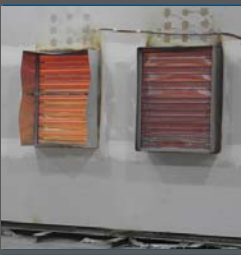
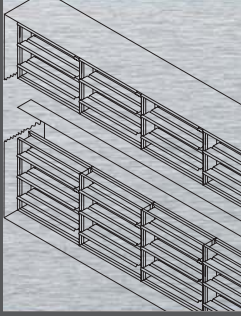


Smoke and Combination Fire Smoke Dampers



 **GREENHECK**
Building Value in Air.

March
2006

Smoke and Combination Fire Smoke Dampers

The Greenheck Difference

What makes Greenheck different from other damper manufacturers? Perhaps it's having the best performing UL Classified dampers, or industry-leading testing capabilities. Most Greenheck dampers are AMCA-licensed and meet California State Fire Marshal and the New York Material and Equipment Acceptance (MEA) unit requirements. Aggressive research and development keeps Greenheck a major player in the damper industry.



Greenheck Fan Corporation certifies that the models CFSD-211, 212; FSD-211, 212, 213, 231, 311, 311M, 312, 312M; SSFSD-211; SEFSD-211; OFSD-211, 212, 311, 312; SMD-201, 202, 203, 301, 302, 301M, 302M; SESMD-210 and SSSMD-201 shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Programs. The AMCA Certified Ratings Seal applies to air performance only.

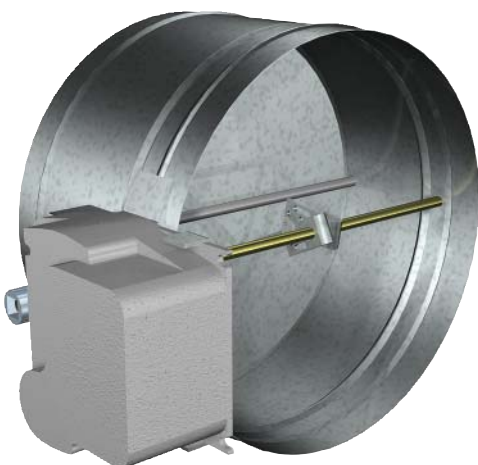
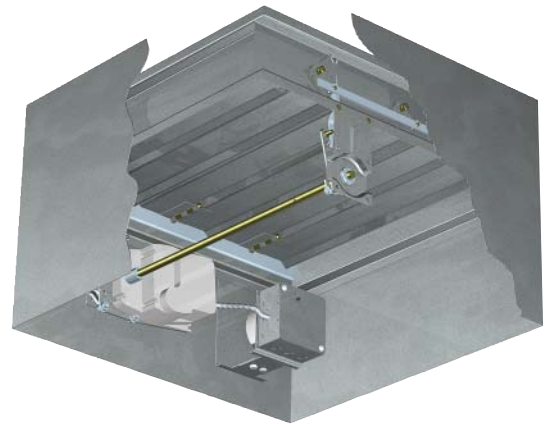


The Industry Standard

For over 50 years, the Greenheck name has been synonymous with innovation, product quality and customer service. Our fire, smoke and combination fire/smoke dampers have become industry standards for the same reasons. We know our dampers are:

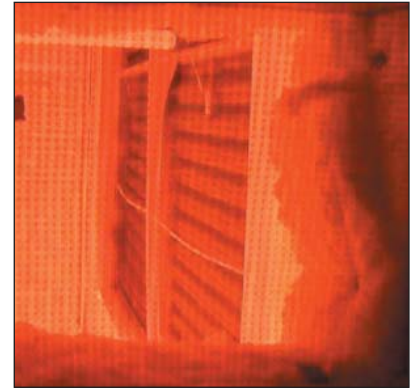
- Number one in product quality and reliability
- Number one in combined reputation and after-sale service and support
- Put into service over 200 times a day

From the Petronas Twin Towers in Kuala Lumpur to well known Las Vegas casinos to world-renowned hospitals, Greenheck dampers meet the safety need of the most complex applications.



Unparalleled In-house Testing Capabilities

Internal testing capabilities are directly related to product quality and the ability to meet stringent code requirements. With industry-leading testing capabilities, Greenheck can introduce new products faster, and can quickly develop qualified products for your unique applications. Our dampers qualify to UL555 and UL555S and AMCA 500D test standards.



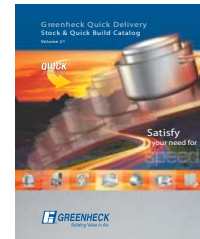
A Global Presence

Greenheck operates four damper manufacturing locations, eight national distribution centers, and four international distribution centers:



Quick Build and Delivery

Greenheck's Quick Build (QB) program, along with strategic manufacturing locations, ensure rapid response time. Products are manufactured the next day, three, five or ten days, then efficiently shipped to your job site.



Leading Edge Technical Support

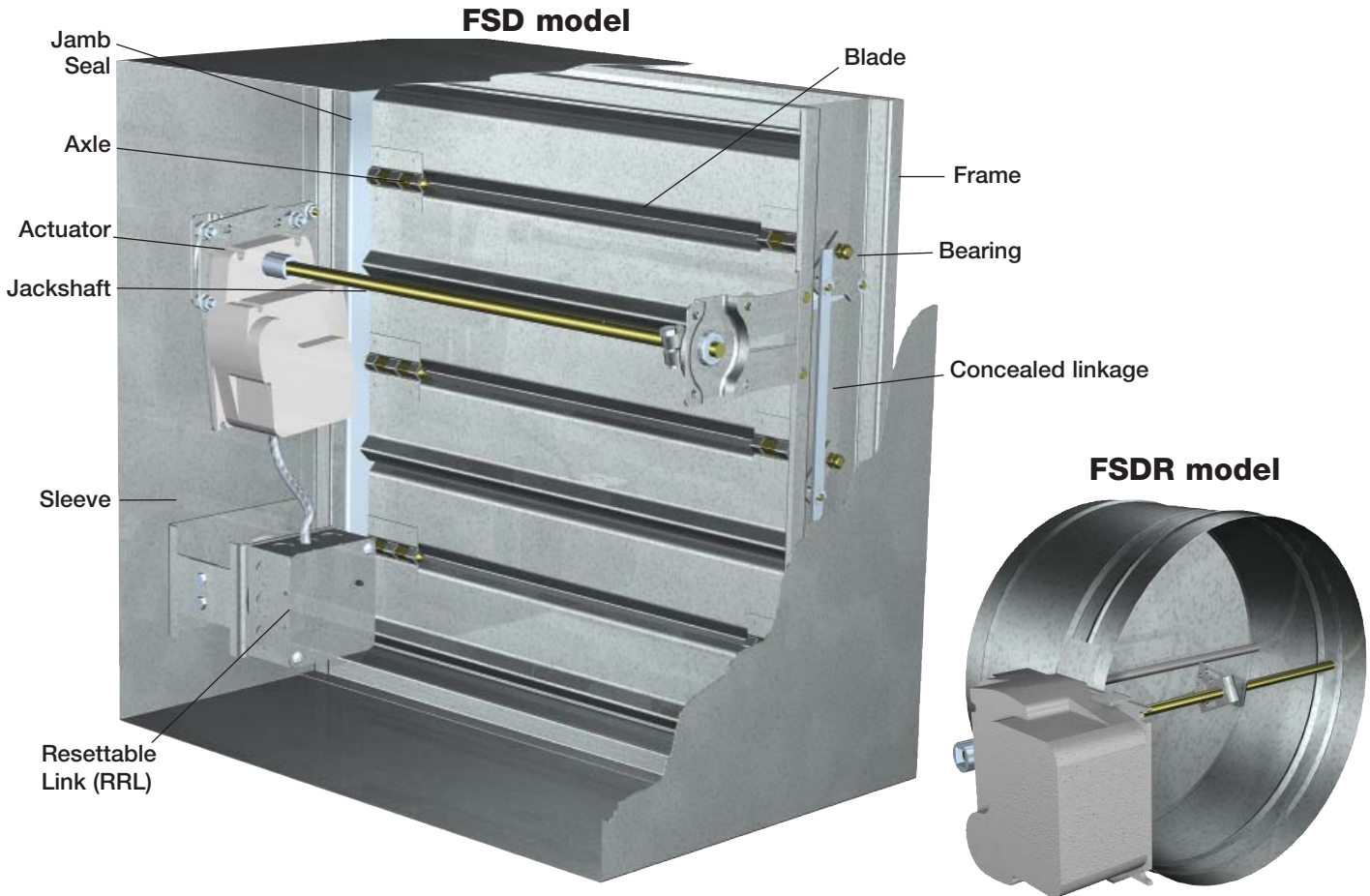
All Greenheck products are supported by the industry's best product literature, electronic media, and Computer Aided Product Selection program (CAPS). You'll also find extensive information on the internet.

For more application information and help in selecting the right damper, see our Application Manual for Fire Smoke Dampers.

You can always count on the personal service and expertise of our national and international representative organizations. To locate your nearest Greenheck representative, call 715-359-6171, or visit our website at www.greenheck.com

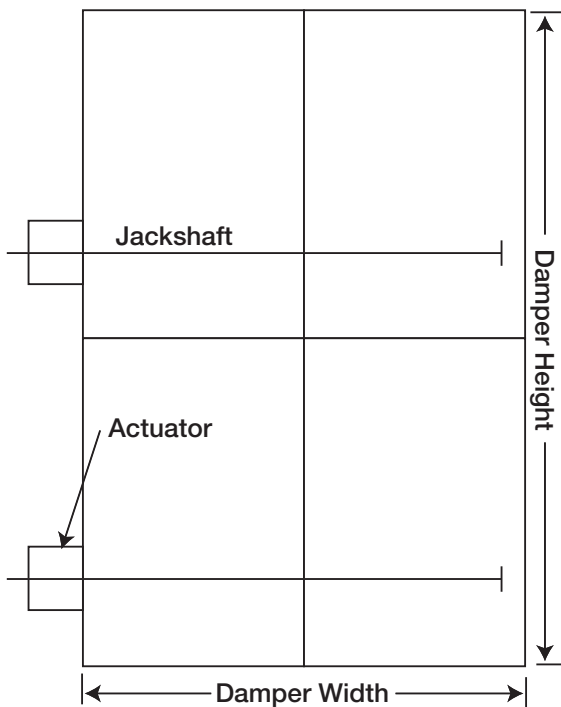


FSD & FSDR Construction Features



Drive arrangement code

The following breakdown of a drive arrangement code is a good reference in understanding what each number and letter signifies.



22-2FEL-2

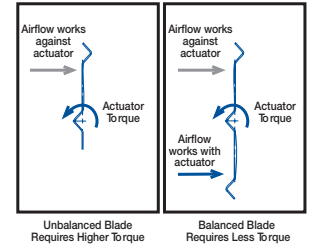
① ② ③ ④ ⑤ ⑥ ⑦

- ① Number of sections wide
- ② Number of sections high
- ③ Number of actuators
- ④ Who supplies the actuators
F - Factory (*always*) on UL dampers
- ⑤ Actuator mounting
E - External
I - Internal
B - Both internal and external
- ⑥ Actuator location - viewed from jackshaft side
L - Left hand drive
R - Right hand drive
B - Both right and left
- ⑦ Number of jackshafts

Design and Construction Features

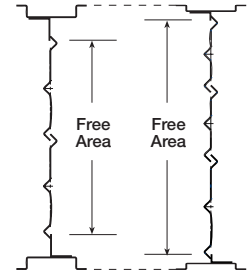
Maximized free area and minimized pressure drop

Greenheck's Variable Symmetrical Blade (VSB) design uses a combination of four symmetrical blade sizes— 4, 5, 6, and 7 inch (102, 127, 152, and 178mm)— to maximize the free area at any given height and minimize pressure drop. The VSB design also allows for consistent operating characteristics regardless of airflow direction. Traditional damper designs utilize only one blade width (usually 6 in. [152mm]), which reduces manufacturing costs, but compromises the dampers' performance capabilities by having cutoff or extended blades and oversized closure strips.



Low profile frame

Low profile top and bottom frames, standard on all dampers 17 inches (432mm) high or less, optimize free area on smaller dampers and reduce pressure loss.



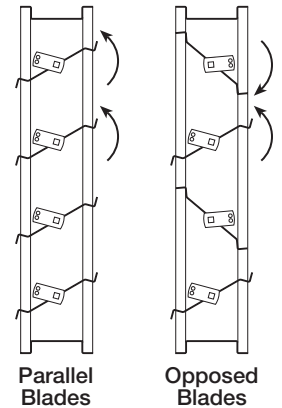
Reinforced corner design

The Tog-L-Loc® design, Greenheck's reinforced corner, is incorporated into every Greenheck Combination Fire Smoke Damper frame. It provides higher structural rigidity than many competitors' welded frames. It also prevents the probability of rust that may result from improper welds. The design ensures that every frame has square corners, helping prevent blades from binding on the jamb seals and making damper operation much smoother with less friction.

Parallel vs. opposed blades

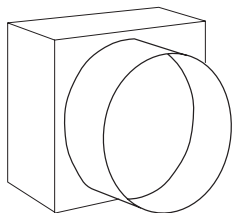
Three-V blade models typically have parallel blades, while airfoil dampers typically have opposed blades.

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

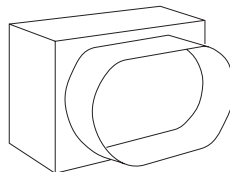


Transitions

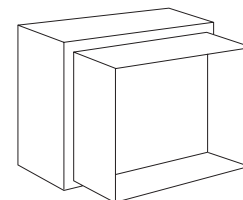
When a rectangular fire smoke damper is being used in conjunction with round or oval ductwork, it must be supplied with round or oval transitions on one or both ends of the sleeve. A Type C transition may be used to increase free area and minimize pressure drop. Dampers should be ordered to the duct dimensions. Drawings below show overall damper size.



Type R



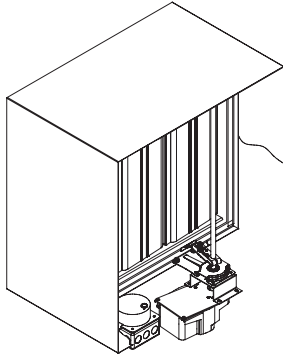
Type O



Type C

Design and Construction Features

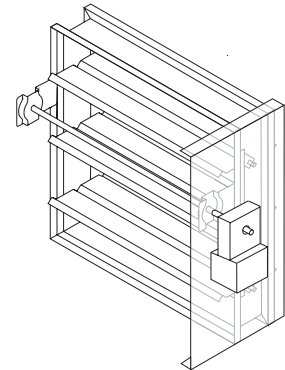
Factory-mounted external actuator on sleeve



As all combination fire smoke dampers require a sleeve for proper installation, the most practical choice is for the damper to be furnished by the factory complete with a sleeve. The actuator must be installed on the outside of the sleeve by the factory.

Sideplate

Smoke dampers may be installed with sleeves or sideplates. In lieu of sleeves, external factory installation of the actuator can still be accomplished with a sideplate (usually the full height of the damper as illustrated). These dampers are installed in a slotted duct section with the sideplate covering the slot in the side of the duct. Full height sideplates may not be practical on larger smoke dampers (particularly multi-section assemblies).

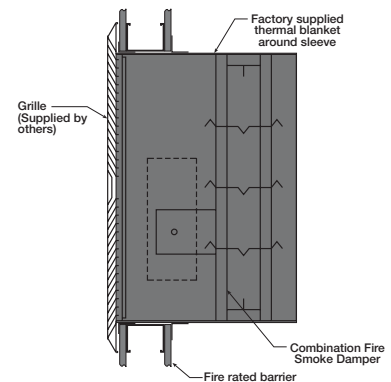


Vertical blade available

Vertical blade dampers (shown above) allow the installer to mount the actuator externally on the top or bottom of the damper when obstructions prevent installation with the actuator mounted on the sides. Also, when a damper is installed on a vertical shaft, the vertical blade design prevents excessive force from being placed on the top or bottom blades. The FSD-311V has a Class I leakage rating and 350°F (176°C) temperature rating.

Out-of-wall mounting

Greenheck was the first to offer fire dampers for installation out-of-the-wall. Model OFSD (1 1/2 hour fire rated) dampers are approved for concrete, steel stud, and wood stud installation out of the plane of the wall, making room for the motor to be internally mounted in front of the damper and directly behind a grille. To provide maintenance, the grille is removed and the actuator is located in front, meaning there is no more reaching through damper blades or working in a chase.



Grille access

Greenheck has the most convenient through-the-grille access to a combination fire smoke damper in the industry. Grille access is available in applications in a shaft wall without access on the non-grille side and enables access to actuators and/or accessories through the grille. The actuator is located within the airstream and is available with 3-V and airfoil blades.

Single-point wiring

In correlation with revised UL requirements for 555 and 555S, all actuators must be factory installed and linked through one heat responsive device to ensure a single event closing on multi-section dampers. All actuators and accessories are wired to a single junction box for a convenient single point wiring installation. This is standard on all fire smoke dampers.

Space considerations

To make the necessary duct-to-sleeve connection hassle free, Greenheck has designed the external actuator mounting bracket so that the actuator is mounted far enough away from the sleeve to provide room for all connections including flanged system breakaway connections. The actuator mounting bracket also allows room so the actuator can be rotated about the jackshaft to accommodate space considerations.

Many combination fire smoke dampers are required to be motorized internally for tight locations. Greenheck can provide an internally mounted actuator on a damper as small as 6 inches (152mm) high!

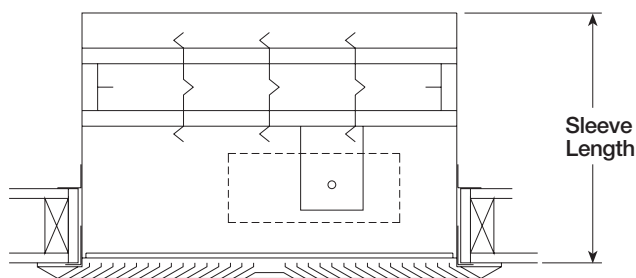


Modulating actuator availability

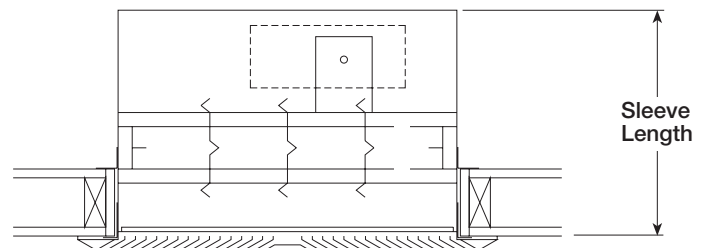
Greenheck offers a UL-approved modulating actuator on smoke and combination fire smoke dampers. A modulating actuator combines the functions of a control damper and a fire smoke damper into one unit, reducing the number of dampers needed and the overall project cost. It is an option available with electric and pneumatic actuators.

Corridor ceiling qualified

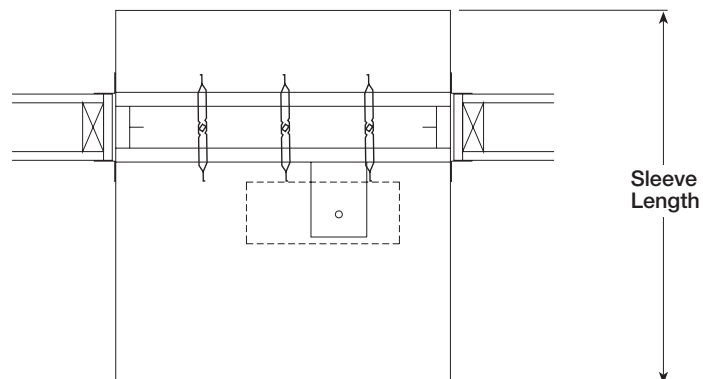
Greenheck has corridor ceiling rated Combination Fire Smoke Dampers which can be ordered in three different installation configurations. Configurations #1 & #2 apply when the fire rated ceiling is also the finished ceiling and the damper is installed behind a grille, register, or diffuser. Configuration #3 applies when the fire rated ceiling is above the finished ceiling.



Configuration #1



Configuration #2

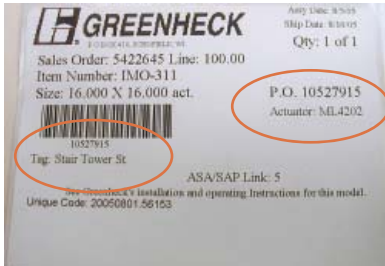
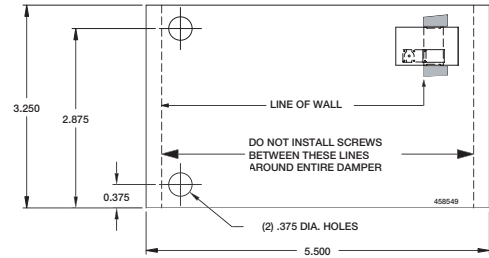


Configuration #3

Installation and Convenience Features

Helpful installation decals

Greenheck dampers come complete with decals highlighting damper areas that are important to an accurate installation. Our decals point out critical damper areas and include messages to make installation hassle free. We are the only damper manufacturer to offer these simple yet very helpful tips right on the damper.



Tag label

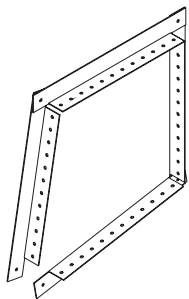
Greenheck offers a new label on all dampers that includes the tag information off your order. This tag gives you the damper model, size, actuator model, and PO number. This label will help save time in the field when you have multiple locations for the dampers on the job site.

Single side retaining angles and plates

Rectangular dampers and sleeve assemblies are qualified to use retaining angles on **one side** of the partition only. Vertical mount is qualified up to a maximum size of 80 inches W x 50 inches H, 50 inches W x 80 inches H, or 40 inches W x 100 inches H (2032mm x 1270mm, 1270mm x 2032mm, or 1270mm x 2540mm). Horizontal mount is qualified up to maximum size of 144 inches W x 96 inches H (3657mm x 2438mm). Round dampers and sleeve assemblies up to a maximum diameter of 24 in. (610mm) may be installed with retaining plates on **one side** only. Damper assemblies exceeding these maximum sizes must be secured with retaining angles or plates on **both sides** of the partition.

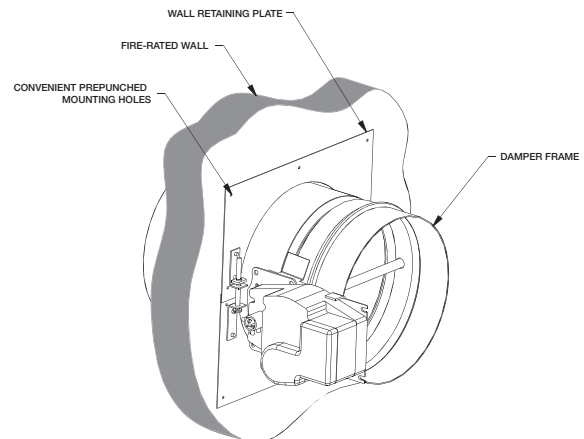
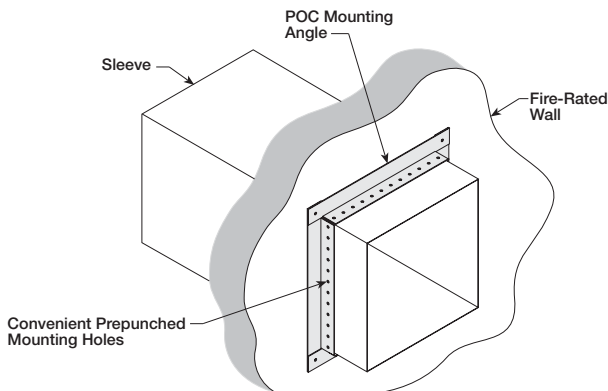
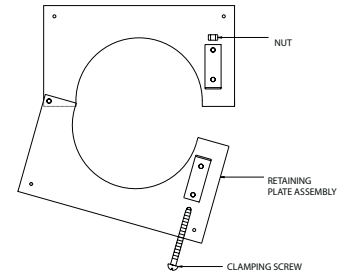
One piece retaining angles

Greenheck's one piece retaining angle, the POC (literally named for being a "Piece of Cake") makes Fire Damper installation a breeze. The POC simply wraps around the sleeve of the damper, connections are made as described in our installation instructions, and that's it! Simple! Like their rectangular counterparts, round one-piece retaining plates easily wrap around the sleeve of the damper and tighten with the clamping screw for simplified installation.



Greenheck has added three new options available on Fire Dampers. The retaining angle options are:

- Single-fastened provides the angle mechanically fastened to the damper at the location specified
- Single-wrapped retaining angle is wrapped around the damper sleeve and tied together
- Double-wrapped is the same as the single-wrapped except with two retaining angles provided.



Installation booklets

In every shipment of dampers, Greenheck includes installation booklets. These booklets include installation guidelines such as field supplied sleeves, single side retaining angle, and many more to help with your installation needs.



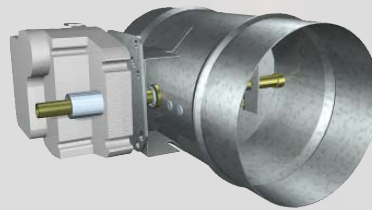
No top or bottom



Job sites are full of restricted space envelopes that are difficult to account for when planning for damper installations. However, Greenheck's Combination Fire Smoke Dampers are qualified for installation in any position with the blades horizontal. As shown in the drawing at the left, the damper can be turned over so the actuator is on the other side. In essence, the damper does not have a top or bottom.



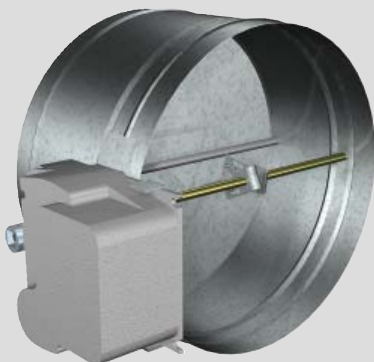
SMD, SSSMD Series



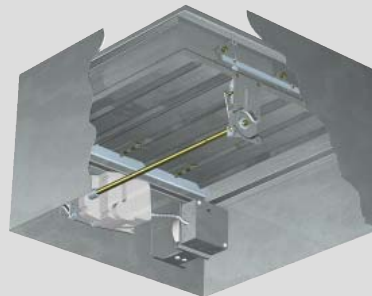
SMDR, SSSMDR Series



FSD, SSFSD Series



FSDR, SSFSDR Series



CFSD Series

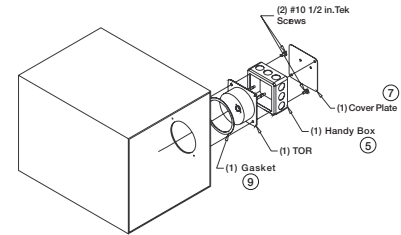


OFSD Series

Options and Accessories

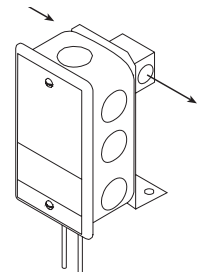
Actuators - A variety of electric and pneumatic actuators are available for all damper models. Each actuator-damper combination is UL listed to operate up to specific maximum velocities and pressures, with ratings as high as 3000 fpm (15.2 m/s) and 6 in. wg. (1494 Pa) available. Actuators can be mounted internally or externally—many manufacturers only offer externally mounted actuators. Per revised UL Standard 555S, all actuators must be factory installed.

Temperature Override Control (TOR) - The TOR option provides damper closure, usually at 165°F (74°C), with the ability to override this closure (reopen damper) so duct system can accomplish its intended Smoke Control System functions as long as temperature at damper does not exceed the secondary heat responsive device setting, usually 350°F (176°C).



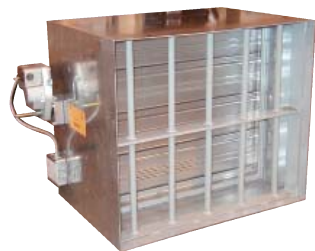
Resettable Link (RRL) - The RRL replaces the fusible link with a bimetal heat responsive device that is easily reset from outside the duct. This allows routine testing of a damper without the need to replace a fusible link. It also ensures controlled closure of the damper, eliminating the possibility of duct damage resulting from sudden dynamic type closures. RRL options are available with temperature ratings of 165°F (74°C), 212°F (100°C), 250°F (121°C) and 350°F (176°C).

Electro-Pneumatic switch (EP) - This is also known as a three-way solenoid valve, and is used to electronically open and close a pneumatic actuated damper. It is wired in series with a normally closed thermostat when used with a fire smoke damper to initiate closure at elevated temperatures. It can also be used on a smoke damper to initiate closure when required in a smoke control system.



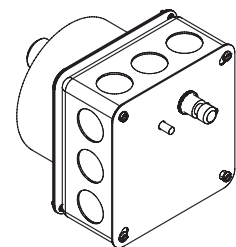
Pneumatic Relief Valve (PRV) - The PRV is a heat responsive device that activates when temperatures in excess of 165°F (74°C), 212°F (100°C), or 350°F (176°C) are detected. When the fuse link melts, air from the actuator is exhausted to close the damper. No electrical connection is required. Pneumatic actuators should be piped per local codes. The PRV must be installed at the factory and cannot be added in the field. An alternative to the PRV is a RRL with EP switch, which requires an electrical connection.

Open Closed Indicator (OCI) - The OCI option provides two switches, one set to open when the damper blades are at their open position, and the other set to close when the damper blades are at their closed position. The switches are physically linked to a damper blade and therefore give a true representation of the damper's position.



Security Bars - When a specification requires security bars to be installed with the damper, they can be shipped assembled. Installation of security bars into dampers reduces security risks and reinforces the equipment. Security bars maintain the UL classification for all products. The standard product is welded into the sleeve.

Momentary Test Switch - The momentary test switch is used with fire smoke dampers to test and cycle the damper on location for both start-up testing and maintenance. This UL-qualified assembly ships factory-mounted and wired.



Greenheck Test Switch - Greenheck test switches are used in dynamic smoke management systems containing Combination Fire Smoke Dampers equipped with TOR. GTS-1 is a three position control switch (normal, closed, override). This control panel has a red indicator light for closed, green for open damper. GTS-2 is a key switch in place of control switch (used on GTS-1). GTS-3 and GTS-4 can be used on Combination Fire Smoke Dampers equipped with RRL/OCI, OCI, or TOR. GTS-3 has momentary test switch along with open and close indicators. GTS-4 test switch has open and close indicator lights.

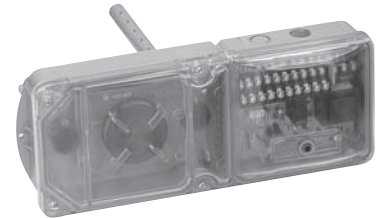


Breakaway connections - ★ Greenheck is the first manufacturer to qualify Ductmate to TDC or Ductmate to TDF connections as a UL approved breakaway connection. The options available are:

- Single side attached
- Both sides attached
- One side attached and one side shipped loose.

S & Drive connection uses drive slip connection on the side of the hemmed sleeve and S-slip joints are used on top and bottom.

Smoke Detector - The smoke detector's purpose is to sample air currents passing through a duct and upon alarm, provide management of fans, blowers, and combination fire smoke dampers. Models available provide cover supervision, continuous electronic monitoring, multi-unit interconnections and are operable in air velocities from 100 to 4000 fpm (.51 to 20.3 m/s). Models are recognized and approved for use by UL, ULC, FM, MEA, CSFM & State of Maryland. The detectors are available factory mounted and wired or shipped loose.



No Flow Smoke Detector - This smoke detector is rated for systems without a minimum operating velocity. No flow smoke detector (model 2151) is rated for air velocities 0 to 3000 fpm (0 to 15.2 m/s) and is mounted internally to the damper sleeve. No flow smoke detector has built-in test switch.

Fire/Smoke Damper Model Number Code

PRODUCT TYPE

- SMD** - Smoke Damper
- SESMD** - 316 Stainless Steel Smoke Damper
- SSSMD** - 304 Stainless Steel Smoke Damper
- SMDR** - Round Smoke Damper
- SESMDR** - Round 316 Stainless Steel Smoke Damper
- SSSMDR** - Round 304 Stainless Steel Smoke Damper
- FSD** - Combination Fire Smoke Damper
- SEFSD** - 316 Stainless Steel Combination Fire Smoke Damper
- SSFSD** - 304 Stainless Steel Combination Fire Smoke Damper
- FSDR** - Round Combination Fire Smoke Damper
- SEFSDR** - Round 316 Stainless Steel Combination Fire Smoke Damper
- SSFSDR** - Round 304 Stainless Steel Combination Fire Smoke Damper
- OFSD** - Out of Wall Combination Fire Smoke Damper
- CFSD** - Corridor Ceiling Combination Fire Smoke Damper

FSD-311V

PRODUCT TYPE

BLADE STYLE

- 2 Fabricated Steel with Triple Vee Reinforcements (3V)
- 3 Fabricated Steel Airfoil
- 4 Extruded Aluminum Airfoil
- 5 Round

**V (IF VERTICAL BLADE)
M (IF MODULATING)**

LEAKAGE

- 1 Leakage Class I
- 2 Leakage Class II
- 3 Leakage Class III

FIRE RATING

- 0 Smoke Damper-no fire rating
- 1 1½ hours
- 3 3 hours

EXAMPLE: Combination Fire-Smoke Damper with Vertical Steel Airfoil Blades, 1.5 Hour Fire Rating, Class I Leakage

Actuator Checklist

Electric Actuator Checklist

All actuators must be factory installed

See Figures 6 & 7

- ✓ **Power Supply**
 - 24, 120, and 240 Vac
 - Frequency in Hz
- ✓ **Operation**
 - Spring Return (spring will drive damper to original starting point)
 - Modulating (damper position determined by modulating control signal)
 - Two position (damper position is open or close)
- ✓ **Fail Direction** (spring return only)
 - Open or Closed
- ✓ **Location**
 - Internal or external
- ✓ **Control Signal** (for modulating only)
 - 0-10 Vdc, 4-20 mAdc
- ✓ **NEMA Enclosure**
 - 1, 3, 4, 4X, or 7 (specify one for specific application)
- ✓ **Accessories**
 - Auxiliary Switches (end switches)
 - Transformers



Figure 6

Greenheck offers a wide variety of electric actuators for installation as an external or internal mount.

Pneumatic Actuator Checklist

See Figure 8

- ✓ **Power Supply**
 - 20 psi
- ✓ **Operation**
 - Modulating (damper position determined by modulating pressure signal)
 - Two Position (damper position is open or closed)
- ✓ **Fail Direction** (spring return only)
 - Open or Closed
- ✓ **Location**
 - Internal or external
- ✓ **Control Signal** (for modulating only)
 - Control pressure start point and operating span are field adjustable.
- ✓ **Accessories**
 - Solenoid Valves or Positioners

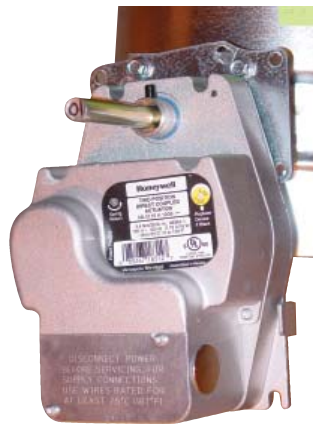


Figure 7



Figure 8

Greenheck also offers several options of pneumatic actuators.

Damper Performance Testing Criteria

Pressure drop testing was conducted in accordance with AMCA Standard 500-D using the three configurations shown. All data has been corrected to represent standard air at a density of .075 lb/ft³ (1.201 kg/m³).

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

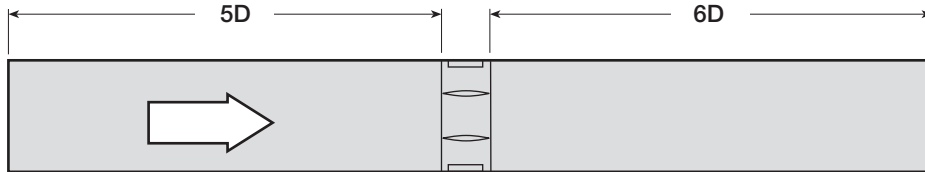


Figure 5.3

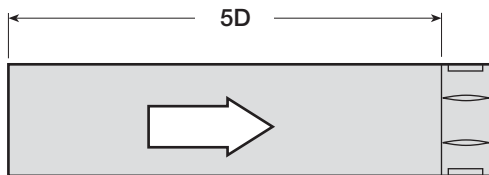


Figure 5.2

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

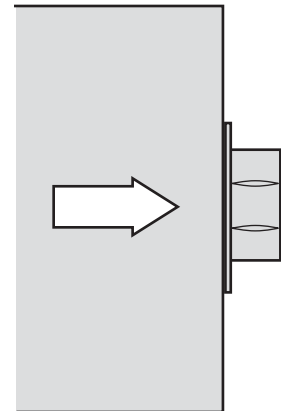


Figure 5.5

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

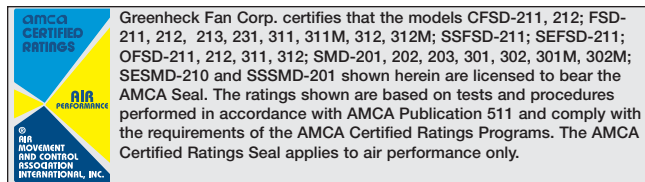


Figure 5.3 Illustrates a fully ducted damper. This configuration has the lowest pressure drop of the three test configurations because entrance and exit losses are minimized by straight duct runs upstream and downstream of the damper.

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

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

Pressure Drop Data for 3-V Blade Models

These pressure drop charts are for the following models: CFSD-211, 212; FSD-211, 212, 213, 231; OFSD-211, 212; SEFSD-211; SSFSD-211; SMD-201, 202, 203; SESMD-201; and SSSMD-201.

AMCA Figure 5.2 Pressure Drop

Dimension in. (mm)	12 x 12 (305 x 305)	24 x 24 (610 x 610)	36 x 36 (914 x 914)	12 x 48 (305 x 1219)	48 x 12 (1219 x 305)
velocity (fpm)	Pressure Drop - in. wg				
500	.04	.02	.01	.01	.03
1000	.14	.07	.04	.06	.10
1500	.32	.15	.09	.13	.23
2000	.56	.27	.16	.23	.41
2500	.88	.42	.25	.36	.63
3000	1.26	.61	.36	.52	.91
3500	1.72	.83	.49	.70	1.24
4000	2.24	1.08	.64	.92	1.62

AMCA Figure 5.3 Pressure Drop

Dimension in. (mm)	12 x 12 (305 x 305)	24 x 24 (610 x 610)	36 x 36 (914 x 914)	12 x 48 (305 x 1219)	48 x 12 (1219 x 305)
velocity (fpm)	Pressure Drop - in. wg				
500	.02	.01	.01	.01	.02
1000	.09	.04	.03	.04	.07
1500	.20	.09	.06	.10	.16
2000	.36	.16	.11	.17	.29
2500	.56	.25	.17	.27	.45
3000	.81	.35	.24	.39	.64
3500	1.10	.48	.33	.53	.88
4000	1.44	.63	.42	.70	1.14

AMCA Figure 5.5 Pressure Drop

Dimension in. (mm)	12 x 12 (305 x 305)	24 x 24 (610 x 610)	36 x 36 (914 x 914)	12 x 48 (305 x 1219)	48 x 12 (1219 x 305)
velocity (fpm)	Pressure Drop - in. wg				
500	.06	.03	.03	.03	.04
1000	.22	.14	.12	.13	.17
1500	.50	.31	.26	.30	.38
2000	.89	.55	.47	.53	.67
2500	1.39	.86	.73	.83	1.04
3000	2.00	1.24	1.05	1.19	1.50
3500	2.73	1.69	1.42	1.62	2.05
4000	3.56	2.20	1.86	2.11	2.67

Pressure Drop Data for Airfoil Blade Models

These pressure drop charts are for the following models: FSD-311, 311M; FSD-312, 312M; OFSD-311, 312; SMD-301, 302; and SMD-301M, 302M.

AMCA Figure 5.2 Pressure Drop

Dimension in. (mm)	12 x 12 (305 x 305)	24 x 24 (610 x 610)	36 x 36 (914 x 914)	12 x 48 (305 x 1219)	48 x 12 (1219 x 305)
velocity (fpm)	Pressure Drop - in. wg				
500	.03	.01	.01	.01	.02
1000	.12	.06	.06	.05	.08
1500	.26	.12	.12	.12	.18
2000	.46	.22	.22	.21	.32
2500	.72	.34	.34	.33	.51
3000	1.04	.49	.49	.48	.74
3500	1.41	.67	.67	.65	1.00
4000	1.84	.87	.88	.85	1.31

AMCA Figure 5.3 Pressure Drop

Dimension in. (mm)	12 x 12 (305 x 305)	24 x 24 (610 x 610)	36 x 36 (914 x 914)	12 x 48 (305 x 1219)	48 x 12 (1219 x 305)
velocity (fpm)	Pressure Drop - in. wg				
500	.01	.01	.01	.01	.01
1000	.06	.03	.02	.03	.05
1500	.13	.06	.05	.07	.10
2000	.23	.11	.10	.12	.18
2500	.36	.17	.15	.18	.29
3000	.52	.24	.22	.26	.41
3500	.71	.33	.29	.36	.56
4000	.92	.43	.38	.47	.74

AMCA Figure 5.5 Pressure Drop

Dimension in. (mm)	12 x 12 (305 x 305)	24 x 24 (610 x 610)	36 x 36 (914 x 914)	12 x 48 (305 x 1219)	48 x 12 (1219 x 305)
velocity (fpm)	Pressure Drop - in. wg				
500	.05	.03	.03	.03	.04
1000	.18	.13	.12	.13	.15
1500	.41	.30	.27	.29	.33
2000	.73	.53	.47	.51	.58
2500	1.14	.83	.74	.80	.91
3000	1.65	1.20	1.06	1.15	1.31
3500	2.24	1.64	1.44	1.57	1.79
4000	2.93	2.14	1.88	2.05	2.33

Quick Reference Guide

	FRAME							BLADE PROFILE			LEAKAGE CLASS			FIRE RATING			CLOSURE TEMPERATURE					CLOSURE DEVICE			ACCESSORIES											
	5" x 1" x 16 ga. galvanized steel hat channel	20 ga. galvanized steel round	304 stainless steel	316 stainless steel	304 stainless steel round	316 stainless steel round	8" x 2" x 12 ga. galvanized steel hat channel	Round	3V	Steel Airfoil	Aluminum Airfoil	Class I	Class II	Class III	1 hour	1 1/2 hour	3 hour	165°F	212° F	250°F	286°F	350°F	Fusible link	¹ Reusable Resettable Link (RRL)	² Temperature Limited Override (TOR)	³ Pneumatic Relief Valve (PRV)	Retaining angles	Retaining Plates	Smoke Detector	Momentary switches	Open or close Indicator (OCI)	Transformer	Greenheck test switch (GTS)			
CFSD-211	X							X			X			X			X	O	O		O	X	O	O	O				O	O	O	O	O	O		
CFSD-212	X							X				X			X			X	O	O		O	X	O	O	O				O	O	O	O	O	O	
FSD-211	X							X			X				X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-212	X							X				X			X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-213	X							X					X		X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-231	X							X			X					X		X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
SEFSD-211				X				X			X				X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
SSFSD-211			X					X			X				X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-311	X								X		X				X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-312	X								X			X			X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-311M	X								X		X				X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-312M	X								X			X			X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSD-311V	X								X		X				X			X	O	O		O	X	O	O	O		O		O	O	O	O	O	O	
FSDR-511		X						X			X				X			X	O	O	O	O	X	O	O	O		O		O	O	O	O	O	O	
FSDR-512		X						X				X			X			X	O	O	O	O	X	O	O	O		O		O	O	O	O	O	O	
SEFSDR-511					X			X			X				X			X	O	O	O	O	X	O	O	O		O		O	O	O	O	O	O	
SSFSDR-511				X				X			X				X			X	O	O	O	O	X	O	O	O		O		O	O	O	O	O	O	
SSFSDR-512				X				X				X			X			X	O	O	O	O	X	O	O	O		O		O	O	O	O	O	O	
OFSD-211	X							X			X				X			X	O	O		O	X	O		O				O	O	O	O	O	O	
OFSD-212	X							X				X			X			X	O	O		O	X	O		O				O	O	O	O	O	O	
OFSD-311	X								X		X				X			X	O	O		O	X	O		O				O	O	O	O	O	O	O
OFSD-312	X								X			X			X			X	O	O		O	X	O		O				O	O	O	O	O	O	O
SMD-201	X							X			X																			O	O	O	O	O	O	O
SMD-202	X							X				X																		O	O	O	O	O	O	O
SMD-203	X							X					X																	O	O	O	O	O	O	O
SSSMD-201			X					X			X																			O	O	O	O	O	O	O
SESM-201				X				X			X																			O	O	O	O	O	O	O
SMD-301	X								X		X																			O	O	O	O	O	O	O
SMD-301M	X								X		X																			O	O	O	O	O	O	O
SMD-301V	X								X		X																			O	O	O	O	O	O	O
SMD-302	X								X				X																	O	O	O	O	O	O	O
SMD-302M	X								X				X																	O	O	O	O	O	O	O
SMD-401	X										X	X																		O	O	O	O	O	O	O
SMD-401M	X										X	X																		O	O	O	O	O	O	O
HSD-401						X					X	X																						O	O	O
SMDR-501		X						X				X																						O	O	O
SMDR-502		X						X					X																					O	O	O
SESMR-501						X		X			X																							O	O	O
SSSMR-501					X			X			X																							O	O	O
SSSMR-502					X			X				X																						O	O	O

¹ Available with or without Open or Closed Indicator; EP switch required if pneumatic actuator is used.
² Includes Open or Closed Indicator; EP switch required if pneumatic actuator used
³ For use with pneumatic actuators

Model and size limitations

MODEL	SIZE LIMITATIONS - W X H in inches (mm)						Temperature Ratings °F (°C)	Maximum Velocity fpm (m/s)	Maximum Pressure in. wg (Pa)
	Single Section				Multi-Section				
	Horizontal		Vertical		Horizontal	Vertical			
	Minimum	Maximum	Minimum	Maximum	Maximum				
FIRE/SMOKE DAMPERS									
FSD-211,212,213	8 x 6 (203 x 152)	32 x 50 or 36 x 48 (813 x 1270 or 914 x 1219)	8 x 6 (203 x 152)	32 x 50 or 36 x 48 (813 x 1270 or 914 x 1219)	144 x 96 (3658 x 2438)	128 x 100 (3251 x 2540)	350 (176)	2000 (10.2)	4 (996)
SSFSD-211, SEFSD-211	8 x 6 (203 x 152)	24 x 30 (610 x 762)	8 x 6 (203 x 152)	24 x 30 (610 x 762)	48 x 30 (1219 x 762)	48 x 30 (1219 x 762)	350 (176)	2000 (10.2)	4 (996)
FSD-231	8 x 6 (203 x 152)	32 x 48 or 36 x 36 (813 x 1219 or 914 x 914)	8 x 6 (203 x 152)	32 x 48 or 36 x 36 (813 x 1219 or 914 x 914)	72 x 48 (1829 x 1219)	72 x 48 (1829 x 1219)	350 (176)	2000 (10.2)	4 (996)
FSD-311,312	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	96 x 50 (2438 x 1270)	128 x 100 (3251 x 2540)	350 (176)	3000 (15.2) up to 128 x 72 (V) or 96 x 50 (H); 2000 (10.2) all sizes	4 (996)
FSD-311M, FSD-312M	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	96 x 50 (2438 x 1270)	128 x 36 or 96 x 72 (3251 x 914 or 2438 x 1829)	350 (176)	2000 (10.2)	4 (996)
FSD-311V	--	--	6 x 8 (152 x 203)	50 x 32 (1270 x 813)	--	--	350 (176)	2000 (10.2)	4 (996)
FSDR-511,512 SSFSDR-511,512 SEFSDR-511	6 (152)	24 (610)	6 (152)	24 (610)	--	--	350 (176)	3000 (15.2)	4 (996)
CFSD-211,212	8 x 6 (203 x 152)	24 x 24 (610 x 610)	--	--	--	--	350 (176)	2000 (10.2)	4 (996)
OFSD-211,212	--	--	12 x 12 (305 x 305)	36 x 36 (914 x 914)	--	--	350 (176)	2000 (10.2)	4 (996)
OFSD-311,312	--	--	12 x 12 (305 x 305)	32 x 36 (813 x 914)	--	36 x 36 (914 x 914)	350 (176)	2000 (10.2)	4 (996)
SMOKE DAMPERS									
SMD-201,202,203	8 x 6 (203 x 152)	32 x 50 or 36 x 48 (813 x 1270 or 914 x 1219)	8 x 6 (203 x 152)	32 x 50 or 36 x 48 (813 x 1270 or 914 x 1219)	144 x 100 or 288 x 50 (3658 x 2540 or 7315 x 1270)	144 x 100 or 288 x 50 (3658 x 2540 or 7315 x 1270)	350 (176)	2000 (10.2)	4 (996)
SESMD-201, SSSMD-201	8 x 6 (203 x 152)	24 x 30 (610 x 762)	8 x 6 (203 x 152)	24 x 30 (203 x 152)	48 x 30 (1219 x 762)	48 x 30 (1219 x 762)	350 (176)	2000 (10.2)	4 (996)
SMD-301,302	8 x 6 (203 X 152)	32 x 50 (813 x 1270)	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	128 x 100 or 256 x 50 (3251 x 2540 or 6502 x 1270)	128 x 100 or 256 x 50 (3251 x 2540 or 6502 x 1270)	350 (176)	3000 (15.2) up to 128 x 72 (V) or 96 x 50 (H); 2000 (10.2) all sizes	4 (996)
SMD-301M, SMD-302M	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	8 x 6 (203 x 152)	32 x 50 (813 x 1270)	128 x 100 or 256 x 50 (3251 x 2540 or 6502 x 1270)	128 x 36 or 96 x 72 (3251 x 914 or 2438 x 1829)	250 (121)	2000 (10.2)	4 (996)
SMD-301V	--	--	6 x 8 (152 x 203)	50 x 32 (1270 x 813)	--	--	350 (176)	2000 (10.2)	4 (996)
SMD-401	8 x 8 (203 x 203)	48 x 60 (1219 x 1524)	8 x 8 (203 x 203)	48 x 60 (1219 x 1524)	192 x 72 (4877 x 1829)	192 x 72 (4877 x 1829)	250 (121)	3000 (15.2) up to 144 x 36 or 48 x 108 2000 (10.2) all sizes	6 (1494) up to 48 x 36 4 (996) all sizes
SMD-401M	8 x 8 (203 x 203)	36 x 36 (914 x 914)	8 x 8 (203 x 203)	36 x 36 (914 x 914)	--	--	250 (121)	2000 (10.2)	4 (996)
SMDR-501,502 SESMDR-501 SSSMDR-501,502	6 (152)	24 (610)	6 (152)	24 (610)	--	--	350 (176)	3000 (15.2)	4 (996)
HSD-401	6 x 6 1/4 (152 x 159)	60 x 60 (1524 x 1524)	6 x 6 1/4 (152 x 159)	60 x 60 (1524 x 1524)	96 x 60 or 48 x 120 (2438 x 1524 or 1219 x 3048)	96 x 60 or 48 x 120 (2438 x 1524 or 1219 x 3048)	250 (121)	3000 (15.2)	6 (1494)

Specification Checklist

Combination Fire Smoke Damper Specification Checklist

- ✓ **UL Standard** – UL 555 and UL 555S Classified
- ✓ **Fire Resistance** – NFPA 90A required
 - 1½ hour
 - 3 hours
- ✓ **Fire Closure Temperature** – Required to be equipped with a heat responsive device (RRL) to close the damper when the temperature at the damper reaches a specific maximum– 165°F (74°C), 212°F (100°C), 250°F (121°C), 286°F (141°C), 350°F (176°C)
- ✓ **Elevated Operational Temperature** – The highest temperature rating, 350°F (176°C), is recommended as it provides a higher level of safety [250°F (121°C) or 350°F (176°C)]
- ✓ **Leakage** – Lowest leakage rating (Class I) is recommended as it provides a higher level of safety. Most codes require a minimum of Class II (Class I, II, or III)
- ✓ **Differential Pressure** – Maximum pressure of a closed damper (6 in. wg [1494 Pa])
- ✓ **Velocity** – Maximum airflow rate through the open damper (2000 or 3000 fpm [10.2 or 15.2 m/s])
- ✓ **Damper Construction** – Frame, blades, blade stops, seals, linkage, axles
- ✓ **Sleeves** – Single assembly with an integral factory sleeve of desired lengths and thickness
- ✓ **Retaining Angles or Plates** – UL listed angles (rectangular dampers) or plates (round dampers)
- ✓ **Mounting** – Vertical or horizontal mount
- ✓ **Actuators** – Type, operation, power supply, mounting – external or internal
- ✓ **Accessories** – Momentary switch, smoke detector, security bars, breakaway connections, etc.

Smoke Damper Specification Checklist

- ✓ **UL Standard** – UL 555S Classified
- ✓ **Elevated Operational Temperature** – The highest temperature rating, 350° F (176° C), is recommended as it provides a higher level of safety– 250° F (121°C) or 350° F (176°C)
- ✓ **Leakage** – Lowest leakage rating (Class I) is recommended as it provides a higher level of safety. Most codes require a minimum of Class II (Class I, II, or III)
- ✓ **Differential Pressure** – Maximum pressure of a closed damper (4 or 6 in. wg [996 or 1494 Pa])
- ✓ **Velocity** – Maximum airflow rate through the open damper (2000 or 3000 fpm [10.2 or 15.2 m/s])
- ✓ **Damper Construction** – Frame, blades, blade stops, seals, linkage, axles
- ✓ **Sleeves** – Single assembly with an integral factory sleeve of desired lengths and thickness.
- ✓ **Mounting** – Vertical or horizontal mount
- ✓ **Actuators** – Type, operation, power supply, mounting - external or internal
- ✓ **Accessories** – Momentary switch, smoke detector, security bars, breakaway connections, etc.

Please visit our website at www.greenheck.com/products/dampers/index for complete specifications.

Greenheck has a complete line of Dampers for your needs!

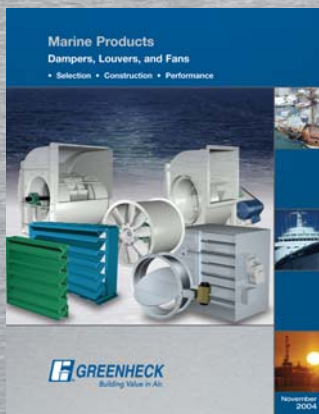
- Commercial Control
- Industrial Control
- Fire, Smoke, & Combination Fire Smoke
- Ceiling Radiation
- Backdraft
- Pressure Relief Dampers
- Manual Balancing
- Access Doors
- Marine
- Severe Environment
- Industrial Smoke
- Insulated Thermally Broken
- Air Measuring
- Pressure Relief Access Doors
- Barometric Relief
- Industrial Backdraft



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Greenheck has invested in state-of-the-art laboratory and testing facilities to help develop new products and update our existing products to provide you with the highest quality. Greenheck's laboratory facilities test products to the latest versions of AMCA, ANSI, ASHRAE, UL, USCG and other industry standards of performance.

- Ferries
- Ships
- Tug Boats
- Offshore oil rigs
- Riverboat Casinos
- Cruise ships



Our Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs. *As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.*

