	42	48
24" (610)	120	140	160	180	200	224	256	30	34	38	43	48	56	64
30" (762)	150	176	202	228	254	280	320	37	42	48	54	60	70	80
36" (914)	180	211	242	273	304	336	384	45	51	58	65	72	84	96
42" (1067)	210	246	282	318	354	392	448	52	60	68	76	84	98	112
48" (1219)	240	281	322	363	404	448	512	60	69	78	87	96	112	128
54" (1372)	270	316	362	408	454	504	576	67	77	87	97	108	126	144
60" (1524)	300	352	404	456	508	560	640	75	86	97	108	129	140	160
66" (1676)	330	387	444	501	558	616	704	82	94	106	118	132	154	176
72" (1829)	360	422	484	546	608	672	768	90	103	116	129	144	168	192
78" (1981)	390	457	524	591	658	728	832							
84" (2134)	420	492	564	636	708	784	896							
90" (2286)	450	528	606	684	762	840	960							
96" (2438)	480	563	646	729	812	896	1024							

(See Leakage Statement above)

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00
5 (1250)	2.24
6 (1500)	2.45
7* (1750)	2.65
8* (2000)	2.83
9* (2250)	3.00
10* (2500)	3.16
11* (2750)	3.32
12* (3000)	3.46
13* (3250)	3.61
14* (3500)	3.74
15* (3750)	3.87

VC-413

Damper Height in. and (mm)	WITHOUT SEALS (1 in. wg) Damper Width in. and (mm) 12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	54" (1372)	60" (1524)	WITH SEALS (1 in. wg) Damper Width in. and (mm) 12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	54" (1372)	60" (1524)
12" (305)	60	70	80	90	100	112	128	144	160	15	18	20	22	24	28	32	36	40
18" (457)	90	105	120	135	150	168	192	216	240	22	24	28	32	36	42	48	54	60
24" (610)	120	140	160	180	200	224	256	288	320	30	34	38	43	48	56	64	72	80
30" (762)	150	176	202	228	254	280	320	360	400	37	42	48	54	60	70	80	90	100
36" (914)	180	211	242	273	304	336	384	432	480	45	51	58	65	72	84	96	108	120
42" (1067)	210	246	282	318	354	392	448	504	560	52	60	68	76	84	98	112	126	140
48" (1219)	240	281	322	363	404	448	512	576	640	60	69	78	87	96	112	128	144	160
54" (1372)	270	316	362	408	454	504	576	648	720	67	77	87	97	108	126	144	162	180
60" (1524)	300	352	404	456	508	560	640	720	800	75	86	97	108	120	140	160	180	200
66" (1676)	330	387	444	501	558	616	704	792	880	82	94	106	118	132	154	176	198	220
72" (1829)	360	422	484	546	608	672	768	864	960	90	103	116	128	144	168	192	216	240
78" (1981)	390	457	524	591	658	728	832	936	1040									
84" (2134)	420	492	564	636	708	784	896	1008	1120									
90" (2286)	450	528	606	684	762	840	960	1080	1200									
96" (2438)	480	563	646	729	812	896	1024	1152	1280									

* See Pressure Limitations Chart on pages 28 and 29.

Rectangular Duct Flange Mount

Model 400 Series - Airfoil Blade Construction

Parallel Blade

Opposed Blade

American Warming and Ventilating's 400 Series airfoil blade volume control dampers are designed for a variable range of pressures and velocities.

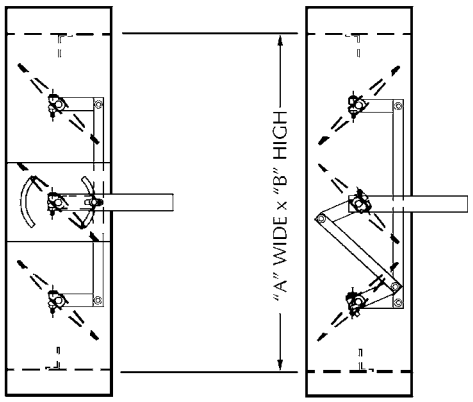
The performance of the parallel or opposed blade design for clean air systems allows superior performance in both constant and varying pressure drop applications.

The parallel blade unit is recommended for constant pressure drop applications such as mixing air, multi-zone, face and bypass as well as normal open/closed applications.

The opposed blade unit is recommended for varying pressure drop conditions such as volume control or as a blower outlet.

OPTIONS:

- 304 & 316 stainless steel construction
- Special flange width (4" max.)
- Axles and linkage construction: 304 & 316 stainless steel
- Bearings: stainless steel ball with cadmium plated races (422), stainless steel sleeve, Teflon® sleeve, flanged ball, stuffing boxes
- Seals: EPT or silicone blade and stainless steel jamb
- Actuator: manual quadrant and lever arm. Also available in 304 & 316 stainless steel
- Mounting holes



STANDARD SPECIFICATIONS FOR MODELS VC-421, 422 AND 433 Inches are shown, numbers in ( ) are mm

	VC-421	VC-422	VC-423
Max. Face Velocity:	**3500 fpm** (15 m/s)*	**5000 fpm** (25 m/s)*	**6000 fpm** (30 m/s)*
Max. Differential Pressure:	**15 in. wg** (3725 Pa)*	**30 in. wg** (7475 Pa)*	**45 in. wg** (11170 Pa)*
Max. Temperature:	**250°F** (120°C)	**250°F** (120°C)	**250°F** (120°C)
Dimensions:	"A" (width) and "B" (height) dimensions are inside damper frame. Dampers will be fabricated to exact size		
Max. Panel Size:	**48"** (1219) W x **96"** (2438) w/o seals **48"** (1219) W x **72"** (1829) with seals	**48"** (1219) W x **96"** (2438) w/o seals **48"** (1219) W x **72"** (1829) with seals	**60"** (1524) W x **96"** (2438) w/o seals **60"** (1524) W x **72"** (1829) with seals
Min. Panel Size:	**6"** (152) W x **8"** (203) H (Parallel) **6"** (152) W x **12"** (305) H (Opposed)	**6"** (152) W x **8"** (203) H (Parallel) **6"** (152) W x **12"** (305) H (Opposed)	**6"** (152) W x **8"** (203) H (Parallel) **6"** (152) W x **12"** (305) H (Opposed)
Frame:	**8"** (203) x **2"** (51) x **14 Ga.** (1.9) galv. steel through **72"** (1829) H; **12 Ga.** (2.67) through **96"** (2438)	**8"** (203) x **2"** (51) x **12 Ga.** (2.67) galv. steel	**8"** (203) x **2"** (51) x **12 Ga.** (2.67) galv. steel
Blades:	**16 Ga.** (1.52) galv. steel, airfoil shape, **8"** (203) max. width	**16 Ga.** (1.52) galv. steel, airfoil shape, **8"** (203) max. width	**16 Ga.** (1.52) galv. steel, airfoil shape, **8"** (203) max. width
Axles:	**1/2"** (12.7) sq. plated steel, full length	**3/4"** (19) dia. plated steel, full length	**1"** (25) dia. plated steel, full length
Bearings:	Oil impregnated bronze	Oil impregnated bronze	Oil impregnated bronze
Linkage:	Heavy-duty plated steel arms, stainless steel pivots and galvanized steel angle, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel angle, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel bar, external type
Stops:	Galvanized steel angle	Galvanized steel angle	Galvanized steel angle
Finish:	Mill	Mill	Mill
Actuator:	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard

* Velocities and Pressures differ based on blade length. Reference charts on pages 28 and 29.

LEAKAGE DATA (IN SCFM) FOR MODELS VC-421, VC-422 AND VC-423

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4* (1000)	2.00
5* (1250)	2.24
6* (1500)	2.45
7* (1750)	2.65

* See Pressure Limitations Chart on Page 23

Quantities are derived from tests performed in accordance with AMCA Standard 500. The values shown in the leakage chart are stated in scfm at 1 in. wg. Use of the conversion factors below will give leakage values at greater pressures. For lower leakages, contact factory.

To convert SCFM Leakage Values to m3/s: Multiply SCFM x .000472

VC-421

Damper Height in. and (mm)	WITHOUT SEALS (1 in. wg) Damper Width in. and (mm)							WITH SEALS (1 in. wg) Damper Width in. and (mm)						
	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)
12" (305)	95	110	125	140	160	175	190	13	16	19	22	24	27	30
18" (457)	125	140	160	175	190	205	220	17	20	22	25	28	31	33
24" (610)	170	190	210	230	255	275	295	22	27	30	33	37	41	44
30" (762)	210	235	265	290	315	345	370	28	33	37	42	46	51	55
36" (914)	250	285	315	350	380	410	445	33	39	44	50	55	61	66
42" (1067)	295	330	370	405	445	480	520	43	45	52	58	65	71	77
48" (1219)	325	360	400	435	475	510	550	43	49	55	62	68	75	81
54" (1372)	365	410	450	495	535	580	625	48	55	63	70	77	85	92
60" (1524)	410	460	505	555	600	650	700	54	62	70	78	87	95	103
66" (1676)	450	505	560	610	665	715	770	59	68	77	87	96	105	114
72" (1829)	490	550	610	670	730	785	845	65	75	85	95	105	115	125
78" (1981)	525	580	640	700	760	829	875							
84" (2134)	565	630	695	760	820	885	950							
90" (2286)	610	675	745	815	885	955	1025							
96" (2438)	650	725	800	875	950	1025	1100							

(See Leakage Statement above)

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00
5 (1250)	2.24
6 (1500)	2.45
7 (1750)	2.65
8 (2000)	2.83
9* (2250)	3.00
10* (2500)	3.16

* See Pressure Limitations Chart on Page 23

VC-422

Damper Height in. and (mm)	WITHOUT SEALS (1 in. wg) Damper Width in. and (mm)							WITH SEALS (1 in. wg) Damper Width in. and (mm)						
	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)
12" (305)	115	130	145	165	180	195	210	13	16	19	22	24	27	30
18" (457)	155	175	190	205	220	235	255	17	20	22	25	28	31	33
24" (610)	210	230	250	275	295	315	335	22	27	30	33	37	41	44
30" (762)	260	290	315	340	370	395	420	28	33	37	42	46	51	55
36" (914)	315	345	380	410	440	475	505	33	39	44	50	55	61	66
42" (1067)	365	405	440	480	515	555	590	39	45	52	58	65	71	77
48" (1219)	410	445	485	520	560	595	630	43	49	55	62	68	75	81
54" (1372)	460	505	545	590	630	675	715	48	55	63	70	77	85	92
60" (1524)	515	560	610	660	705	755	800	54	62	70	78	87	95	103
66" (1676)	565	620	670	725	780	830	885	59	68	77	87	96	105	114
72" (1829)	620	675	735	795	850	910	970	65	75	85	95	105	115	125
78" (1981)	660	720	775	835	895	955	1010							
84" (2134)	710	775	840	905	970	1030	1100							
90" (2286)	765	835	905	970	1040	1110	1180							
96" (2438)	815	890	965	1040	1115	1190	1265							

(See Leakage Statement above)

Differential Pressure in. wg (Pa)	Multiplier
2 (500)	1.41
3 (750)	1.73
4 (1000)	2.00
5 (1250)	2.24
6 (1500)	2.45
7 (1750)	2.65
8 (2000)	2.83
9 (2250)	3.00
10 (2500)	3.16
11 (2750)	3.32
12 (3000)	3.46
13* (3250)	3.61
14* (3500)	3.74
15* (3750)	3.87

VC-423

Damper Height in. and (mm)	WITHOUT SEALS (1 in. wg) Damper Width in. and (mm)									WITH SEALS (1 in. wg) Damper Width in. and (mm)								
	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	54" (1372)	60" (1676)	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	54" (1372)	60" (1676)
12" (305)	115	130	145	165	180	195	210	225	245	13	16	19	22	24	27	30	33	35
18" (457)	155	175	190	205	220	235	255	270	285	17	20	22	25	28	31	33	36	39
24" (610)	210	230	250	275	295	315	335	360	380	22	27	30	33	37	41	44	48	52
30" (762)	260	290	315	340	370	395	420	450	475	28	33	37	42	46	51	55	60	65
36" (914)	315	345	380	410	440	475	505	540	570	33	39	44	50	55	61	66	72	77
42" (1067)	365	405	440	480	515	555	590	630	665	39	45	52	58	65	71	77	84	90
48" (1219)	410	445	485	520	560	595	630	670	705	43	49	55	62	68	75	81	88	94
54" (1372)	460	505	545	590	630	675	715	760	800	48	55	63	70	77	85	92	100	107
60" (1524)	515	560	610	660	705	755	800	850	900	54	62	70	78	87	95	103	111	120
66" (1676)	565	620	670	725	780	830	885	940	990	59	68	77	87	96	105	114	123	133
72" (1829)	620	675	735	795	850	910	970	1030	1085	65	75	85	95	105	115	125	135	145
78" (1981)	660	720	775	835	895	955	1010	1070	1130									
84" (2134)	710	775	840	905	970	1030	1100	1160	1225									
90" (2286)	765	835	905	970	1040	1110	1180	1250	1320									
96" (2438)	815	890	965	1040	1115	1190	1265	1340	1415									

* See Pressure Limitations Chart on pages 28 and 29.

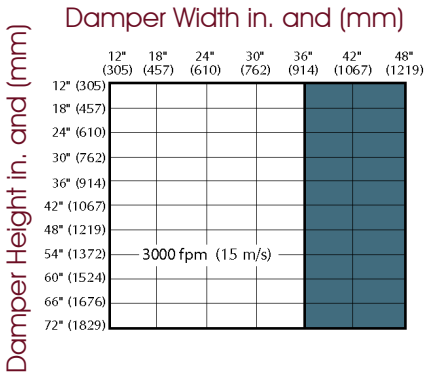
Rectangular Duct Flange Mount

VELOCITY LIMITATIONS FOR 400 SERIES (SINGLE THICKNESS AND AIRFOIL BLADE DESIGN)

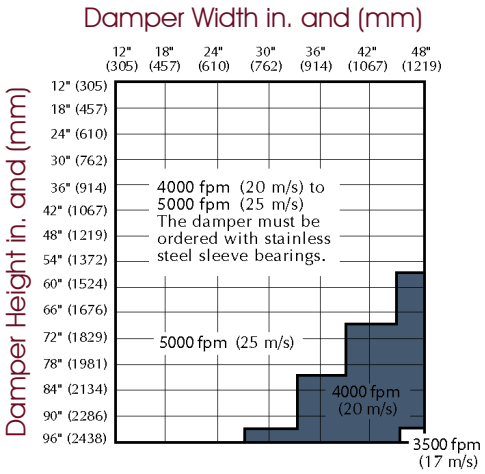
The velocity restrictions shown below are based on the design limits of the extended shaft. In-duct actuators, jackshafting or another model is required if velocities exceed the values shown.

SINGLE THICKNESS BLADE DESIGN

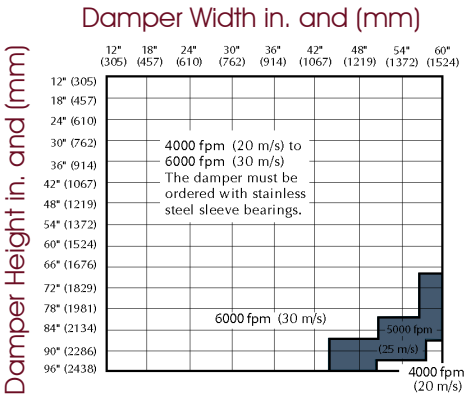
VC-411



VC-412

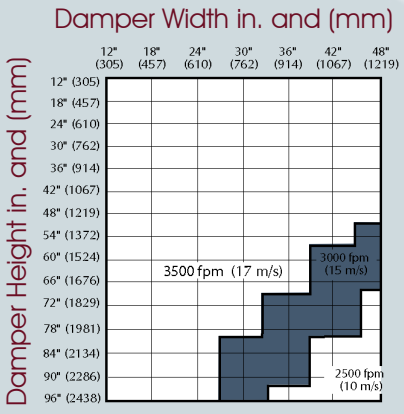


VC-413

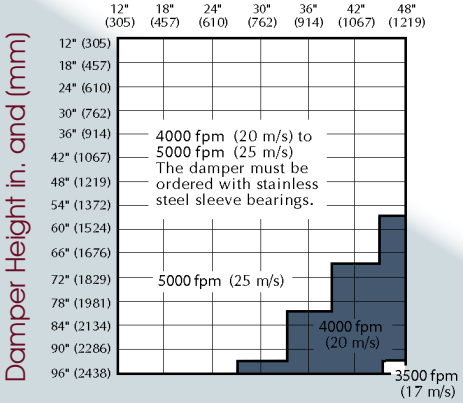


AIRFOIL BLADE DESIGN

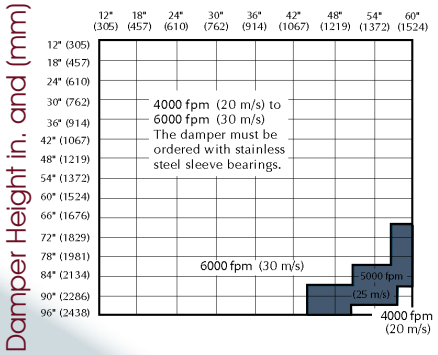
VC-421



VC-422



VC-423

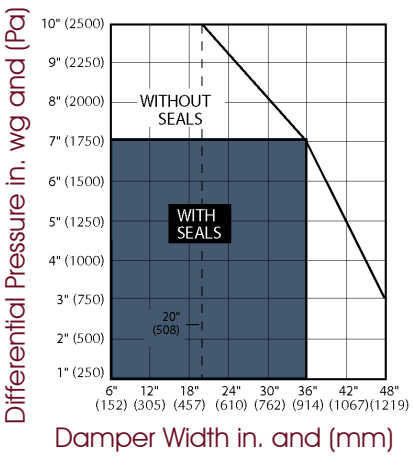


PRESSURE LIMITATIONS FOR 400 SERIES (SINGLE THICKNESS AND AIRFOIL BLADE DESIGN)

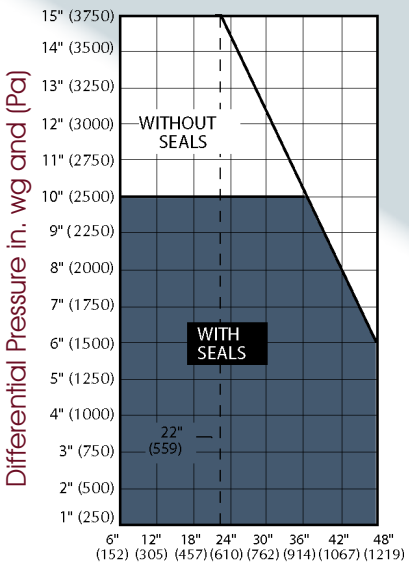
The pressure ratings shown below are based on the design limits of the extended shaft or blade deflection. Another model should be selected if pressures exceed the values shown.

SINGLE THICKNESS BLADE DESIGN

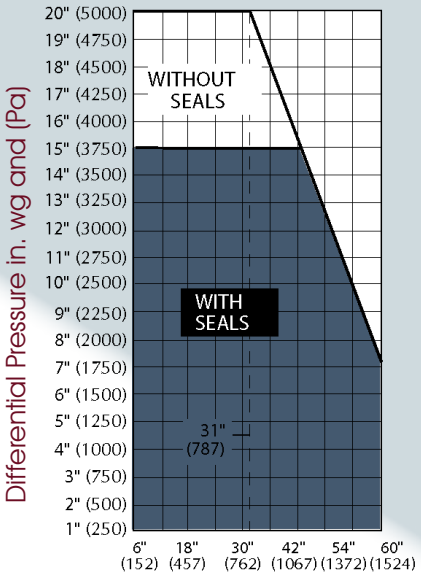
VC-411



VC-412

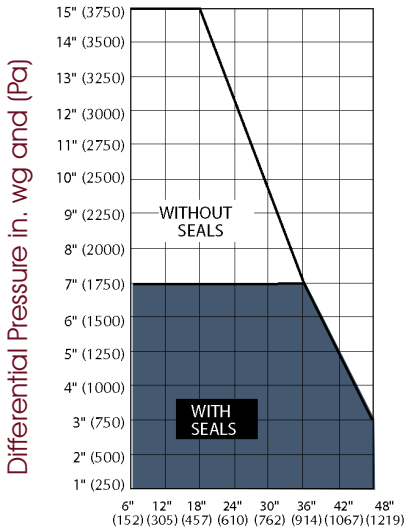


VC-413

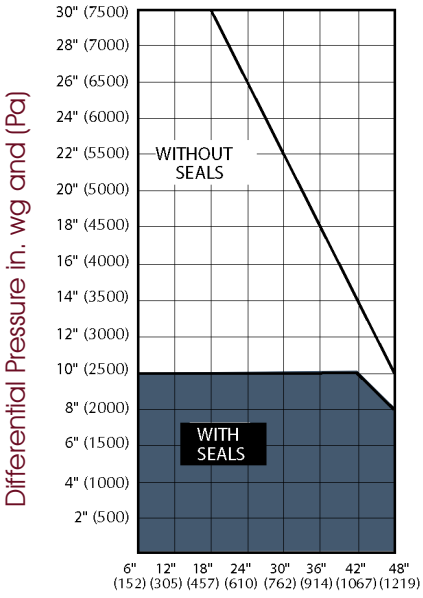


AIRFOIL BLADE DESIGN

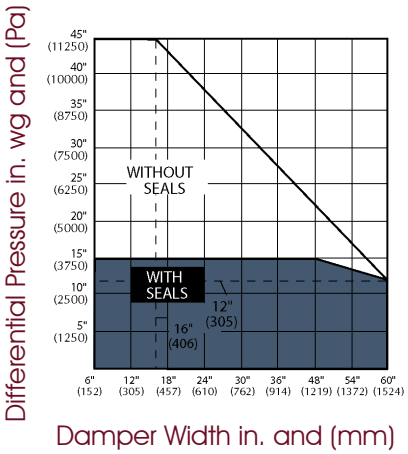
VC-421



VC-422



VC-423



Rectangular Duct Flange Mount

TORQUE TABLES FOR 400 SERIES

The torque required to operate the VC-400 Series Volume Control Dampers is the greatest torque value that the damper will see in operation . The condensed tables shown give torque values for various face velocities, differential pressures and sealing requirements.

The torque required for a damper is the torque due to velocity or pressure or sealing the damper, whichever is greater. In either case, 20 in.-lbs. (2.26 Nm) should be the minimum torque selected. Also, safety factors should be used when using these values to size an actuator.

Model VC-411
(Single Thickness Blade) 250 in.-lbs. (28.25 Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE Damper Width in. and (mm)				PRESSURE TORQUE Damper Width in. and (mm)				SEALING TORQUE Damper Width in. and (mm)		
	12" (305)	24" (610)	36" (914)	48" (1219)	12" (305)	24" (610)	36" (914)	48" (1219)	12" (305)	24" (610)	36" (914)
12" (305)	1 (.113)	1 (.113)	2 (.226)	3 (.339)	1 (.113)	2 (.226)	3 (.339)	4 (.452)	26 (2.94)	33 (3.67)	39 (4.41)
24" (610)	3 (.339)	5 (.565)	7 (.791)	9 (1.02)	3 (.339)	5 (.565)	7 (.791)	9 (1.02)	46 (5.14)	55 (6.17)	64 (7.20)
36" (914)	4 (.452)	7 (.791)	10 (1.13)	13 (1.57)	4 (.452)	7 (.791)	10 (1.13)	13 (1.47)	62 (7.05)	74 (8.37)	86 (9.70)
48" (1219)	5 (.565)	10 (1.13)	14 (1.58)	19 (2.15)	5 (.565)	9 (1.02)	14 (1.58)	18 (2.03)	82 (9.25)	98 (11.02)	113 (12.78)
60" (1524)	6 (.678)	11 (1.24)	16 (1.81)	22 (2.49)	6 (.678)	11 (1.24)	16 (1.81)	21 (2.37)	94 (10.58)	111 (12.49)	127 (14.40)
72" (1829)	8 (.904)	14 (1.58)	21 (2.37)	28 (3.16)	8 (.904)	14 (1.58)	21 (2.37)	27 (3.05)	120 (13.51)	140 (15.87)	161 (18.22)

Face Velocity fpm (m/s)	Multiplier	Diff. Pressure in. wg (Pa)	Multiplier	VC-411	VC-421
1500 (8)	2.25	2 (500)	2		
2000 (10)	4.00	3 (750)	3		
2500 (13)	6.25	4 (1000)	4		
3000 (15)	9.00	5 (1250)	5		
3500 (18)	12.15	6 (1500)	6		
		7 (1750)	7		

TORQUE VALUES ARE GIVEN IN in.-lbs. (Nm)

The Velocity Torque values shown are based on 1000 fpm (5 m/s) face velocity. Use the multipliers at left for greater velocities.

The Pressure Torque values shown are based on 1 in. wg (250 Pa) differential pressure. Use the multipliers at right for greater pressures.

Model VC-421
(Airfoil Blade) 250 in.-lbs. (28.25 Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE Damper Width in. and (mm)				PRESSURE TORQUE Damper Width in. and (mm)				SEALING TORQUE Damper Width in. and (mm)			
	12" (305)	24" (610)	36" (914)	48" (1219)	12" (305)	24" (610)	36" (914)	48" (1219)	12" (305)	24" (610)	36" (914)	48" (1219)
12" (305)	2 (.226)	4 (.452)	5 (.565)	7 (.791)	2 (.226)	4 (.452)	6 (.678)	8 (.904)	34 (3.84)	56 (6.33)	77 (8.70)	99 (11.19)
24" (610)	3 (.339)	5 (.565)	7 (.791)	10 (1.13)	3 (.339)	6 (.678)	9 (1.02)	12 (1.36)	53 (5.99)	82 9.27)	111 (12.54)	140 (15.84)
36" (914)	4 (.452)	8 (.904)	12 (1.36)	16 (1.81)	5 (.565)	10 (1.13)	15 (1.70)	20 (2.26)	80 (9.04)	123 (13.90)	166 (18.76)	209 (23.62)
48" (1219)	5 (.565)	10 (1.13)	14 (1.58)	19 (2.15)	6 (.678)	12 (1.36)	18 (2.03)	24 (2.71)	99 (11.19)	149 (16.84)	200 (22.60)	250 (28.25)
60" (1524)	7 (.791)	13 (1.47)	19 (2.15)	25 (2.83)	8 (.904)	16 (1.81)	24 (2.71)	32 (3.63)	125 (14.13)	190 (21.47)	255 (28.82	320 (36.16)
72" (1829)	8 (.904)	16 (1.81)	24 (2.71)	31 (3.50)	10 (1.13)	20 (2.26)	30 (3.39)	40 (4.52)	152 (17.18)	231 (26.10)	310 (35.03)	389 (43.96)
84" (2134)	9 (1.02)	17 (1.92)	26 (2.94)	34 (3.84)	11 (1.24)	22 (2.49)	33 (3.73)	44 4.97)				
96" (2286)	10 (1.13)	20 (2.26)	30 (3.39)	40 (4.52)	13 (1.47)	26 (2.94)	39 (4.41)	52 (5.88)				

TORQUE TABLES FOR 400 SERIES

Please note, care should be taken in designing systems requiring higher pressures and velocities which, in turn, will elevate the operating torque of the dampers.

The shaded areas in the charts depict dampers that may exceed the design limits of extended shaft operation.

The maximum torques for each model is shown in parenthesis next to the model number. When this value is exceeded, the use of "in-duct" or jackshafted actuators is required.

Model VC-412 & VC-422
(Single Thickness Blade) (Airfoil Blade)
610 in. -lbs. (68.93 Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE Damper Width in. and (mm)				PRESSURE TORQUE Damper Width in. and (mm)				SEALING TORQUE Damper Width in. and (mm)			
	12" (305)	24" (610)	36" (914)	48" (1219)	12" (305)	24" (610)	36" (914)	48" (1219)	12" (305)	24" (610)	36" (914)	48" (1219)
12" (305)	2 (.226)	4 (.452)	5 (.565)	7 (.791)	2 (.226)	4 (.452)	6 (.678)	8 (.904)	34 (3.84)	56 (6.33)	77 (8.70)	99 (11.19)
24" (610)	3 (.339)	5 (.565)	7 (.791)	10 (1.13)	3 (.339)	6 (.678)	9 (1.02)	12 (1.36)	53 (5.99)	82 (9.27)	111 (12.54)	140 (15.82)
36" (914)	4 (.452)	8 (.904)	12 (1.36)	16 (1.81)	5 (.565)	10 (1.13)	15 (1.70)	20 (2.26)	80 (9.04)	123 (13.90)	166 (18.76)	209 (23.62
48" (1219)	5 (.565)	10 (1.13)	14 (1.58)	19 (2.15)	6 (.678)	12 (1.36)	18 (2.03)	24 (2.71)	99 (11.19)	149 (16.89)	200 (22.60)	250 (28.25)
60" (1524)	7 (.791)	13 (1.47)	19 (2.15)	25 (2.83)	8 (.904)	16 (1.81)	24 (2.71)	32 (3.62)	125 (14.13)	190 (21.47)	255 (28.82)	320 (36.16)
72" (1829)	8 (.904)	16 (1.81)	24 (2.71)	31 (3.50)	10 (1.13)	20 (2.26)	30 (3.39)	40 (4.52)	152 (17.18)	231 (26.10)	310 (35.03)	389 (43.96)
84" (2134)	9 (1.02)	17 (1.92)	26 (2.94)	34 (3.84)	11 (1.24)	22 (2.49)	33 (3.73)	44 (4.97)				
96" (2286)	10 (1.13)	20 (2.26)	30 (3.39)	40 (4.52)	13 (1.47)	26 (2.94)	39 (4.41)	52 (5.88)				

TORQUE VALUES ARE GIVEN IN in.-lbs. (Nm)

The Velocity Torque values shown are based on 1000 fpm (5 m/s) face velocity. Use the multipliers at right for greater velocities.

The Pressure Torque values shown are based on 1 in. wg (250 Pa) differential pressure. Use the multipliers at left for greater pressures.

Face Velocity fpm (m/s)	Multiplier	Diff. Pressure in. wg (Pa)	Multiplier	
1500 (8)	2.25	2 (500)	2	VC-412/VC-422
2500 (13)	6.25	4 (1000)	4	
3500 (18)	12.25	6 (1500)	6	
4500 (23)	20.25	8 (2000)	8	
5500 (28)	30.25	10 (2500)	10	
		12 (3000)	12	VC-413/VC-423
		14 (3500)	14	

Model VC-413 & VC-423
(Single Thickness Blade) (Airfoil Blade)
1,300 in. -lbs. (146.9 Nm)

Damper Height in. and (mm)	FACE VELOCITY TORQUE Damper Width in. and (mm)					PRESSURE TORQUE Damper Width in. and (mm)					SEALING TORQUE Damper Width in. and (mm)				
	12" (305)	24" (610)	36" (914)	48" (1219)	60" (1524)	12" (305)	24" (610)	36" (914)	48" (1219)	60" (1524)	12" (305)	24" (610)	36" (914)	48" (1219)	60" (1524)
12" (305)	2 (.226)	4 (.452)	5 (.565)	7 (.791)	8 (.904)	2 (.226)	4 (.452)	6 (.678)	8 (.904)	10 (1.13)	34 (3.84)	56 (6.33)	77 (8.70)	99 (11.19)	120 (13.56)
24" (610)	3 (.339)	5 (.565)	7 (.791)	10 (1.13)	12 (1.36)	3 (.339)	6 (.678)	9 (1.02)	12 (1.36)	15 (1.70)	53 (5.99)	82 (9.27)	111 (12.54)	140 (15.82)	168 (18.98)
36" (914)	4 (.452)	8 (.904)	12 (1.36)	16 (1.81)	20 (2.26)	5 (.565)	10 (1.13)	15 (1.70)	20 (2.26)	25 (2.83)	80 (9.04)	123 (13.90)	166 (18.76)	209 (23.62)	252 (28.48)
48" (1219)	5 (.565)	10 (1.13)	14 (1.48)	19 (2.15)	24 (2.71)	6 (.678)	12 (1.36)	18 (2.03)	24 (2.71)	30 (3.39)	99 (11.19)	149 (16.84)	200 (22.60)	250 (28.25)	300 (33.90)
60" (1524)	7 (.791)	13 (1.47)	19 (2.15)	25 (2.83)	31 (3.50)	8 (.904)	16 (1.81)	24 (2.71)	32 (3.62)	40 (4.52)	125 (14.13)	190 (21.47)	255 (28.82)	320 (36.16)	384 (43.39)
72" (1829)	8 (.904)	16 (1.81)	24 (2.71)	31 (3.50)	39 (4.41)	10 (1.13)	20 (2.26)	30 (3.39)	40 (4.52)	50 (5.65)	152 (17.18)	231 (26.10)	310 (35.03)	389 (43.96)	468 (52.88)
84" (2134)	9 (1.02)	17 (1.92)	26 (2.94)	34 (3.84)	43 (4.86)	11 (1.24)	22 (2.49)	33 (3.73)	44 (4.97)	55 (6.22)					
96" (2286)	10 (1.13)	20 (2.26)	30 (3.39)	40 (4.52)	50 (5.65)	13 (1.47)	26 (2.94)	39 (4.41)	52 (5.88)	65 (7.35)					

RECTANGULAR DUCT FLANGE MOUNT

Model FO Series - Single Thickness Blade

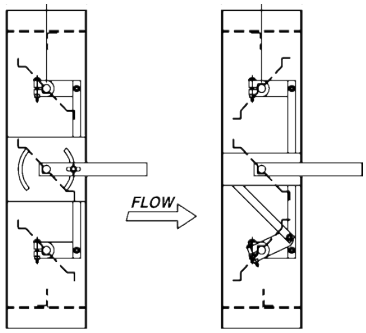
This special damper series was designed to be mounted on the outlet of a Centrifugal Fan application. It offers the options required to meet all of the performance needs of a fan outlet damper. Can be used in new, replacement, or OEM applications.

Parallel Blade

Opposed Blade

OPTIONS:

- Axles and Linkage construction: 304 and 316 stainless steel (FO-412 & 413)
- Bearings: stainless steel sleeve (all units); (FO-412) stainless steel ball with cadmium plated races, (FO-412 & FO-413) Teflon® sleeve, flanged ball bearings
- Seals: EPT blade and silicone blade, stainless steel jamb
- Special flange width 4"(102) max
- 304 and 316 stainless steel construction
- Actuator: manual quadrant and lever arm available in 304 and 316 stainless steel
- Mounting holes



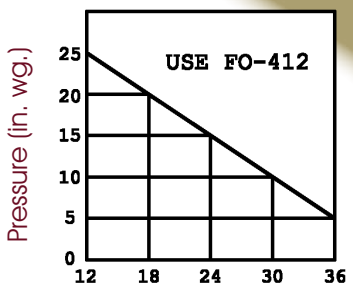
Parallel Blades Opposed Blades

STANDARD SPECIFICATIONS FOR MODELS FO-411, FO-412 AND FO-413 Inches are shown, numbers in ( ) are mm

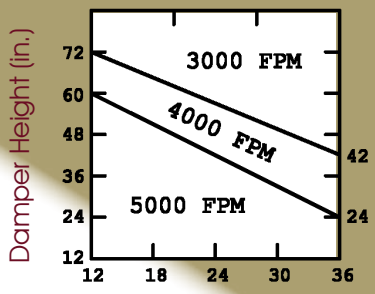
	FO-411	FO-412	FO-413
Max. Face Velocity:	**5000 fpm** (25 m/s)	**6000 fpm** (30 m/s)	**6000 fpm** (30 m/s)a
Max. Differential Pressure:	**25 in. wg** (6225 Pa)	**30 in. wg** (7470 Pa)	**40 in. wg** (9960 Pa)
Max. Temperature:	**800°F** (427°C)	**800°F** (427°C)	**800°F** (427°C)
Dimensions:	"A" (width) and "B" (height) dimensions are inside damper frame. Dampers will be fabricated to exact size		
Max. Panel Size:	**36"** (914) W x **72"** (1829)	**48"** (1219) W x **84"** (2438)	**60"** (1524) W x **96"** (2438)
Min. Panel Size:	**6"** (152) W x **6"** (152) H (Parallel) **6"** (152) W x **10"** (254) H (Opposed)	**6"** (152) W x **6"** (152) H (Parallel) **6"** (152) W x **10"** (254) H (Opposed)	**6"** (152) W x **6"** (152) H (Parallel) **6"** (152) W x **10"** (254) H (Opposed)
Frame:	**10"** (254) x **2"** (51) x **12 Ga.** (2.67) carbon steel	**10"** (254) x **2"** (51) x **12 Ga.** (2.67) carbon steel	**10"** (254) x **2"** (51) x **12 Ga.** (2.67) carbon steel (through **72"** (1829) H) **10"** (254) x **2½"** (64) x **10 Ga.** carbon steel (through **96"** (2438) H)
Blades:	**14 Ga.** (1.9) carbon steel, single thickness, **10"** (254) max. width	**12 Ga.** (2.67) carbon steel, single thickness, **10"** (254) max. width	**12 Ga.** (2.67) carbon steel, single thickness, **10"** (254) max. width (through **36"** W) **10 Ga.** carbon steel (through **60"** W)
Axles:	**½"** (12.7) dia. steel, stub	**¾"** (19) dia. steel, stub	**1"** (25) dia. steel, stub
Bearings:	Oil impregnated bronze (to 300°F) with stainless steel thrust washers	Oil impregnated bronze (to 300°F) with stainless steel thrust washers	Oil impregnated bronze (to 300°F) with stainless steel thrust washers
Linkage:	Heavy-duty plated steel arms, stainless steel pivots and galvanized steel angle, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel angle, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel bar, external type
Stops:	Carbon steel angle	Carbon steel angle	Carbon steel angle
Finish:	One coat of AWV industrial shop primer	One coat of AWV industrial shop primer	One coat of AWV industrial shop primer
Actuator:	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard

LIMITATIONS TABLES FOR FO SERIES - SINGLE THICKNESS BLADE

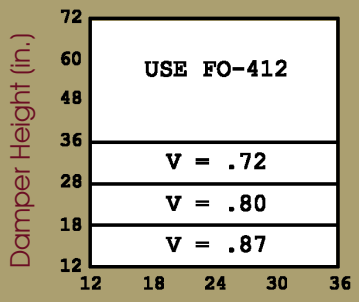
Model FO-411



Damper Width (in.)
Pressure Limitations

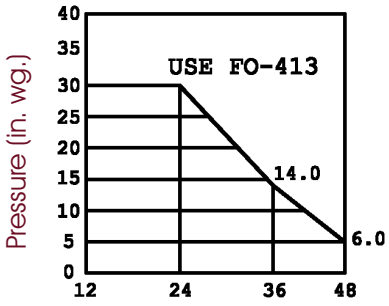


Damper Width (in.)
Velocity Limitations

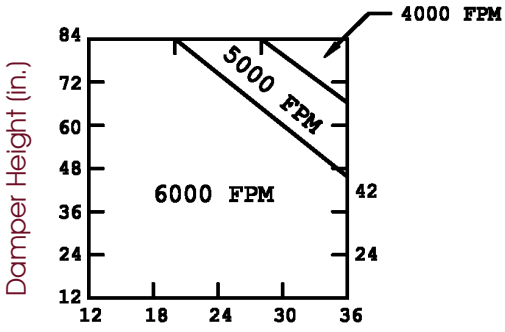


Damper Width (in.)
Stuffing Box Limitations

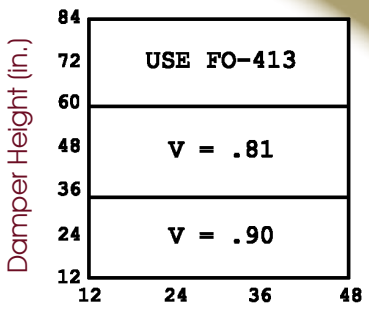
Model FO-412



Damper Width (in.)
Pressure Limitations

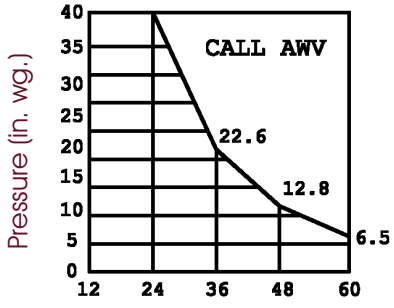


Damper Width (in.)
Velocity Limitations

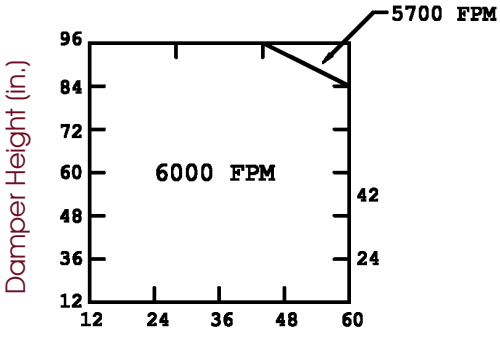


Damper Width (in.)
Stuffing Box Limitations

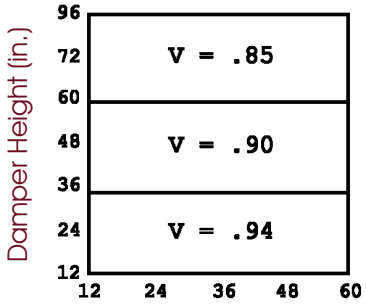
Model FO-413



Damper Width (in.)
Pressure Limitations



Damper Width (in.)
Velocity Limitations



Damper Width (in.)
Stuffing Box Limitations

RECTANGULAR DUCT FLANGE MOUNT

Model FO Series - Airfoil Blade Construction

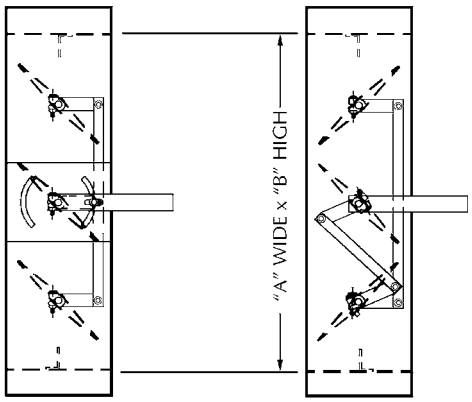
Parallel Blade

Opposed Blade

This special damper series was designed to be mounted on the outlet of a Centrifugal Fan application. It offers the options required to meet all of the performance needs of a fan outlet damper. Can be used in new, replacement, or OEM applications.

OPTIONS:

- 304 & 316 stainless steel construction
- Special flange width (4" max.)
- Axles and linkage construction: 304 & 316 stainless steel
- Bearings: stainless steel ball with cadmium plated races (422), stainless steel sleeve, Teflon® sleeve, flanged ball, stuffing boxes
- Seals: EPT or silicone blade and stainless steel jamb
- Actuator: manual quadrant and lever arm. Also available in 304 & 316 stainless steel
- Mounting holes

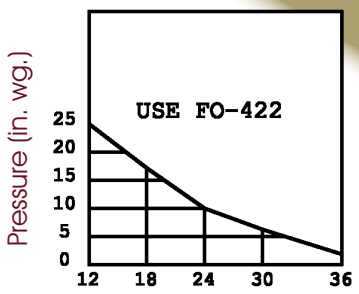


STANDARD SPECIFICATIONS FOR MODEL FO SERIES Inches are shown, numbers in ( ) are mm

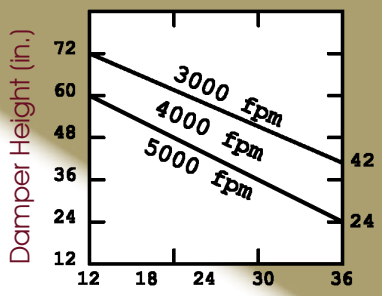
Product:	FO-421	FO-422	FO-423
Max. Face Velocity:	**5000 fpm** (25 m/s)	**6000 fpm** (30 m/s)	**6000 fpm** (30 m/s)
Max. Differential Pressure:	**25 in. wg** (6225 Pa)	**30 in. wg** (7470 Pa)	**40 in. wg** (9960 Pa)
Max. Temperature:	**800°F** (427°C)	**800°F** (427°C)	**800°F** (427°C)
Dimensions:	"A" (width) and "B" (height) dimensions are inside damper frame. Dampers will be fabricated to exact size		
Max. Panel Size:	**36"** (914) W x **72"** (1829)	**48"** (1219) W x **84"** (2134)	**60"** (1524) W x **96"** (2438)
Min. Panel Size:	**6"** (152) W x **6"** (152) H (Parallel) **6"** (152) W x **10"** (254) H (Opposed)	**6"** (152) W x **6"** (152) H (Parallel) **6"** (152) W x **10"** (254) H (Opposed)	**6"** (152) W x **6"** (152) H (Parallel) **6"** (152) W x **10"** (254) H (Opposed)
Frame:	**10"** (254) x **2"** (51) x **12 Ga.** (2.67) carbon steel	**10"** (254) x **2"** (51) x **12 Ga.** (2.67) carbon steel	**10"** (254) x **2"** (51) x **12 Ga.** (2.67) carbon steel (through **72"** (1829) H) **10"** (254) x **2½"** (64) x **10 Ga.** carbon steel (through **96"** (2438)H)
Blades:	**16 Ga.** (1.29) carbon steel, single thickness, **10"** (254) max. width	**16 Ga.** (1.29) carbon steel, airfoil shape, **10"** (254) max. width	**16 Ga.** (1.29) carbon steel, airfoil shape, **10"** (254) max. width
Axles:	**½"** (12.7) dia. steel, full length	**¾"** (19) dia. steel, full length	**1"** (25) dia. steel, full length
Bearings:	Oil impregnated bronze (to 300°F) with stainless steel thrust washers	Oil impregnated bronze (to 300°F) with stainless steel thrust washers	Oil impregnated bronze (to 300°F) with stainless steel thrust washers
Linkage:	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel bar, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel bar, external type	Heavy-duty clamp on plated steel arms, stainless steel pivots and galvanized steel bar, external type
Stops:	Carbon steel angle	Carbon steel angle	Carbon steel angle
Finish:	One coat of AWV industrial shop primer	One coat of AWV industrial shop primer	One coat of AWV industrial shop primer
Actuator:	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard	An extendable shaft **4"** (101) beyond the frame on the right is standard

LIMITATIONS TABLES FOR FO SERIES - AIRFOIL BLADE CONSTRUCTION

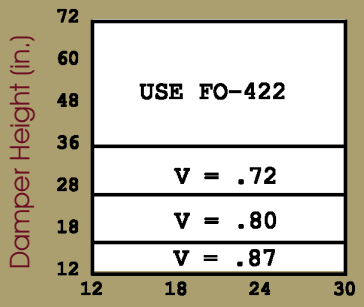
Model FO-421



Damper Width (in.)
Pressure Limitations

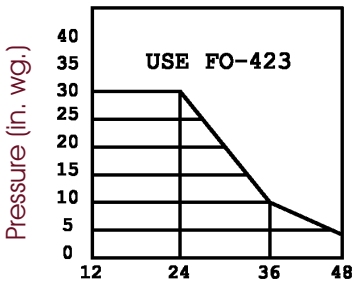


Damper Width (in.)
Velocity Limitations

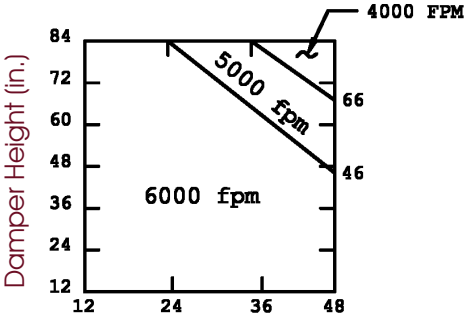


Damper Width (in.)
Stuffing Box Limitations

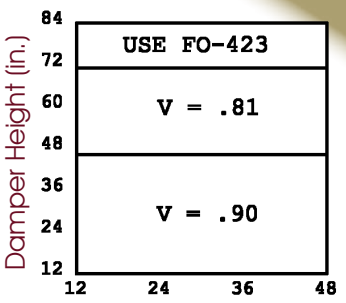
Model FO-422



Damper Width (in.)
Pressure Limitations

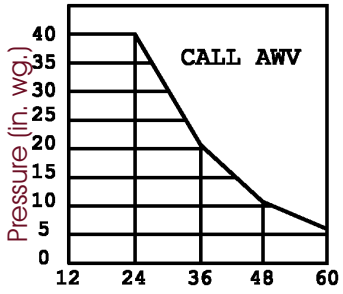


Damper Width (in.)
Velocity Limitations

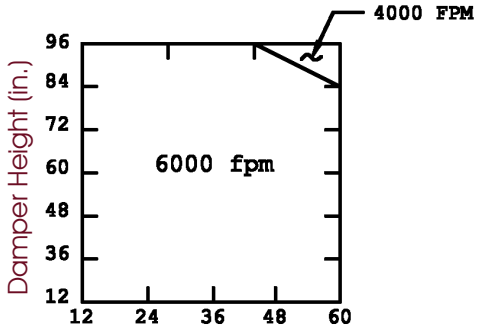


Damper Width (in.)
Stuffing Box Limitations

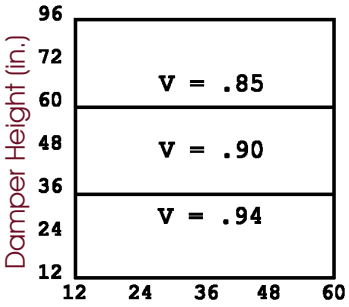
Model FO-423



Damper Width (in.)
Pressure Limitations



Damper Width (in.)
Velocity Limitations



Damper Width (in.)
Stuffing Box Limitations

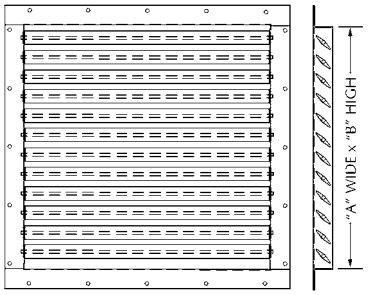
2 WAY and 4 WAY

Models DF-45/DF-45F and DF-46/DF-46F

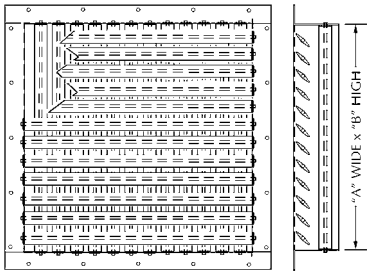
American Warming and Ventilating manufactures a variety of 2-way and 4-way diffusers. These units are typically mounted to the end of a duct in manufacturing plants to disperse air in multiple directions via individually adjustable single thickness or airfoil blades.

NOTE: "A" wide and "B" high designate the opening into which the diffuser must fit. Diffuser frames are manufactured a nominal 1" (25) undersize to permit clearance for the axle tips. This allows for a nominal usable flange width of 11/2" (38). For 2-way diffusers, the "A" dimension is always parallel to the blades. If vertical blades are required, specify "B" as the width and "A" as the height.

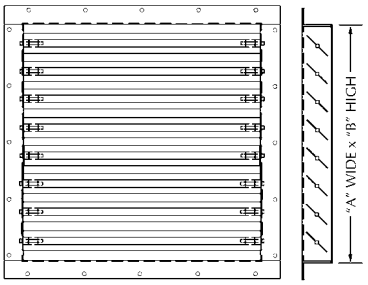
For 4-way diffusers, the "A" dimension is always parallel to the horizontal blades. If vertical blades are required on the flange side, specify "B" as the width and "A" as the height.



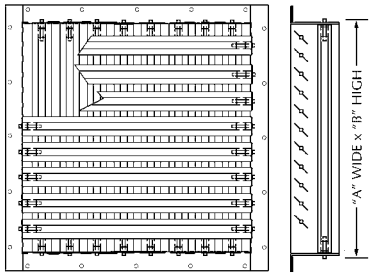
DF-45



DF-45F



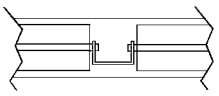
DF-46



DF-46F

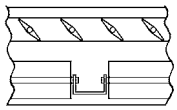
FACTORY ASSEMBLED MULLIONS

DF-45



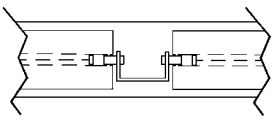
2-way

DF-45F



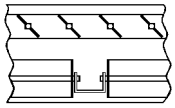
4-way

DF-46



2-way

DF-46F



4-way

STANDARD SPECIFICATIONS FOR MODELS DF-45, DF-45F, DF-46, AND DF-46F Inches are shown, numbers in ( ) are mm

Product:	DF-45	DF-45F	DF-46	DF-46F
Max. Face Velocity:	**3000 fpm** (15 m/s)	**3000 fpm** (15 m/s)	**2000 fpm** (10 m/s)	**2000 fpm** (10 m/s)
Max. Panel Size:	**30"** (762) x **96"** (2438)	"A" Dim. **30"** (762) x **96"** (2438) "B" Dim. **96"** (2438) x **30"** (2438)	**30"** (762) x **96"** (2438)	"A" Dim. **30"** (762) x **96"** (2438) "B" Dim. **96"** (2438) x **30"** (2438)
Frame:	**2"** (51) x **2"** (51) x **16 Ga.** (1.52) galv. steel through **18"** (457) sq. **14 Ga.** (1.9) above **18"** (457) sq.	**3 3/8"** (79) x **2"** (51) x **16 Ga.** (1.52) galv. steel through **18"** (457) sq. **14 Ga.** (1.9) above **18"** (457) sq.	**3"** (76) x **2"** (51) x **16 Ga.** (1.52) galv. steel through **18"** (457) sq. **14 Ga.** (1.9) above **18"** (457) sq.	**5"** (127) x **2"** (51) x **16 Ga.** (1.52) galv. steel through **18"** (457) sq. **14 Ga.** (1.9) above **18"** (457) sq.
Mullion:	**1 1/4"** (32) x **1"** (25) x **14 Ga.** (1.9) galv. steel channel through **60"** (1524) H; **1 1/4"** (32) x **1 1/2"** (38) x **10 Ga.** (3.42) galv. steel channel above **60"** (1524) H	**1 1/4"** (32) x **1"** (25) x **14 Ga.** (1.9) galv. steel channel through **60"** (1524) H; **1 1/4"** (32) x **1 1/2"** (38) x **10 Ga.** (3.42) galv. steel channel above **60"** (1524) H	**1 1/4"** (32) x **1"** (25) x **14 Ga.** (1.9) galv. steel channel through **75"** (1905) H; **1 1/4"** (32) x **1 1/2"** (38) x **10 Ga.** (3.42) galv. steel channel above **60"** (1524) H	**1 1/4"** (32) x **1"** (25) x **14 Ga.** (1.9) galv. steel channel through **75"** (1905) H; **1 1/4"** (32) x **1 1/2"** (38) x **10 Ga.** (3.42) galv. steel channel above **60"** (1524) H
Blades:	**20 Ga.** (.91) galv. steel, airfoil, **2"** (51) width, held in place with a friction device. Each blade is individually adjustable.	Two (2) **20 Ga.** (.91) galv. steel, airfoil, **2"** (51) width, held in place with a friction device. Each blade is individually adjustable.	**20 Ga.** (.91) galv. steel, single thickness, **3"** (76) width, held in place with a friction device. Each blade is individually adjustable.	Two (2) **20 Ga.** (.91) galv. steel, airfoil, **3"** (76) width, held in place with a friction device. Each blade is individually adjustable.
Axles:	**5/16"** (7.94) dia. plated steel full length	**5/16"** (7.94) dia. plated steel full length	**5/16"** (7.94) dia. plated steel stub	**5/16"** (7.94) dia. plated steel stub
Finish:	Mill	Mill	Mill	Mill

Heavy-Duty Radial

Model DF-78

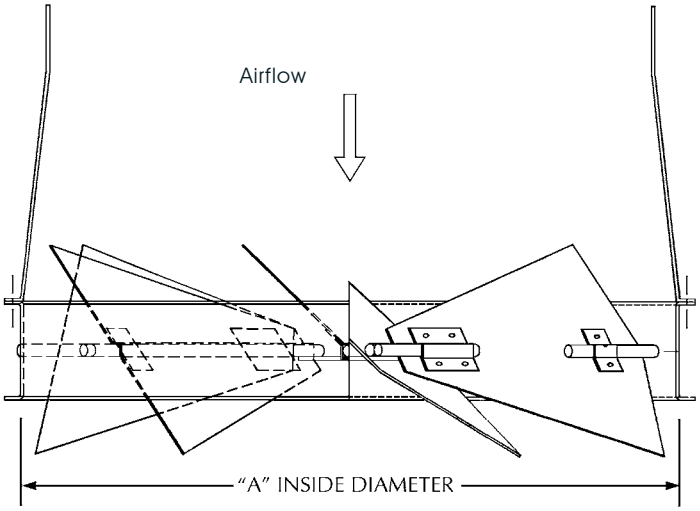
American Warming and Ventilating manufactures a radial diffuser for air conditioning systems in large industrial areas.

Proven effective by thousands of installations in automotive plants, the radial diffuser offers a variety of air deflection patterns.

Individually adjustable air deflectors allow an infinite number of air patterns and areas of coverage. The differing air pattern deflectors have minimal effect on scfm delivered or static pressure requirements.

DF-78

End View



STANDARD SPECIFICATIONS FOR DF-78 Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**2000 fpm** (15 m/s)
Max. Panel Size:	"A" Dimension is **42"** (1066.8)
Min. Panel Size:	"B" Dimension is **16"** (406.4)
Frame:	**4"** (101.6) x **3/4"** (19.1) **16 Ga.** carbon steel channel
Blades:	**16 Ga.** carbon steel single thickness secured to axle with two hinge pads, one of those with a set screw
Axles:	**1/2"** (12.7) Diameter plated or HRS steel stubs on each end
Center Disk:	**16 Ga.** x **4"** (101.6) Dia. carbon steel, located on flow entering side
Disk Support:	**10 Ga.** x **1 5/8"** (41.3) steel welded to frame and disk
Straps:	**12 Ga.** **1 1/2"** (38.1) x 12 Lg. carbon steel
Finish:	One (1) coat of standard shop primer

ROUND DUCT FLANGE MOUNT

Model VC-560 Series - Industrial Round Dampers

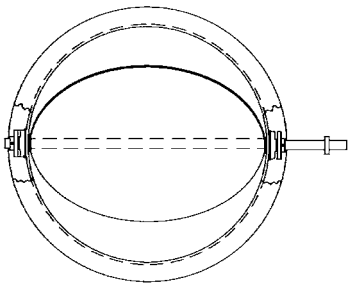
The VC-560 Series is designed for all types of round duct applications ranging from 6" (152) diameter to 72" (1829) diameter. These dampers are available in a variety of materials and optional features suitable for most service conditions. The VC-560 Series is designed to operate at pressures up to 30 in. wg (7500 Pa), velocities to 6400 fpm (32.64 m/s) and temperatures to 250°F (120°C).

A full range of optional actuation systems are available in either electric or pneumatic.

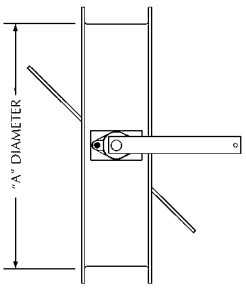
VC-561 with Quadrant

OPTIONS:

- Bearings: stainless steel sleeve (through 1" (25) dia. axles), relubricable ball
- Seals: metal bar, EPT wedge, and silicone wedge
- Construction: 304 and 316 stainless steel and aluminum
- Mounting Holes



Face View
shown with External Bearings



End View
with Lever Arm

STANDARD SPECIFICATIONS FOR VC-560 Series Inches are shown, numbers in ( ) are mm

Product:	VC-561	VC-562
Max. Face Velocity:	**3900 fpm** (20 m/s)	**5150 fpm** (26 m/s)
Max. Differential Pressure:	**5 in. wg** (1250 Pa)	**8.5 in. wg** (2110 Pa)
Max. Temperature:	**250°F** (120°C) w/o seals; **150°F** (65°C) w/seals	**250°F** (120°C) w/o seals; **150°F** (65°C) w/seals
Frame:	Frame depths and widths vary, min. **11 Ga.** (3.1) steel butt welded angles up to **11"**. **8"** (203) x **1 1/2"** (38) x **12 Ga.** (2.67) rolled steel channel through **25"** (635) dia. **10"** (254) x **2"** (51) x **10 Ga.** (3.42). rolled steel channel, **25 1/16"** (637) through **60"** (1524) dia.	**8"** (203) x **1 1/2"** (38) x **10 Ga.** (3.42) rolled steel channel through **25"** (635) dia. **10"** (254) x **2"** (51) x **10 Ga.** (3.42) rolled steel channel, **25 1/16"** (637) through **60"** (1524) dia. **3"** (76) x **2"** (51) x **3/16"** (4.76) thick steel angles, **6"** (152) deep, **60 1/16"** (1526) through **72"** (1829) dia. **(see Optional Frame Styles NEXT PAGE)**
Sleeves: (Used w/optional frames)	**16 Ga.** (1.52) steel through **11"** (279) dia. **14 Ga.** (1.9) steel **11 1/16"** (281) through **48"** (1219) dia. **12 Ga.** (2.67) steel; **48 1/16"** (1221) through **60"** (1524) dia.	**10 Ga.** (3.42) steel
Blades:	**14 Ga.** (1.9) steel, welded to axle, through **11"** (279) dia. **10 Ga.** (3.42) steel, welded to axle, **11 1/16"** (281) through **48"** (1219) dia. **3/16"** (4.76) steel, welded to axle, **48 1/16"** (1221) through **60"** (1524) dia.	**10 Ga.** (3.42) steel, welded to axle through **24"** (610) dia. **3/16"** (4.76) thick steel, welded to axle, **24 1/16"** (1221) through **48"** (1219) dia. **1/4"** (6.35) thick steel, welded to axle, **48 1/16"** (1221) through **72"** (1829) dia.
Axles:	**1/2"** (12.7) dia. steel, full length, through **24"** (610) dia. **3/4"** (19) dia. steel full length, **24 1/16"** (612) through **48"** (1219) dia. **1"** (25) dia. steel full length, **48 1/16"** (1221) through **60"** (1524) dia.	**1/2"** (12.7) dia. steel, full length, through **16"** (406) dia. **3/4"** (19) dia. steel full length, **16 1/16"** (408) through **36"** (914) dia. **1"** (25) dia. steel full length, **36 1/16"** (916) through **54"** (1372) dia. **1 1/16"** (25) dia. steel full length, **54 1/16"** (1373) through **72"** (1829) dia.
Bearings:	Oil impregnated bronze with stainless steel thrust washers	Oil impregnated bronze with stainless steel thrust washers through **36"** (914); relubricable ball w/stainless steel thrust washers **36 1/16"** (916) through **72"** (1829)
Stops:	Steel pin	Steel pin
Seals:	Optional	Optional
Finish:	One coat of AWV standard primer	One coat of AWV standard primer
Actuator:	Extended shaft with lever arm (shipped loose) is standard	Extended shaft with lever arm (shipped loose) is standard

STANDARD SPECIFICATIONS FOR VC-560 Series Continued Inches are shown, numbers in ( ) are mm

Product:	VC-563	VC-564	VC-565
Max. Face Velocity:	**6400 fpm** (32 m/s)	**6400 fpm** (32 m/s)	**6400 fpm** (32 m/s)
Max. Diff. Pressure:	**13.5 in. wg** (3350 Pa)	**20 in. wg** (4965 Pa)	**30 in. wg** (7450 Pa)
Max. Temperature:	**250°F** (120°C) w/o seals; **150°F** (65°C) w/seals	**250°F** (120°C) w/o seals; **150°F** (65°C) w/seals	**250°F** (120°C) w/o seals; **150°F** (65°C) w/seals
Frame:	**8"** (203) x **1 1/2"** (38) x **10 Ga.** (3.42) rolled steel channel through **25"** (635) dia. **10"** (254) x **2"** (51) x **10 Ga.** (3.42) rolled steel channel, **25 1/16"** (637) through **36"** (914) dia. **10"** (254) x **2"** (51) x **3/16"** (4.76) thick rolled steel channel, **36 1/16"** (916) through **60"** (1524) dia. **3"** (76) x **2"** (51) x **3/16"** (4.76) thick steel angles, **6"** (152) deep, **60 1/16"** (1526) through **72"** (1829) dia.	**8"** (203) x **1 1/2"** (38) x **10 Ga.** (3.42) rolled steel channel through **25"** (635) dia. **10"** (254) x **2"** (51) x **10 Ga.** (3.42) rolled steel channel, **25 1/16"** (637) through **36"** (914.4) dia. **10"** (254) x **2"** (51) x **3/16"** (4.76) thick rolled steel channel, **36 1/16"** (914) through **60"** (1524) dia. **2"** (51) x **2"** (51) x **1/4"** thick steel angles w/ **3/16"** (4.76) thick steel sleeve **10"** (254) deep, **60 1/16"** (1524) through **72"** (1829) dia.	**8"** (203) x **1 1/2"** (38) x **10 Ga.** (3.42) rolled steel channel through **25"** (635) dia. **10"** (254) x **2"** (51) x **10 Ga.** (3.42) rolled steel channel, **25 1/16"** (637) through **36"** (914.4) dia. **10"** (254) x **2"** (51) x **3/16"** (4.76) thick rolled steel channel, **36 1/16"** (914) through **60"** (1526) dia. **2"** (51) x **2"** (51) x **1/4"** thick steel angles with **3/16"** (4.76) thick steel sleeve **10"** (254) deep, **60 1/16"** (1524) through **72"** (1829) dia.
Sleeves: (Used w/optional frames)	**10 Ga.** (3.42) steel, through **36"** (914) dia. **3/16"** (4.76) thick steel, **36 1/16"** (916) through **72"** (1829) diameter	(Used with optional frames) **10 Ga.** (3.42) steel, through **36"** (914) dia. **3/16"** (4.76) thick steel, **36 1/16"** (914) through **72"** (1829) diameter	(Used with optional frames) **10 Ga.** (3.42) steel, through **36"** (914) dia. (4.76) thick steel, **36 1/16"** (916) through **72"** (1829) diameter
Blades:	**3/16"** (4.76) thick steel, welded to axle, through **24"** (610) dia. **1/4"** (6.35) thick steel, welded to axle, **24 1/16"** (612) through **48"** (1219) dia., with steel reinforcing channels as required. **3/8"** (9.53) thick steel, welded to axle, **48 1/16"** (1221) through **72"** (1829) dia., with steel reinforcing channels as required.	**3/16"** (4.76) thick steel, welded to axle, through **24"** (610) dia. **1/4"** (6.35) thick steel, welded to axle, **24 1/16"** (612) through **48"** (1219) dia. **3/8"** (9.53) thick steel, welded to axle, **48 1/16"** (1221) through **72"** (1829) dia. All sizes have steel reinforcing channels as required	**3/16"** (4.76) thick steel, welded to axle, through **18"** (457) dia. **1/4"** (6.35) thick steel, welded to axle, **18 1/16"** (458) through **36"** (914) dia. **3/8"** (9.53) thick steel, welded to axle, **36 1/16"** (915) through **72"** (1829) dia. All sizes have steel reinforcing channels as required
Axles:	**3/4"** (19) dia. steel full length, through **36"** (914) dia. **1"** (25) dia. steel full length, **36 1/16"** (916) through **48"** (1219) dia. **1 1/4"** (32) dia. steel full length, **48 1/16"** (1221) through **60"** (1524) dia. **1 1/2"** (38) dia. steel full length, **60 1/16"** (1526) through **72"** (1829) dia.	**3/4"** (19) dia. steel full length, through **24"** (610) dia. **1"** (25) dia. steel full length, **24 1/16"** (611) through **36"** (914) dia. **1 1/4"** (32) dia. steel full length, **36 1/16"** (915) through **48"** (1219) dia. **1 1/2"** (38) dia. steel full length, **48 1/16"** (1220) through **60"** (1524) dia. **1 3/4"** (45) dia. steel full length, **60 1/16"** (1525) through **66"** (1676) dia. **2"** (51) dia. steel full length, **66 1/16"** (1677) through **72"** (1829) dia.	**3/4"** (19) dia. steel full length, through **18"** (457) dia. **1"** (25) dia. steel full length, **18 1/16"** (458) through **30"** (762) dia. **1 1/4"** (32) dia. steel full length, **30 1/16"** (763) through **42"** (1067) dia. **1 1/2"** (38) dia. steel full length, **42 1/16"** (1068) through **54"** (1372) dia. **1 3/4"** (45) dia. steel full length, **54 1/16"** (1373) through **66"** (1676) dia. **2"** (51) dia. steel full length, **66 1/16"** (1677) through **72"** (1829) dia.
Bearings:	Relubricable ball with stainless steel thrust washers	Relubricable ball	Relubricable ball with double gland stuffing boxes
Stops:	Steel pin	**1/2"** dia. steel pin	**1/2"** dia. steel pin
Seals:	Optional	Optional, see schedule	Optional, see schedule
Finish:	One coat of AWV standard primer	One coat of AWV standard primer	One coat of AWV standard primer
Actuator:	Extended shaft with lever arm (shipped loose) is standard	Extended shaft with lever arm (shipped loose) is standard (See schedule for options)	Extended shaft with lever arm (shipped loose) is standard (See schedule for options)

TORQUE

The torque required to operate a control damper is the greatest torque value that the damper will see in operation. The tables to the right give torque values for various face velocities, differential pressures and sealing requirements. The torque required for a damper without seals is the torque due to velocity or pressure, whichever is greater. The torque required for a damper with seals is the torque due to velocity, differential pressure or sealing the damper, whichever is greater.

These torque and pressure drop values are based on 3,900 fpm and 5 in. wg. The given leakage values are based on 1 in. wg differential pressure. For differential pressures other than 1 in. wg (but not exceeding 5 in. wg) and other face velocities, use the multipliers chart below.

VC-561													
TORQUE	PRESSURE DROP (in. wg)	Dia.	3 1/16"	6 3/32"	9 1/8"	12"	18"	24"	30"	36"	42"	48"	54"	60"
		No Seals	.323	.168	.139	.132	.114	.108	.114	.108	.108	.114	.108	.108
		Bar Seals	N/A	N/A	.203	.348	.207	.168	.153	.132	.132	.132	.126	.126
	LEAKAGE (SCFM)	Bar Seals	N/A	N/A	31	40	60	75	95	115	135	150	175	195
		EPT Seals	4	6	7	9	12	15	19	22	25	28	35	40
		No Seals	55	110	165	215	325	435	545	655	770	880	1640	1825
	Face Velocity Torque	in. lbs.	10	10	10	20	65	160	310	535	850	1270	1805	2480
	Diff. Pressure Torque w/Bar Seals Only	in. lbs.	N/A	N/A	10	8	15	30	45	63	85	115	145	175
	EPT Seal Torque	in. lbs.	10	10	10	12	25	45	70	100	135	180	225	280

ROUND DUCT FLANGE MOUNT

PERFORMANCE DATA FOR VC-560 SERIES CONTINUED

METRIC CONVERSIONS FOR PERFORMANCE DATA

INCHES to mm: Multiply inches x 25.42
PRESSURE x DROP to Pa: Multiply in.wg x 250
LEAKAGE to $m^3/_S$: Multiply SCFM x .000472
FACE VELOCITY, DIFFERENTIAL PRESSURE AND SEALING TORQUES to N/m: Multiply in. lbs. x .113

These torque and pressure drop values are based on 5,150 fpm and 8.5 in. wg. The given leakage values are based on 1 in. wg differential pressure. For differential pressures other than 1 in. wg (but not exceeding 8.5 in. wg) and other face velocities, use the multipliers chart on page 41.

VC-562

TORQUE	PRESSURE DROP (in. wg)	Dia.	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"
		No Seals	.230	.220	.209	.198	.188	.198	.188	.188	.198	.188	.188
		Bar Seals	.607	.369	.322	.279	.266	.254	.231	.198	.230	.220	.209
	LEAKAGE (SCFM)	Bar Seals	40	60	78	97	115	135	154	175	196	215	235
		EPT Seals	10	13	16	19	22	25	29	36	40	44	47
		No Seals	218	327	436	547	657	767	878	1640	1820	2005	2192
	Face Velocity Torque	in. lbs.	35	115	275	540	935	1480	2215	3150	4325	5755	7470
	Diff. Pressure Torque w/Bar Seals Only	in. lbs.	12	25	47	75	110	145	195	245	300	365	435
	EPT Seal Torque	in. lbs.	12	25	45	70	100	135	175	225	275	335	400

These torque and pressure drop values are based on 6,400 fpm and 13.5 in. wg. The given leakage values are based on 1 in. wg differential pressure. For differential pressures other than 1 in. wg (but not exceeding 13.5 in. wg) and other face velocities, use the multipliers chart on page 41.

VC-563

TORQUE	PRESSURE DROP (in. wg)	Dia.	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"
		No Seals	.411	.355	.322	.306	.306	.306	.291	.306	.290	.306	.205
		Bar Seals	1.073	.647	.474	.431	.411	.393	.356	.356	.356	.356	.339
	LEAKAGE (SCFM)	Bar Seals	41	60	78	97	115	135	154	178	197	218	236
		EPT Seals	10	13	16	19	22	26	29	38	41	46	49
		No Seals	218	327	436	547	657	768	880	1641	1825	2010	2195
	Face Velocity Torque	in. lbs.	55	180	430	835	1445	2290	3420	4865	6675	8885	11,535
	Diff. Pressure Torque w/Bar Seals Only	in. lbs.	20	45	75	120	170	235	305	390	470	580	690
	EPT Seal Torque	in. lbs.	12	25	45	70	100	135	180	225	280	335	400

These torque and pressure drop values are based on 6,400 fpm and 20 in. wg. The given leakage values are based on 1 in. wg differential pressure. For differential pressures other than 1 in. wg (but not exceeding 20 in. wg) and other face velocities, use the multipliers chart on page 41.

VC-564

TORQUE	PRESSURE DROP (in. wg)	Dia.	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"
		No Seals	.431	.339	.322	.339	.322	.322	.306	.322	.322	.322	.306
		Bar Seals	.874	.497	.452	.452	.411	.411	.431	.431	.411	.393	.393
	LEAKAGE (SCFM)	Bar Seals	42	60	79	98	117	137	155	175	194	215	233
		EPT Seals	11	13	16	21	24	28	31	35	38	42	47
		No Seals	217	325	433	541	649	757	865	1622	1802	1983	2163
	Face Velocity Torque	in. lbs.	54	181	428	835	1443	2291	3420	4870	6680	8890	11,542
	Diff. Pressure Torque w/Bar Seals Only	in. lbs.	21	48	85	176	254	347	453	857	1060	1283	1529
	EPT Seal Torque	in. lbs.	12	25	45	70	100	136	178	225	277	336	399

These torque and pressure drop values are based on 6,400 fpm and 30 in. wg. The given leakage values are based on 1 in. wg differential pressure. For differential pressures other than 1 in. wg (but not exceeding 30 in. wg) and other face velocities, use the multipliers chart on page 41.

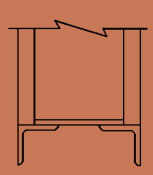
VC-565

TORQUE	PRESSURE DROP (in. wg)	Dia.	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"
		No Seals	.431	.339	.356	.339	.339	.322	.339	.322	.322	.322	.322
		Bar Seals	.871	.497	.647	.597	.545	.520	.570	.545	.521	.500	.474
	LEAKAGE (SCFM)	Bar Seals	42	60	79	98	114	137	155	175	194	215	233
		EPT Seals	11	13	16	21	24	28	312	35	38	42	47
		No Seals	217	325	433	541	649	757	865	1622	1802	1983	2163
	Face Velocity Torque	in. lbs.	94	221	478	885	1503	2351	3490	4940	6770	8980	11,652
	Diff. Pressure Torque w/Bar Seals Only	in. lbs.	72	111	177	314	431	570	730	1355	1679	2015	2403
	EPT Seal Torque	in. lbs.	54	65	95	120	160	196	248	295	367	426	509

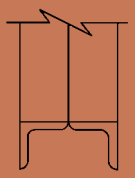
The above torques and pressure drops are based on the maximum rated velocity and pressure of each model. To obtain torques or pressure drops for pressures and/or velocities lower than the maximums, multiply the values in the above tables by the appropriate multiplier obtained from the table on page 41.

Damper Width in. and (mm)				
MODEL NO.	VELOCITY TORQUE	PRESSURE TORQUE	PRESSURE DROP	LEAKAGE
VC-561	$\left(\frac{\text{FACE VELOCITY}}{3900}\right)^2$	$\frac{\text{PRESSURE}}{5}$	$\left(\frac{\text{FACE VELOCITY}}{3900}\right)^2$	$\sqrt{\text{PRESSURE}}$
VC-562	$\left(\frac{\text{FACE VELOCITY}}{5150}\right)^2$	$\frac{\text{PRESSURE}}{8.5}$	$\left(\frac{\text{FACE VELOCITY}}{5150}\right)^2$	$\sqrt{\text{PRESSURE}}$
VC-563	$\left(\frac{\text{FACE VELOCITY}}{6400}\right)^2$	$\frac{\text{PRESSURE}}{13.5}$	$\left(\frac{\text{FACE VELOCITY}}{6400}\right)^2$	$\sqrt{\text{PRESSURE}}$
VC-564	$\left(\frac{\text{FACE VELOCITY}}{6400}\right)^2$	$\frac{\text{PRESSURE}}{20}$	$\left(\frac{\text{FACE VELOCITY}}{6400}\right)^2$	$\sqrt{\text{PRESSURE}}$
VC-565	$\left(\frac{\text{FACE VELOCITY}}{6400}\right)^2$	$\frac{\text{PRESSURE}}{30}$	$\left(\frac{\text{FACE VELOCITY}}{6400}\right)^2$	$\sqrt{\text{PRESSURE}}$

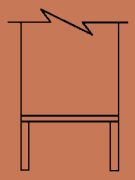
OPTIONAL FRAME STYLES



Angle Rings and Sleeve



Butt Welded Angle Rings



Donut Rings and Sleeve

Example: VC-562 30" dia., 3500 fpm, 6 in. wg
Velocity torque = (540) $(^{3500}/_{5150})^2$= 250in./lb.
Pressure torque = (75) $(^{6}/_{8.5})$ = 53 in./lb.
Pressure Drop = (0.198) $(^{3500}/_{5150})^2$ = 0.091 in. wg
Leakage = (97) $\sqrt{6}$ = 238 SCFM

HEAVY-DUTY ROUND ISOLATORS

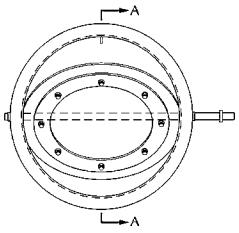
Models VC-56-ISO

When ultra - low leakage is required for your application this damper design will meet your every need. Our years of producing this product for many special applications are a field proven product. Offered in the size and materials required for your application.

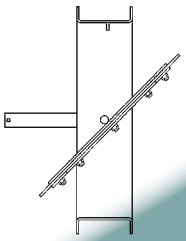
OPTIONS:

- "C" flange width
- "D" frame depth
- Material gauges/thicknesses for frames, sleeves, flanges and blades
- Axle dimensions
- Manual quadrants
- Lever arms
- Mounting holes
- Frame styles

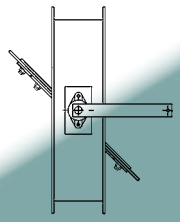
FACE VIEW



SECTION VIEW A — A



END VIEW



ROUND ISOLATION DAMPERS

STANDARD SPECIFICATIONS FOR VC-56-ISO Inches are shown, numbers in ( ) are mm

Max. Face Velocity:	**4000 fpm** (10 m/s)
Max. Temperature:	**150°F** (65°C)
Frame:	**8"** (203) x 1½" (38) x **10 Ga.** (3.42) rolled steel channel through **25"** (635) dia. **10"** (254) x **2"** (51) x **10 Ga.** (3.42) rolled steel channel, **25**1/16" (637) through **36"** (914) dia. 10" (254) x 2" (51) x 3/16" (4.76) thick rolled steel channel, **36**1/16" (916) through 60" (1524)
Sleeve:	(Used with optional frames) **10 Ga.** (3.42) steel, through **36"** (914) dia. 3/16" (4.76) thick steel, **36**1/16" (916) through **60"** (1524) dia.
Blade:	3/16" (4.76) thick steel, welded to axle, through **24"** (610) dia. 1/4" (6.35) thick steel, welded to axle, **24**1/16" (611) through **60"** (1524) dia.
Axle:	3/4" (19) dia. steel full length, through **18"** (457) dia., 1" (25) dia. steel full length, **18**1/16" (459) through **28"** (711) dia., 1 1/4" (32) dia. steel full length, **28**1/16" (713) through **40"** (1016) dia. 1½" (38) dia. steel full length, **40**1/16" (1018) through **48"** (1219) dia., 1¾" (44) dia. steel full length, **48**1/16" (1211) through **60"** (1524) dia.
Bearings:	Relubricable ball with nitrile O-ring stuffing boxes
Stops:	½" (12.7) dia. steel pin
Seals:	Full circumference Ameriprene seal retained by a seal ring bolted to the blade
Finish:	Extended shaft (See options above)
Actuator:	One (1) coat of standard shop primer

Models VC-81, VC-82, VC-83 and VC-84

VC-80 Series

American Warming and Ventilating manufactures inlet vanes for applications requiring reduction of expended power and wear on heavy duty fans. These inlet vanes pre-spin the air in the direction the fan blades are moving thus reducing energy consumption by the fan motors.

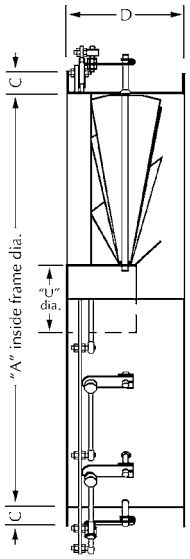
Constructed of sturdy carbon steel with single thickness blades, these units perform well in light, medium, and heavy-duty clean air systems.

OPTIONS:

- Maximum temperature 250°F (120°C)
- Ball bearing sheave and support
- Prime coat finish
- Steel linkage ring with ball swivels and plated steel linkage arms (VC-83 units above 16" (406) have heavy duty no-lash ball sockets with steel linkage)
- Standard type two tab for electric or pneumatic actuator hookup
- Mounting Holes

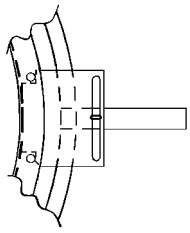
NOTE:

SWSI units are provided with one vane. DWDI units are provided with two vanes, one clockwise (CW) and one counter-clockwise (CCW) with a "U" diameter hole in the hub of the drive side inlet vane. On CW DWDI fans, the inlet vane with the CCW to open blade rotation is located on the drive side. On CCW DWDI fans, the inlet vane with CW to open blade rotation is located on the drive side. Fan rotation is viewed from drive side of SWSI or DWDI blowers. Fan rotation is viewed from the air leaving side for vane axial or tubular centrifugal fans.

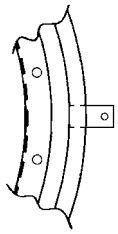


VC-82 SIDE VIEW

ACTUATOR HOOKUPS



Optional type lever arm with locking quadrant



Standard type tab for actuator hookup

Standard Frame And Design Criteria					
	"A" Inside Frame Dia. inches and (mm)	C Frame Flange inches and (mm)	D Frame Depth inches and (mm)	Max. Diff. Pressure in. wg and (Pa)	Max. Velocity fpm and (m/s)
VC-81	12" (305) to 16" (406)	1 1/4" (32)	9" (229)	7 (1750)	3000 (15)
	16 1/16" (408) to 40" (1016)	1 1/2" (38)	10" (254)	7 (1750)	3000 (15)
	40 1/16" (1018) to 59" (1499)	2" (51)	11" (279)	7 (1750)	3000 (15)
	59 1/16" (1500) to 60" (1524)	2" (51)	12" (305)	7 (1750)	3000 (15)
	60 1/16" (1526) to 80" (2032)	3" (76)	12" (305)	7 (1750)	3000 (15)
	80 1/16" (2034) to 90" (2286)	3" (76)	13" (330)	7 (1750)	3000 (15)
	90 1/16" (2288) to 100" (2540)	3 1/2" (89)	14" (356)	7 (1750)	3000 (15)
VC-82	12" (305) to 16" (406)	1 1/4" (32)	9" (229)	10 (2500)	4000 (20)
	16 1/16" (408) to 40" (1016)	1 1/2" (38)	10" (254)	10 (2500)	4000 (20)
	40 1/16" (1018) to 48" (1219)	2" (50)	11" (279)	10 (2500)	4000 (20)

PERFORMANCE DATA FOR MODELS VC-81, VC-82, VC-83 and VC-84

Standard Frame And Design Criteria Continued					
	"A" Inside Frame Dia. inches and (mm)	C Frame Flange inches and (mm)	D Frame Depth inches and (mm)	Max. Diff. Pressure in. wg and (Pa)	Max. Velocity fpm and (m/s)
VC-83	12" (305) to 16" (406)	1 1/2" (38)	12" (305)	90 (2250)	10000 (50)
	16 1/16" (408) to 20" (508)	1 1/2" (38)	12" (305)	85 (21250)	9500 (48)
	20 1/16" (510) to 30" (762)	1 1/2" (38)	12" (305)	75 (18750)	9000 (45)
	30 1/16" (764) to 40" (1016)	2" (51)	12" (305)	65 (16250)	8500 (43)
	40 1/16" (1018) to 50" (1270)	2" (51)	12" (305)	55 (13750)	8000 (40)
	50 1/16" (1272) to 60" (1524)	2" (51)	12" (305)	45 (11250)	7500 (38)
	60 1/16" (1526) to 65" (1651)	3 1/2" (89)	12" (305)	35 (8750)	7000 (35)
	65 1/16" (1653) to 72" (1829)	4" (102)	13" (330)	25 (6250)	6500 (33)
	72 1/16" (1830) to 80" (2032)	4" (102)	13" (330)	15 (3750)	6000 (30)
VC-84	16 1/16" (408) to 20" (508)	1 1/2" (38)	12" (305)	85 (21250)	9500 (48)
	20 1/16" (510) to 30" (762)	1 1/2" (38)	12" (305)	75 (18750)	9000 (45)
	30 1/16" (764) to 40" (1016)	2" (51)	12" (305)	65 (16250)	8500 (43)
	40 1/16" (1018) to 50" (1270)	2" (51)	12" (305)	55 (13750)	8000 (40)
	50 1/16" (1272) to 60" (1524)	2" (51)	12" (305)	45 (11250)	7500 (38)
	60 1/16" (1526) to 65" (1651)	3 1/2" (89)	12" (305)	35 (8750)	7000 (35)
	65 1/16" (1653) to 72" (1829)	4" (102)	13" (330)	25 (6250)	6500 (33)
	72 1/16" (1830) to 80" (2032)	4" (102)	13" (330)	15 (3750)	6000 (30)

STANDARD SPECIFICATIONS FOR MODELS VC-81, VC-82, VC-83, VC-84 Inches are shown, numbers in ( ) are mm

Product:	VC-81	VC-82	VC-83	VC-84
Max. Dia.:	**100"** (2540)	**48"** (1219)	**80"** (2032)	**80"** (2032)
Min. Dia.:	**12"** (305)	**12"** (305)	**12"** (305)	**16"** (406)
Frame:	**12 Ga.** (2.67) rolled steel channel for **12"** (305) dia. through **40"** (1016) dia. **10 Ga.** (3.42) rolled steel channel for **40 1/16"** (1018) dia. through **60"** (1524) dia. **14 Ga.** (1.9) steel sleeve with steel anglering flanges for **60 1/16"** (1526) dia. through **100"** (2542) dia. units	**12 Ga.** (2.67) rolled steel channel for **12"** (305) dia. through **40"** (1016) dia. **10 Ga.** (3.42) rolled steel channel for **40 1/16"** (1018) dia. through **48"** (1219) dia.	**10 Ga.** (3.42) rolled steel channel for **12"** (305) dia. through **60"** (1524) dia. **10 Ga.** (3.42) rolled steel sleeve with steel angle ring flanges for **60 1/16"** (1526) dia. through **80"** (2032) dia. units	1/4" (6.4) thk. rolled sleeve and donut ring frame construction up to **24"** (610) dia. 1/4" (6.4) thk. rolled carbon steel channel construction for **24 1/16"** (611) through **60"** (1524). 1/4" (6.4) thk. rolled sleeve and angle ring frame construction for **60 1/16"** (1525) through **80"** (2032)
Blades:	**16 Ga.** (1.52) steel through **60"** (1524) dia., single thickness. **14 Ga.** (1.9) steel **60 1/16"** (1526) through **100"** (2540) dia., single thickness	**16 Ga.** (1.52) steel	**10 Ga.** (3.42) steel, single thickness	**10 Ga.** (3.42) steel
Axles:	1/2" (12.7) dia. plated steel, full length	1/2" (12.7) dia. plated steel, full length	1/2" (12.7) dia. steel, full length for less than **16"** (406) dia. 3/4" (19) dia. steel, full length for **16"** (406) dia. and greater	**1"** Dia. steel, full length.
Bearings:	Oil impregnated bronze sleeve with stainless sleeve thrust washers at hub and frame	Stainless steel sleeve with stainless steel thrust washers at hub and frameA	Relubricable ball, mounted externally with stainless steel sleeve thrust washers at hub and frame	Relubricable ball, mounted externally with stainless steel sleeve bearings and stainless steel thrust washer at hub and frame
Linkage:	Steel linkage ring with ball swivels and plated steel linkage arms	Steel linkage ring with ball joint swivel and plated steel linkage arms	Heavy-duty ball swivel with steel linkage ring for vanes less than **16"** (406) dia. No lash heavy-duty ball sockets with steel linkage for vanes 16" (406) dia. and greater. No lash heavy-duty linkage shown	Heavy-duty linkage arms with "no lash type", heavy-duty ball sockets and a steel linkage ring
Finish:	Prime coat	Prime coat	Prime coat	Prime coat
Actuator:	Standard type tab for electric or pneumatic actuator hookup	Standard type tab for electric or pneumatic actuator hookup	Standard type tab for electric or pneumatic actuator hookup	Standard type tab for electric or pneumatic actuator hookup

Models BD-40 , BD-41 and BD-41-HD

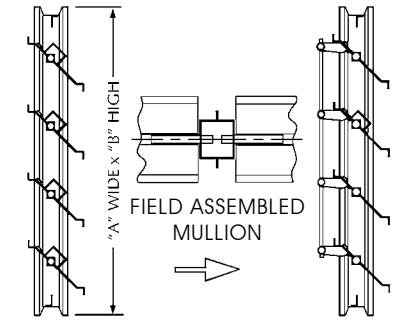
BD-40

AWV's backdraft dampers are designed to effectively prevent the reversal of airflow for a variety of low pressure, medium velocity, clean air systems.

The BD-40 has independent blade operation, whereas the BD-41 and BD-41-HD has blade-to-blade linkage for systems with face velocities through 3000 fpm (15 m/s).

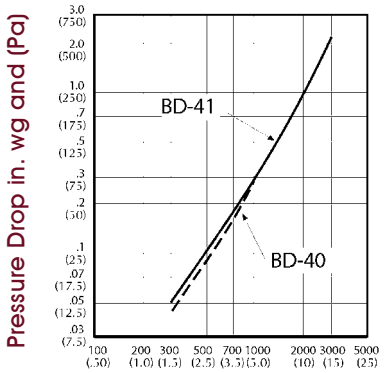
OPTIONS:

- Bearings: stainless steel sleeve, Teflon® sleeve, O.I.B. sleeve and stainless steel ball
- Seals: vinyl blade, EPT wedge jamb
- Stainless steel linkage
- Stainless steel axles



END VIEW BD-40 END VIEW BD-41

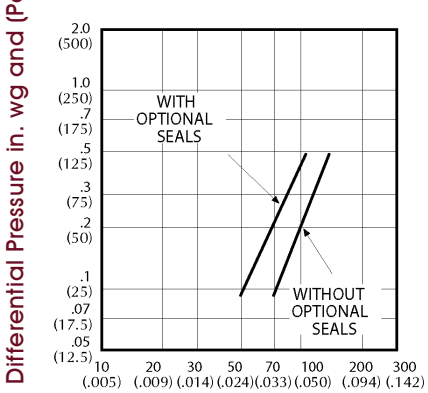
PRESSURE DROP



Face Velocity fpm and (m/s)

Tested per AMCA Standard 500 Figure 5.3; Size Tested — 24" x 24"

LEAKAGE IN SCFM



Leakage in scfm and (m3/s)

Tested per AMCA Standard 500 Figure 5.4; Size Tested — 24" x 24"

NOTE:

Pressure drop will increase with optional sleeve bearings. Fig. 5.3 "in-duct" mount, Fig. 5.4 "wall-mounted."

STANDARD SPECIFICATIONS FOR BD-40, BD-41, and BD-41-HD Inches are shown, numbers in ( ) are mm

Product:	BD-40	BD-41	BD-41-HD
Max. Face Velocity:	**1000 fpm** (5 m/s)	**3000 fpm** (15 m/s)	**3000 fpm** (15 m/s)
Mas. Diff. Pressure:	**.5 in. wg** (12.5 Pa)	**.5 in. wg** (12.5 Pa)	**3 in. wg** (750 Pa)
Max. Temp.:	**250°F** (120°C) (without seals) **150°F** (65°C) (with seals)	**250°F** (120°C) (without seals) **150°F** (65°C) (with seals)	**250°F** (120°C) (without seals) **150°F** (65°C) (with seals)
Max. Panel Size:	**48"** (1219) W x **72"** (1829) H	**48"** (1219) W x **72"** (1829) H	**48"** (1219) W x **72"** (1829) H
Min. Panel Size:	**6"** (152) W x **7 5/8"** (194) H	**6"** (152) W x **7 5/8"** (194) H	**6"** (152) W x **7 5/8"** (194) H
Frame:	**3 1/2"** (89) x **5/8"** (15.9) x **16 Ga.** (1.52) galvanized steel hat channel for "in-duct" mounting. Dampers under **12"** (305) high will be fabricated with a **16 Ga.** (1.52) flat galvanized steel plate at head and sill	**3 1/2"** (89) x **5/8"** (15.9) x **16 Ga.** (1.52) galvanized steel hat channel for "in-duct" mounting. Dampers under **12"** (305) high will be fabricated with a **16 Ga.** (1.52) flat galvanized steel plate at head and sill	**5 1/2"** (140) x **5/8"** (15.9) x **16 Ga.** (1.52) galvanized steel hat channel for "in-duct" mounting. Dampers under **12"** (305) high will be fabricated with a **16 Ga.** (1.52) galvanized steel inverted channel at head and sill
Blades:	**16 Ga.** (1.52) aluminum, **10"** (254) max. and **6"** (152) min. blade width	**16 Ga.** (1.52) aluminum, **10"** (254) max. and **6"** (152) min. blade width	**.08"** (2) aluminum, **10 3/8"** (264) max. and **6"** (152) min. blade width
Axles:	**1/2"** (12.7) dia. plated steel, stub	**1/2"** (12.7) dia. plated steel, stub	**3/4"** (12.7) dia. plated steel, stub
Bearings:	Press fit flanged ball bearings	Press fit flanged ball bearings	Press fit flanged ball bearings
Linkage (BD-41 only):	Plated steel brackets, brass barrels and **5/16"** (7.94) diameter	Plated steel brackets, brass barrels and **5/16"** (7.94) diameter	Plated steel brackets, brass barrels and **5/16"** (7.94) diameter plated steel rod
Stops:	Galvanized steel angle at head and sill	Galvanized steel angle at head and sill	Galvanized steel angle at head and sill
Finish:	Mill with touch ups on welds	Mill with touch ups on welds	Mill with touch ups on welds
Actuator:	Counterbalanced for easy operation	Counterbalanced for easy operation	Counterbalanced for easy operation

Models BD-51, BD-52 and BD-53

The BD-51, 52 and 53 series backdraft dampers are counterbalanced and designed to prevent the reversal of clean air in a variety of systems.

The model BD-51 is designed with single thickness blades for low pressure 5 in. wg (1250 Pa) and medium velocity 3900 fpm (20 m/s) systems.

The Model BD-52 is designed with airfoil blades for medium pressure 8.5 in. wg (2100 Pa) and high velocity 5150 fpm (26 m/s) systems.

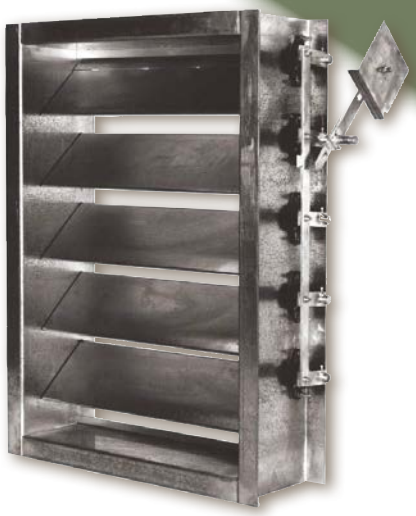
The Model BD-53 is designed with airfoil blades for high pressure 13.5 in. wg (3350 Pa) and higher velocity 6400 fpm (32 m/s) systems.

BD-51

OPTIONS:

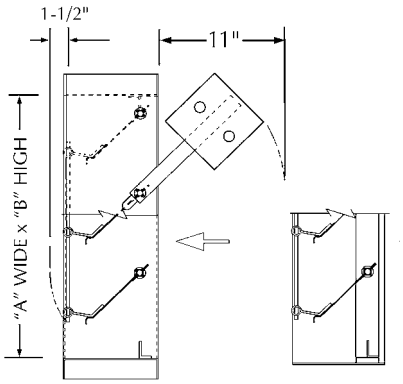
- Axles and linkage: 304 and 316 stainless steel
- Bearings (BD-51 & BD-52 only): stainless steel sleeve, Teflon® sleeve, O.I.B. sleeve, nylon sleeve, stainless steel ball with cadmium plated races
- Seals: silicone blade, EPT jamb, silicone jamb, dual durometer vinyl blade (BD-51 only), ameriprene blade (BD-52 & BD-53 only)
- Construction: 304 and 316 stainless steel

BD-52



BD-53

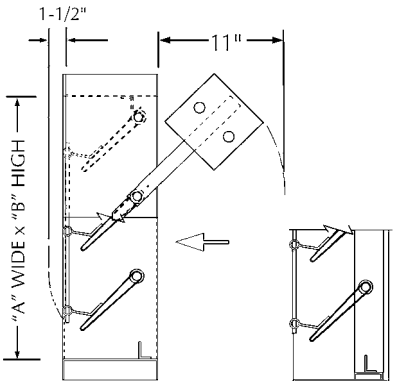
Model BD-51



SECTION VIEW

PARTIAL SECTION VIEW OF SLEEVE FRAME

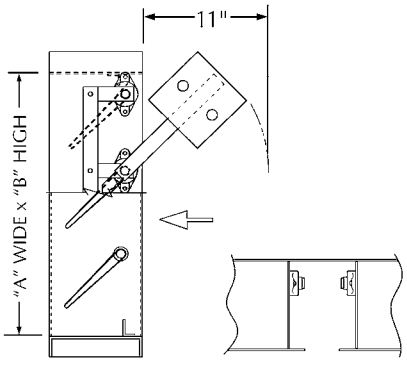
Model BD-52



SECTION VIEW

PARTIAL SECTION VIEW OF SLEEVE FRAME

Model BD-53



SECTION VIEW

MULLION

See next page for Specification Data.

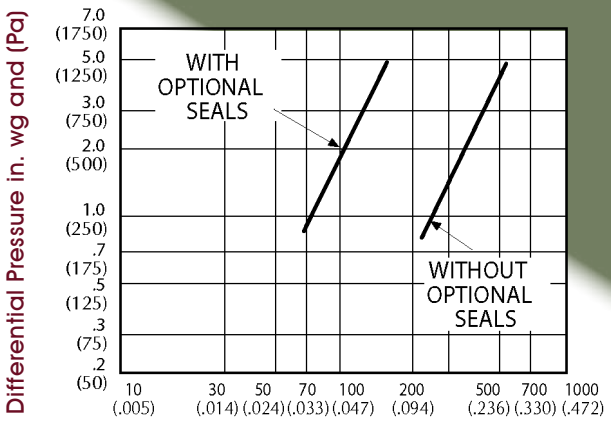
STANDARD SPECIFICATIONS FOR MODELS BD-51, BD-52 and BD-53 Inches are shown, numbers in ( ) are mm

Product:	BD-51	BD-52	BD-53
Max. Face Velocity:	**3900 fpm** (20 m/s)	**5150 fpm** (26 m/s)	**6400 fpm** (32 m/s)
Max. Diff. Pressure:	**5 in. wg** (1250 Pa)	**8.5 in. wg** (2100 Pa)	**13.5 in. wg** (3350 Pa)
Max. Temperature:	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)
Dimensions: (Min. Panel Size): (Max. Panel Size):	**6**" (152) W x **6**" (152) H **48**" (1219) W x **96**" (2438) H	**6**" (152) W x **6**" (152) H **48**" (1219) W x **96**" (2438) H	**6**" (152) W x **6**" (152) H **48**" (1219) W x **96**" (2438) H
Frame (Channel for "Flange duct" mounting):	**8**" (203) x **2**" (51) x **14 Ga.** (1.9) galv. steel through **72**" (1829)W or H **8**" (203) x **2**" (51) x **12 Ga.** (2.67) galv. steel **72 1/16**" (1830) through **96**" (2438) W or H	**8**" (203) x **2**" (51) x **12 Ga.** (2.67) galv. steel through **72**" (1829)W or H **8**" (203) x **2**" (51) x **10 Ga.** (3.42) galv. steel **72 1/16**" (1830) through **96**" (2438) W or H	**10**" (254) x **2**" (51) x **10 Ga.** (3.42) galv. steel through **60**" (1524)W or H **10**" (254) x **2 1/2**" (64) x **7 Ga.** (4.76) galv. steel **60 1/16**" (1526) through **80**" (2032) W or H **10**" (254) x **2 1/2**" (64) x **1/4**" (6.35) steel **80 1/16**" (2034) through **96**" (2438) W or H
Mullion:	**8**" (203) x **1**" (25) x **14 Ga.** (1.9) galv. steel channel	**8**" (203) x **1**" (25) x **12 Ga.** (2.67) galv. steel channel	**10**" (254) x **3**" (76) x **1 1/2**" (38) x **10 Ga.** (3.42) galv. steel channel
Frame (Sleeve for "In-duct" mounting):	**8**" (203) x **14 Ga.** (1.9) galv. steel through **72**" (1829) W or H **8**" (203) x **12 Ga.** (2.67) galv. steel **72 1/16**" (1831) through **96**" (2438) W or H	**8**" (203) x **12 Ga.** (2.67) galv. steel through **72**" (1829) W or H **8**" (203) x **10 Ga.** (3.42) galv. steel	**72 1/16**" (1831) through **96**" (2438)W or H
Blades:	**16 Ga.** (1.52) galv. steel, through through **33**" (838) W or H **12 Ga.** (2.67) galv. steel, from **33 1/16**" (840) through **48**" (1219) length **7 1/2**" (191) max. width	**16 Ga.** (1.52) galv. steel, **7 15/16**" (202) max. width	**16 Ga.** (1.52) galv. steel, through **32**" (813) length **14 Ga.** (1.9) galv. steel, **32 1/16**" (815) through **48**" (1219) length, **7 15/16**" (202) max. width
Axles:	**1/2**" (12.7) dia. plated steel, stub through **28**" (711) W; full length **28 1/16**" (713) through **33**" (838) W **3/4**" (19) dia. plated steel, stub **33 1/16**" (840) through **40**" (1016) W; full length **40 1/16**" (1018) through **48**" (1219) W (all axles with counterbalancing arms are full length)	**3/4**" (19) diameter plated steel, full length	**3/4**" (19) diameter plated steel, full length
Bearings:	Press fit ball bearings	Press fit ball bearings	Relubricable ball (outboard flange mount)
Linkage:	Plated steel brackets, brass barrels, and **5/16**" (7.94) dia. plated steel rod Double linkage on panels over **36**" (914) W	Plated steel brackets, brass barrels, and **5/16**" (7.94) dia. plated steel rod Double linkage on panels over **20**" (508) W	Heavy duty plated steel arms with shoulder bolts, and galvanized steel bar, external type
Stops:	Galvanized steel angle	Galvanized steel angle	Galvanized steel angle
Finish:	Mill	Mill	Mill and one prime coat on black steel
Actuator:	Counterbalanced for easy operation	Counterbalanced for easy operation	Counterbalanced for easy operation

PERFORMANCE DATA FOR MODELS BD-51, BD-52 and BD-53

BD-51

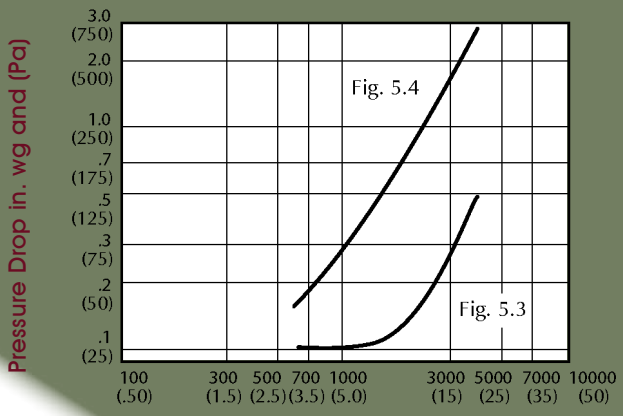
LEAKAGE



Leakage SCFM and (m3/s)

Tested per AMCA Std. 500, fig. 5.4
Size Tested: 24" x 24"

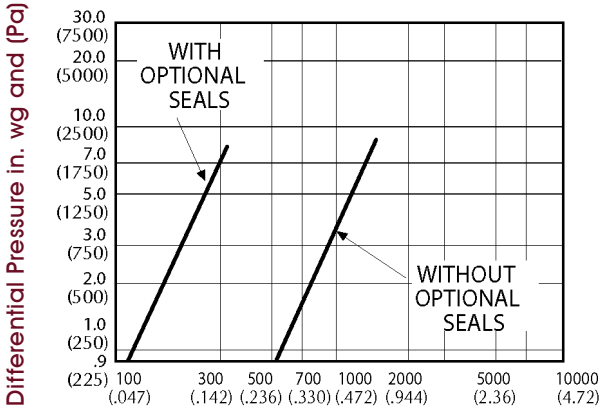
PRESSURE DROP



Face Velocity fpm and (m/s)

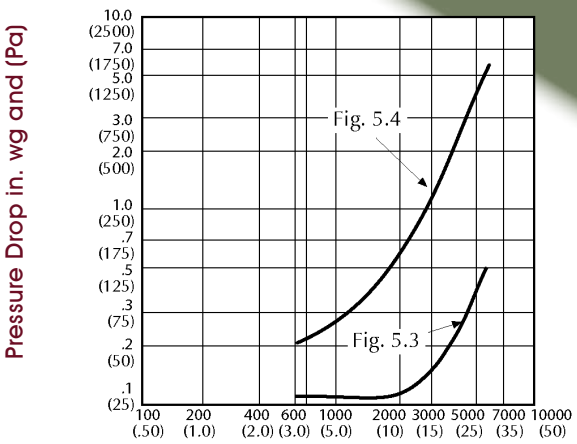
Tested per AMCA Std. 500, fig. 5.3
Size Tested: 24" x 24"

BD-52



Leakage SCFM and (m3/s)

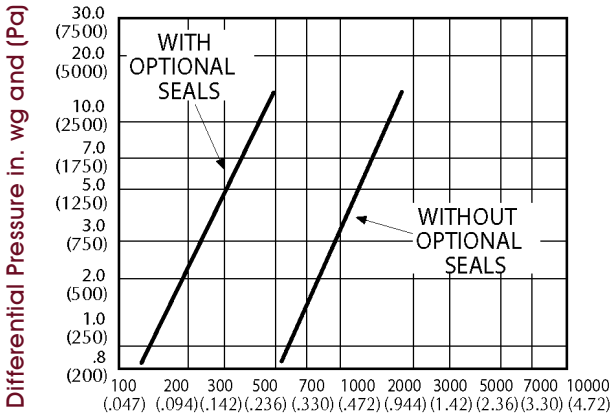
Tested per AMCA Std. 500, fig. 5.4
Size Tested: 42" x 42"



Face Velocity fpm and (m/s)

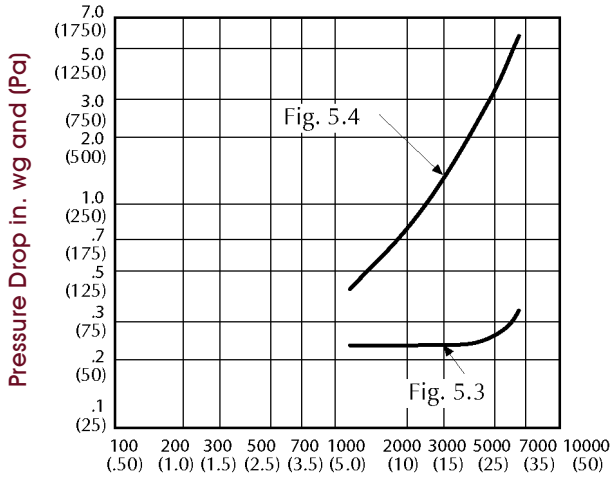
Tested per AMCA Std. 500, fig. 5.3
Size Tested: 24" x 24"

BD-53



Leakage SCFM and (m3/s)

Tested per AMCA Std. 500, fig. 5.4
Size Tested: 42" x 42"

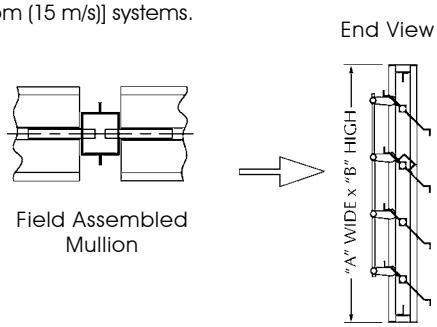


Face Velocity fpm and (m/s)

Tested per AMCA Std. 500, fig. 5.3
Size Tested: 42" x 42"

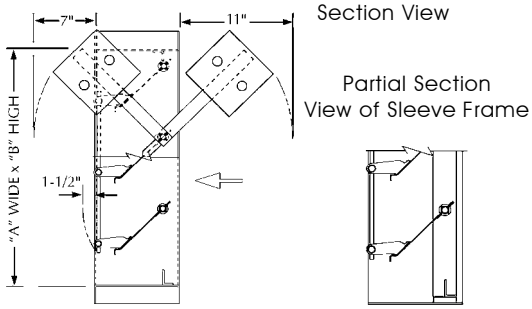
Models PR-10, PR-11, PR-12 and PR-13

The model PR-10 is designed for "in-duct" mounting with tri-formed blades for low pressure [2 in. wg (500 Pa) reversal pressure, 1 in. wg (250 Pa) max. pre-opening pressure] and medium velocity [3000 fpm (15 m/s)] systems.



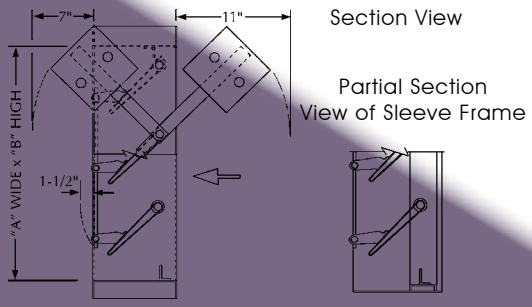
PR-10

The model PR-11 is designed for "flanged duct" mounting with single thickness blades for low pressure [5 in. wg (1250 Pa) reversal pressure, 2 in. wg (500 Pa) max. pre-opening pressure] and medium velocity [3900 fpm (20 m/s)] systems.



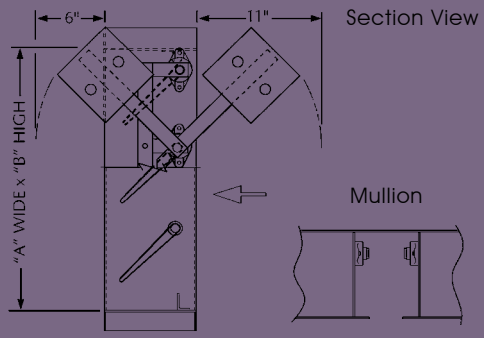
PR-11

The model PR-12 is designed for "flanged duct" mounting with airfoil blades for medium pressure [8.5 in. wg (2100 Pa) reversal pressure, 4 in. wg (1000 Pa) max. pre-opening pressure] and high velocity [5150 fpm (26 m/s)] systems.



PR-12

The model PR-13 is designed for "flanged duct" mounting with airfoil blades for high pressure [13.5 in. wg (3350 Pa) reversal pressure, 6 in. wg (1500 Pa) max. pre-opening pressure] and high velocity [6400 fpm (32 m/s)] systems.



PR-13

Pressure Relief Dampers are designed to begin opening and relieve air at a re-determined amount of water gauge pressure. They also prevent the reversal of air flow.

PRESSURE RELIEF DAMPERS

PERFORMANCE DATA FOR MODELS PR-10, PR-11, PR-12 and PR-13

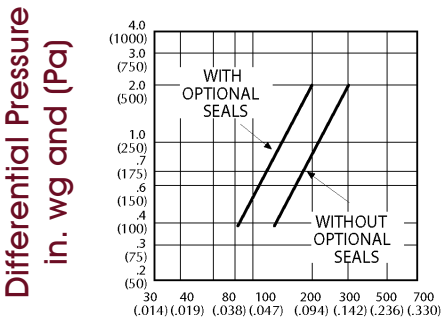
STANDARD SPECIFICATIONS FOR MODELS PR-10 AND PR-11

Inches are shown, numbers in ( ) are mm

Product:	PR-10	PR-11
Max. Face Velocity:	**3000 fpm** (15 m/s)	**3900 fpm** (20 m/s)
Max. Diff. Pressure:	**2 in. wg** (500 Pa)	**5 in. wg** (1250 Pa)
Max. Temperature:	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)
Dimensions:	"A" and "B" dimensions are opening sizes. Dampers will be fabricated 1/4" (6.35) undersize	"A" and "B" dimensions are inside damper frame or sleeve
Max. Panel Size:	**48"** (1219) W x **96"** (2438) H. When a larger unit is required, damper will be fabricated in multiple sections for field assembly	**48"** (1219) W x **96"** (2438) H
Min. Panel Size:	**6"** (152) W x **7 5/8"** (194) H	**6"** (152) W x **6"** (152) H
Frame: (Hat channel/PR-10) (Channel/PR-11)	**5 1/2"** (140) x **7/8"** (22.2) x **16 Ga.** (1.52) galv. steel hat channel for "in-duct" mounting. Dampers under **12"** (305) H will have a flat **10 Ga.** (3.42) galv. steel plate at head and sill	**8"** (203) x **2"** (51) x **14 Ga.** (1.9) galv. steel through **72"** (1829) W or H **8"** (203) x **2"** (51) x **12 Ga.** (2.67) galv. steel **72 1/16"** (1830) through **96"** (2438) W or H
Mullion:		**8"** (203) x **1"** (25) x **14 Ga.** (1.9) galv. steel channel
Frame: (Sleeve for "In-duct" mounting)		**8"** (203) x **14 Ga.** (1.9) galv. steel through **72"** (1829) W or H **8"** (203) x **12 Ga.** (2.67) galv. steel **72 1/16"** (1831) through **96"** (2438) W or H
Blades:	**16 Ga.** (1.52) galv. steel, **10"** (254) max. and **6"** (152) min. blade width.	**16 Ga.** (1.52) galv. steel, through **33"** (838) length. **12 Ga.** (2.67) galv. steel, from **33 1/16"** (840) through **48"** (1219) length. **7 1/2"** (191) max. width
Axles:	1/2" (12.7) dia. plated steel, stub	1/2" (12.7) dia. plated steel stub through **28"** (711) W 1/2" (12.7) dia. plated steel full length **28 1/16"** (713) through **33"** (838) W 3/4" (19) dia. plated steel stub **33 1/16"** (840) through **40"** (1016) W 3/4" (19) dia. plated steel full length **40 1/16"** (1018) through **48"** (1219) W All axles with weights are full length.
Bearings:	Press fit ball bearings	Press fit ball bearings
Linkage:	Plated steel brackets, brass barrels, and 5/16" (7.94) dia. plated steel rod	Plated steel brackets, brass barrels, and 5/16" (7.94) dia. plated steel rod. Dampers have double linkage on panels **36"** (914) wide. over **36"** (914) wide
Stops:	Galvanized steel angle	Galvanized steel angle
Finish:	Mill	Mill
Actuator:	Counter balance and pressure set weights to start to open at a pre-set pressure. Available range is .125 in. wg (31 Pa) through 1 in. wg (250 Pa)	Counter balance and pressure set weights to start to open at a pre-set pressure. Available range is .25 in. wg (62 Pa) through 2 in. wg (497 Pa)

LEAKAGE IN SCFM

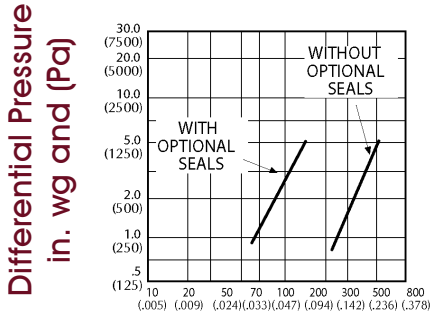
PR-10



Leakage SCFM and (m3/s)

Size Tested 24" X 24"

PR-11



Leakage SCFM and (m3/s)

Size Tested24" X 24"

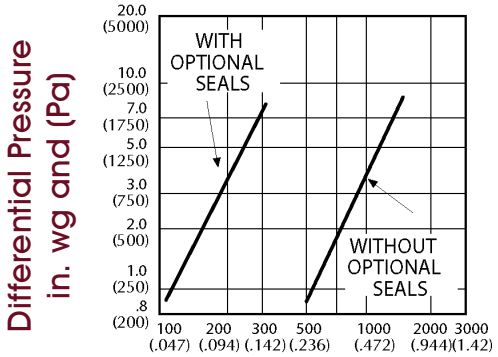
NOTE:

All data tested per AMCA Standard 500, fig. 5.4 "wall-mounted."
Construction options are the same as those for models BD-40/41 and BD-51 Backdraft Dampers.

PERFORMANCE DATA FOR PRESSURE RELIEF DAMPERS

LEAKAGE IN SCFM

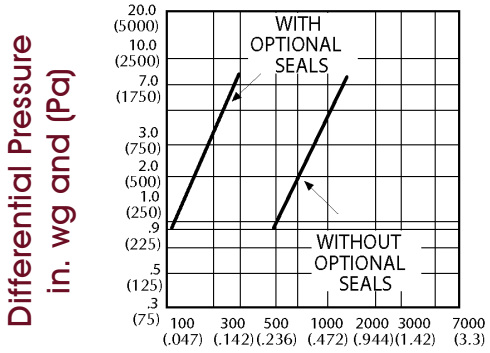
PR-12



Leakage SCFM and (m3/s)

Size Tested 42" X 42"

PR-13



Leakage SCFM and (m3/s)

Size Tested 42" X 42"

NOTE: All data tested per AMCA Standard 500, fig. 5.4 "wall-mounted."
Construction options are the same as those for models BD-52 and BD-53 Backdraft Dampers.

STANDARD SPECIFICATIONS FOR MODELS PR-12 AND PR-13 Inches are shown, numbers in ( ) are mm

Product:	PR-12	PR-13
Max. Face Velocity:	**5150 fpm** (26 m/s)	**6400 fpm** (32 m/s)
Max. Diff. Pressure:	**8.5 in. wg** (2100 Pa)	**13.5 in. wg** (3350 Pa)
Max. Temperature:	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)	**250°F** (120°C) (without seals) **150°F** (65°C) (with optional seals)
Dimensions:	"A" and "B" dimensions inside damper frame or sleeve. "A" and "B" dimensions must include clearance required by the customer on sleeve frame dampers. Dampers will be fabricated to exact size.	"A" and "B" dimensions are inside damper frame or sleeve. Damper with be fabricated to exact size.
Max. Panel Size:	**48"** (1219) W x **96"** (2438) H	**48"** (1219) W x **96"** (2438) H
Min. Panel Size:	**6"** (152) W x **6"** (152) H	**6"** (152) W x **6"** (152) H
Frame: (Hat channel/PR-10) (Channel/PR-11)	**8"** (203) x **2"** (51) x **12 Ga.** (2.67) galv. steel through **72"** (1829) W or H **8"** (203) x **2"** (51) x **10 Ga.** (3.42) galv. steel **72 1/16"** (1830) through **96"** (2438) W or H	**10"** (254) x **2"** (51) x **10 Ga.** (3.42) galv. steel through **60"** (1524) W or H **10"** (254) x **2 1/2"** (64) x **7 Ga.** (4.76) galv. steel **60 1/16"** (1526) W through **80"** (2032) W or H **10"** (254) x **2 1/2"** (64) x **1/4"** (6.35) steel channel **80 1/16"** (2034) through **96"** (2438) W or H
Mullion:	**8"** (203) x **1"** (25) x **12 Ga.** (2.67) galv. steel channel	**10"** (254) x **3"** (76) x **1 1/2"** (38) x **10 Ga.** (3.42) galv. steel channel
Frame: (Sleeve for "In-duct" mounting)	**8"** (203) x **12 Ga.** (2.67) galv. steel through **72"** (1829) W or H **8"** (203) x **10 Ga.** (3.42) galv. steel **72 1/16"** (1831) through **96"** (2438)W or H	**8"** (203) x **14 Ga.** (1.9) galv. steel through **72"** (1829) W or H **8"** (203) x **12 Ga.** (2.67) galv. steel **72 1/16"** (1831) through **96"** (2438) W or H
Blades:	**16 Ga.** (1.52) galv. steel, **7 15/16"** (202) max. width	**16 Ga.** (1.52) galv. steel, through **32"** (813) length **14 Ga.** (1.9) galv. steel, **32 1/16"** (815) through **48"** (1219) length **7 15/16"** (202) max. width
Axles:	**3/4"** (19) diameter plated steel, full length	**3/4"** (19) diameter plated steel, full length
Bearings:	Press fit ball bearings	Press fit ball bearings
Linkage:	Plated steel brackets, brass barrels, and **5/16"** (7.94) dia. plated steel rod. Double linkage on panels over **20"** (508) wide	Heavy-duty plated steel arms and bars with shoulder bolts, washers, and locknuts located outside airstream
Stops:	Galvanized steel angle	Galvanized steel angle
Finish:	Mill with touch up on welds	Mill with touch up on welds and one prime coat on black steel
Actuator:	Counter balance and pressure set weights to start to open at a pre-set pressure. Available range is .25 in. wg (62 Pa) through 4 in. wg (1000 Pa)	Counter balance and pressure set weights to start to open at a pre-set pressure. Available range is .5 in. wg (125 Pa) through 6 in. wg (1500 Pa)

Baffled Dampers

Baffled dampers are custom designed for a specific set of control conditions. Baffles are placed between either parallel or opposed damper blades and the curvature of the baffles are designed to achieve the desired control characteristics. The amount of open area between parallel or opposed blades of conventional dampers is tied to the degrees of blade rotation from 0° to 90° (closed to open). With the addition of baffles, the amount of open area between blades and baffles can be designed to be an amount that falls either between that of conventional parallel and opposed blades or less than the amount of opposed blades.

Dampers constructed for smelting operation.

Parallel blade dampers are applicable for:

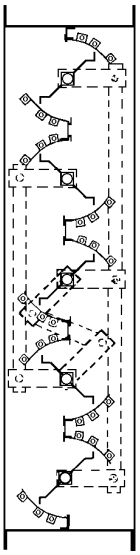
- Two position control, allowing full flow when open or no flow when closed.
- Modulating control of mixing dampers or face and bypass dampers. Such dampers control an essentially constant total flow with a near constant differential pressure. Parallel blade dampers, at the 45° open position, have a little more open area as there is with one damper open and the other damper closed. Opposed blade dampers, at the 45° open position, have a restricted open area and total flow is considerable less than when one damper is open and other one closed. Baffles can be used to refine the control characteristics of parallel blade dampers.

Opposed blade dampers are applicable for:

- Manual balancing dampers.
- Modulating control. Most damper are oversized, because of consideration of other components in the system, such as filters, coils, etc. Baffles can be used to improve the control characteristics of the oversized dampers.

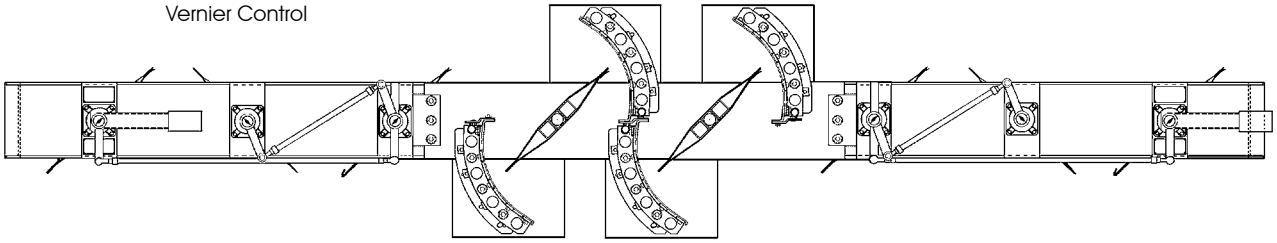
Baffle dampers can be designed for:

- Controlling systems where neither the conventional parallel or opposed blade damper configuration provides the desired control characteristics. This usually occurs where face velocities are relatively low and/or the differential pressure is relatively high. In such applications, the damper is trying to control the full flow with the damper at a near closed position. With the addition of baffles, the control range of the damper is 20° to 70° open.
- To determine if your application could be better controlled by the use of a baffled damper, determine the full flow face velocity and the desired differential pressure across the damper at that flow, check the number of degrees that the parallel or opposed blade damper would be open to achieve those conditions. If the open position of the damper is less than 45°, the control characteristics could be improved with the use of a baffled damper.



Typical Baffle Damper Cross-Section

Vernier Control

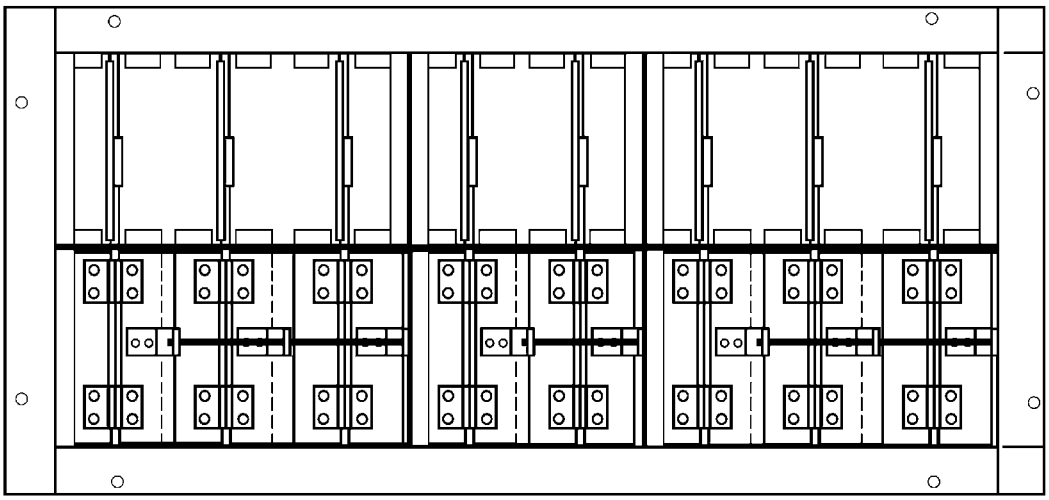


- SMELTER OPERATION — Dampers required to have finer control curve than obtainable with conventional multi-blade dampers. Controls air flow over wide, predetermined pressure drop range.
- ABSOLUTE FILTER OPERATION — When placed in series with the filter, and controlled to maintain a constant pressure drop across the damper and filter, maintains a constant volume flow through the filter when clean or dirty.
- VERNIER CONTROL — When used in conjunction with conventional opposed blades, can be used to control full flow when conventional and baffled blades are used together and control low flow caused by stack offset or loss of fan power, by closing conventional blade and controlling with baffled blades only.

Zone Damper

Zone dampers are used to control the mixture of air from packaged heating, ventilating and air conditioning units. They are a special application for a face and by-pass damper (hot and cold deck) and are divided into individually operated sections (zones) controlling air temperatures in various building areas.

AWV manufactures zone dampers with various dimensions and zone quantities to meet specific job requirements.



Face View

STANDARD SPECIFICATIONS FOR ZONE DAMPERS Inches are shown, numbers in ( ) are mm

Frame:	**4**" (102) x **1 1/2**" (38) x **12 Ga.** (2.67) galvanized steel channel
Blades:	**16 Ga.** (1.52) galvanized steel, max. **6**" (152) width
Deck Divider:	**5 1/2**" (140) x **12 Ga.** (2.67) galvanized steel plate
Zone Baffles:	**5 1/2**" (140) x **12 Ga.** (2.67) galvanized steel plate
Axles:	1/2" (12.7) stainless steel
Bearings:	O.I.B. with stainless steel thrust washers
Extended Shaft:	1/2" (12.7) diameter stainless steel to extend **5**" (127) beyond frame
Stops:	Top and bottom both decks, side stops hot deck only, **16 Ga.** (1.52) galvanized steel
Finish:	Aluminum touch up

Custom Designed Dampers

Various Applications and Materials

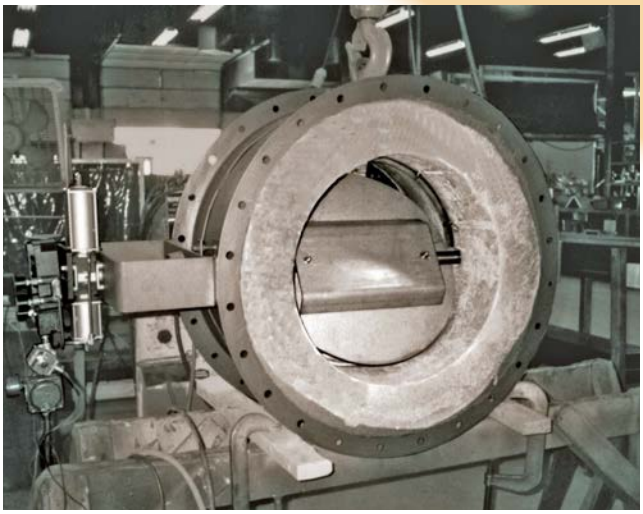
This brochure contains many different types of dampers for use in a variety of applications. However, you may not have found the exact damper model that meets your particular requirements.

For close to 100 years, we have developed innovative dampers designs to meet the most exacting requirements. Temperatures from -80°F to 1600°F. Pressures to 60 psi, velocities to 10,000 fpm. Clean air to highly corrosive and abrasive.

Our designs include nuclear and fossil power stations dampers for use in baghouses, precipitators, scrubbers, boilers, air preheaters, gas turbine inlet and exhaust. We have also designed dampers for use in steel, aluminum and paper mills, cement plants, refineries, subways, tunnel, aircraft and submarines.

Recent examples of our capabilities include:

UTILITY COAL FIRED INDUCED DRAFT FAN INLET BOX CONTROL DAMPER:	
Size:	268" (6807) x 65" (1651)
Max. Face Velocity:	5200 fpm (26 m/s)
Max. Differential Pressure:	47 in. wg (11750 Pa)
Max. Temperature:	300°F (149°C)
Max Torque:	17000 in.-lbs. (1921 Nm)



REFRACTORY LINED ROUND DAMPER:	
Size:	24" (610) inside diameter
Max. Face Velocity:	5700 fpm (29 m/s)
Max. Differential Pressure:	3 in. wg (750 Pa)
Max. Temperature:	1800°F (982°C)
Max Torque:	680 in.-lbs. (77 Nm)

TUNNEL VENTILATION SAFETY DAMPERS:	
Size:	120" (3048) x 120" (3048)
Max. Face Velocity:	2100 fpm (11 m/s)
Max. Differential Pressure:	10 in. wg (2500 Pa)
Max. Temperature:	600°F (316°C)

Regardless of the application, you can rely on the American Warming and Ventilating Custom Damper Group to develop practical, reliable, economical solutions to the most demanding customer requirements. Let us put our design knowledge to work for you on your next project.

Testing Information

REGISTERED TESTING LABORATORY

American Warming and Ventilating utilizes our fully equipped, registered Mestek Laboratory in the developing of new products, verification and value engineering of current products.

The Laboratory is also used for testing required to meet projects with customer witnessing.

TESTING

To ensure continuous product development and performance, we have an AMCA* registered laboratory located at our Bradner manufacturing facility. Our facility is equipped to test differential pressures to 50 in. wg. and flow rates to 80,000 SCFM. The face of the chambers can accommodate dampers to 8 foot square. Through the use of flexible ducting, we can test dampers and louvers larger than 8 foot wide or high. Other tests available to our customers include reverse bend fatigue, slam shut under maximum air flow and pressure drop, cycle, endurance, bubble tight leakage, decay leakage and a 600°F industrial walk-in oven for testing our combination Fire/Smoke and Leakage rated (Smoke only) to 350°F and Tunnel Dampers to 482°F.

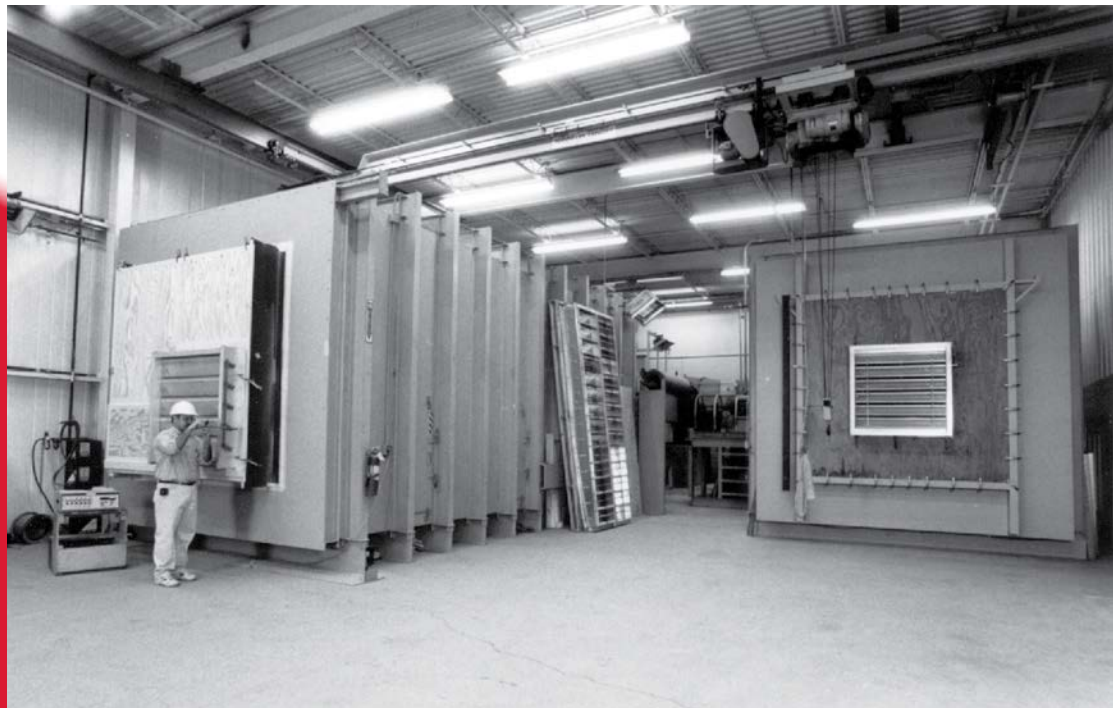
*(Approved for testing in accordance with AMCA Std. 500).

QUALITY ASSURANCE

Our QA program can be applied to products in the form of final inspection or full documentation - from material certification, nondestructive testing of welding, to final assembly. It is structured to meet the AEC's 18-point criteria as stated in 10CFR50, Appendix B, ANSI 45.2, and ASME NQA-1for inspection and testing. Also, the program has met the standards of audit teams from leading engineering firms and nuclear utilities.

TESTING CAPABILITIES INCLUDE:

- Air Duct Erosion of Fiberglass-lined Duct
- Bubble Tight Leakage
- Cycle
- Deflection
- Differential Pressures to 50 in. wg.
- Endurance Limit and Fatigue
- Flow rates to 80,000 SCFM
- High Velocity Pressure Testing on tempering air nozzles and quenchers
- Leakage Measurement
- Micro Strain Measurement
- Open & Close Timing
- Pressure Decay
- Reverse Bend Fatigue
- Slam shut under maximum air flow and close-off pressure on chamber and in-duct pressure drop
- Elevated temperature tests to 500°F
- Thermal Shock



Testing Lab
Bradner, Ohio

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