GREENHECK

Model IMO-311

Combination Fire Smoke Marine Damper

Steel Airfoil Blades
USCG Type Approved for Class A-60 Divisions
ABS Approved (PDA)

APPLICATION

Model IMO-311 is a high performance combination fire smoke damper with extremely low leakage designed for marine application. High strength airfoil blades ensure the lowest resistance to airflow in HVAC systems with velocities to 4000 fpm (20.3 m/s) and pressures to 4 in. w.g. (1 kPa) Model IMO-311 may be installed vertically (with blades running horizontal) or horizontally and is rated for airflow and leakage in either direction.

RATINGS

USCG Approval

Fire Rating: A60 for all sizes

ABS Product Design Assesment

Fire Rating A60 for single section dampers
A30 for multi-section dampers

Performance Rating:

Leakage Class: 3 cfm/ ft^2 @ 1 in. wg
(35 cmh/m^2 @ .25 kPa)
6 cfm/ft^2 @ 4 in. wg
(109 cmh/m^2 @ 1kPa)
Operational Rating: Actual ratings are size dependent
Maximum Velocity: up to 4000 fpm (20.3 m/s) consult factory for higher velocity
Maximum Pressure: 4 in. wg (1 kPa)
Maximum Temperature: 212°F (100°C)- depending upon the actuator

Model IMO-311 meets the requirements for fire damper, smoke damper and combination fire smoke damper established by:

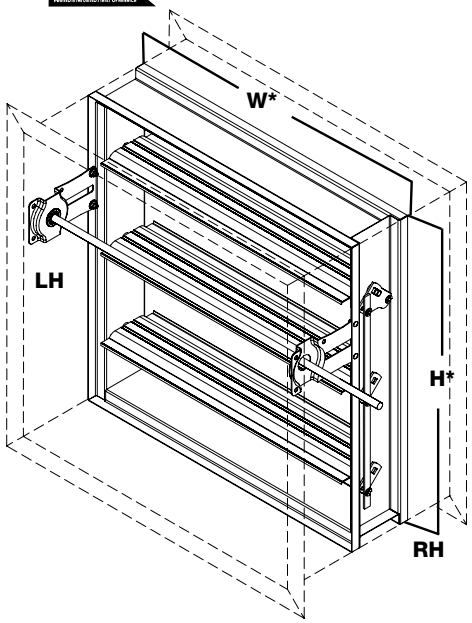
International Maritime Fire Test Procedure Code
USCG Type Approved A-60
Approval Number 164.139/0007/0
United States/European Union
MRA Listed (Ships wheel)
ABS Type Approval Design Assessment (PDA)
Approval Number 06-HS154367-PDA

Greenheck Fan Corporation certifies that the model IMO-311 shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Programs. The AMCA Certified Ratings Seal applies to air performance ratings only.

1408/05

Construction	Standard	Optional
Frame Material	Galvanized steel	-
Frame Material Thickness	16 ga. (1.5mm)	-
Frame Type	5 in. x 1in. (127mm x 25mm) hat channel	-
Blade Material	Galvanized steel	-
Blade Material Thickness	14 ga. (2mm) equivalent	-
Blade Type	Airfoil	-
Linkage	Plated steel out of airstream, concealed in jamb	-
Axle Bearings	Bronze	304SS
Axle Material	Plated Steel	-
Blade Seals	Silicone	-
Jamb Seals	304SS	-
Closure Device	RRL	RRL/OCI, PRV, Fusible Link
Closure Temperature	165°F (74°C)	212°F (100°C)
Flanges	Double flange on 304SS sleeve	-
Flange Width	1 1/2 in. (38mm)	2 or 2 1/2 in. (51mm or 64mm)

W x H	*Minimum Size*	*Maximum Size*	
		Single Section	*Multiple Section*
Inches	8 x 6	32 x 32	64 x 32
mm	203 x 152	813 x 813	1626 x 813



Right hand drive is shown. Left hand drive is available upon request.

FEATURES:

- Frames are constructed with reinforced corners. Low profile head and sill are used on sizes less than 17 in. high (432mm).
- Blades are a double skin airfoil with full length structural reinforcement.

OPTIONS:

- Greenheck test switches (GTS-1, -2, -3, -4)
- Momentary test switch
- RRL/OCI (Open closed indication switches)
- TOR (Temperature limited override)
- Sealed transitions and sleeves
- Smoke detectors

Installation instructions available at www.greenheck.com

Pressure Drop Data IMO-311

This 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/ft^3 (1.201 kg/m^3).

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.

AMCA Test Figures

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.

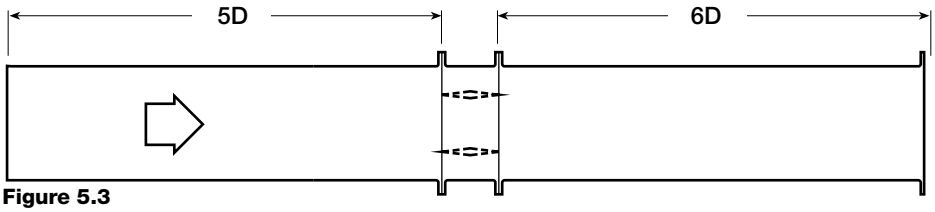
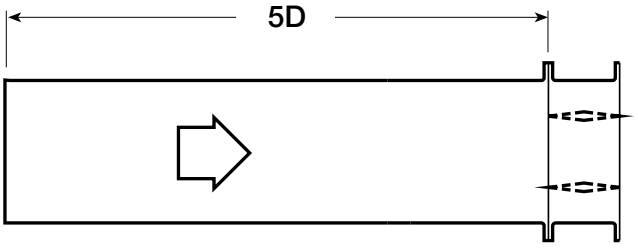


Figure 5.3



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

Figure 5.2

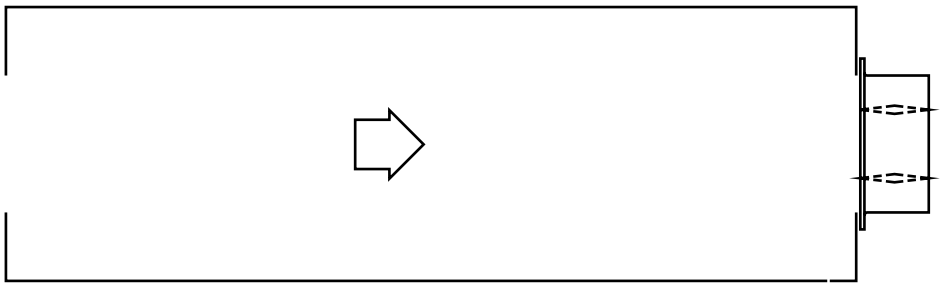
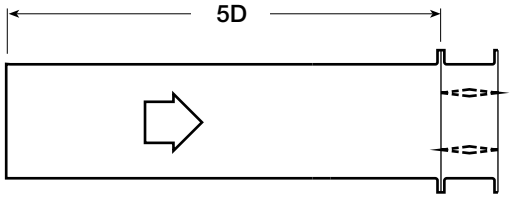


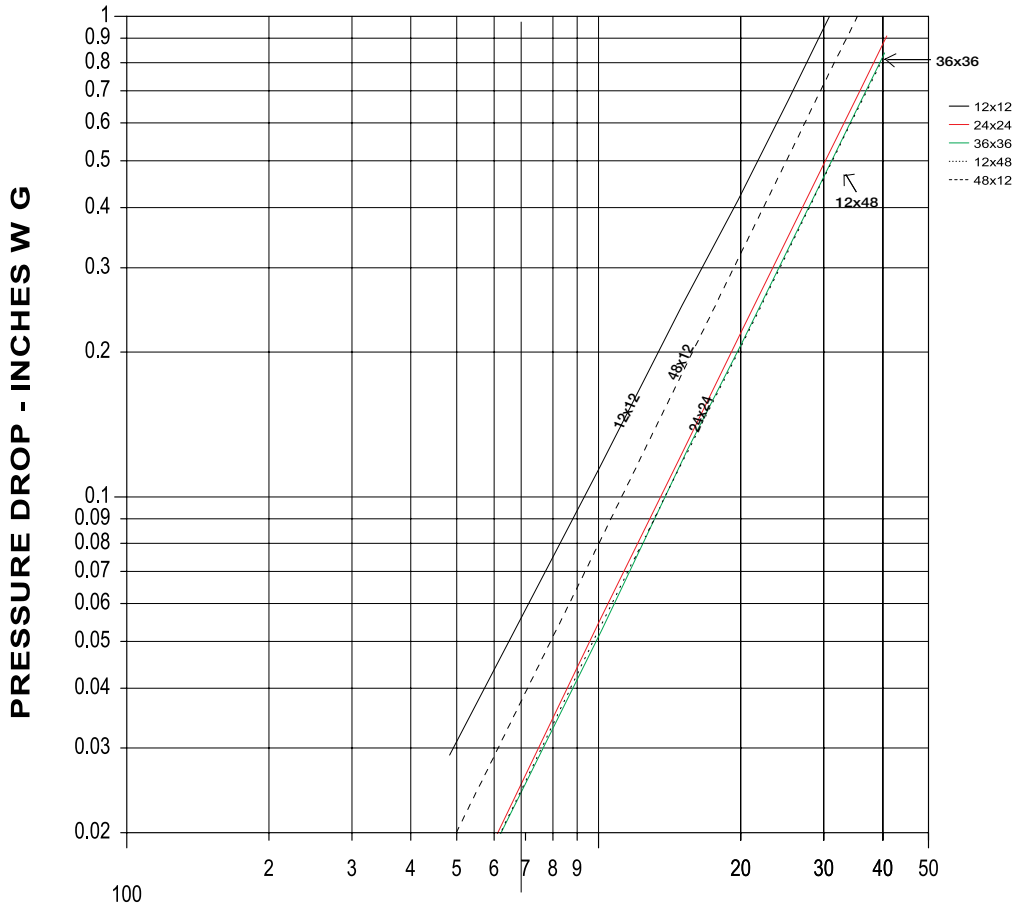
Figure 5.5

AMCA 5.2 Pressure Drop

IMO-311



VELOCITY VS. PRESSURE DROP



FACE VELOCITY - FEET/MINUTE

AMCA FIG. 5.2

* Sizes are in inches.

12 in. x 12 in. (305mm x 305mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.03
1000	0.12
1500	0.26
2000	0.46
2500	0.72
3000	1.04
3500	1.41
4000	1.84

24 in. x 24 in. (610mm x 610mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.06
1500	0.12
2000	0.22
2500	0.34
3000	0.49
3500	0.67
4000	0.87

36in. x 36 in. (914mm x 914mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.06
1500	0.12
2000	0.22
2500	0.34
3000	0.49
3500	0.67
4000	0.88

12in. X 48 in. (305mm x 1219mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.05
1500	0.12
2000	0.21
2500	0.33
3000	0.48
3500	0.65
4000	0.85

48 in. x 12 in. (1219mm x 305mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.02
1000	0.08
1500	0.18
2000	0.33
2500	0.51
3000	0.74
3500	1.00
4000	1.31

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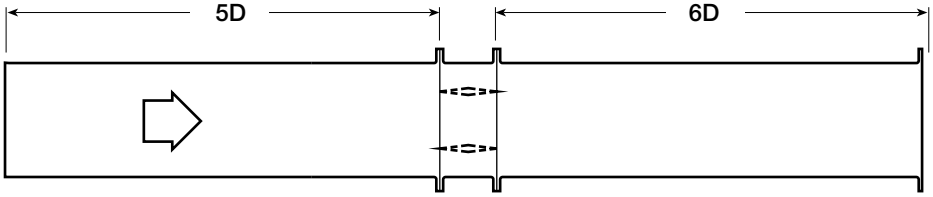
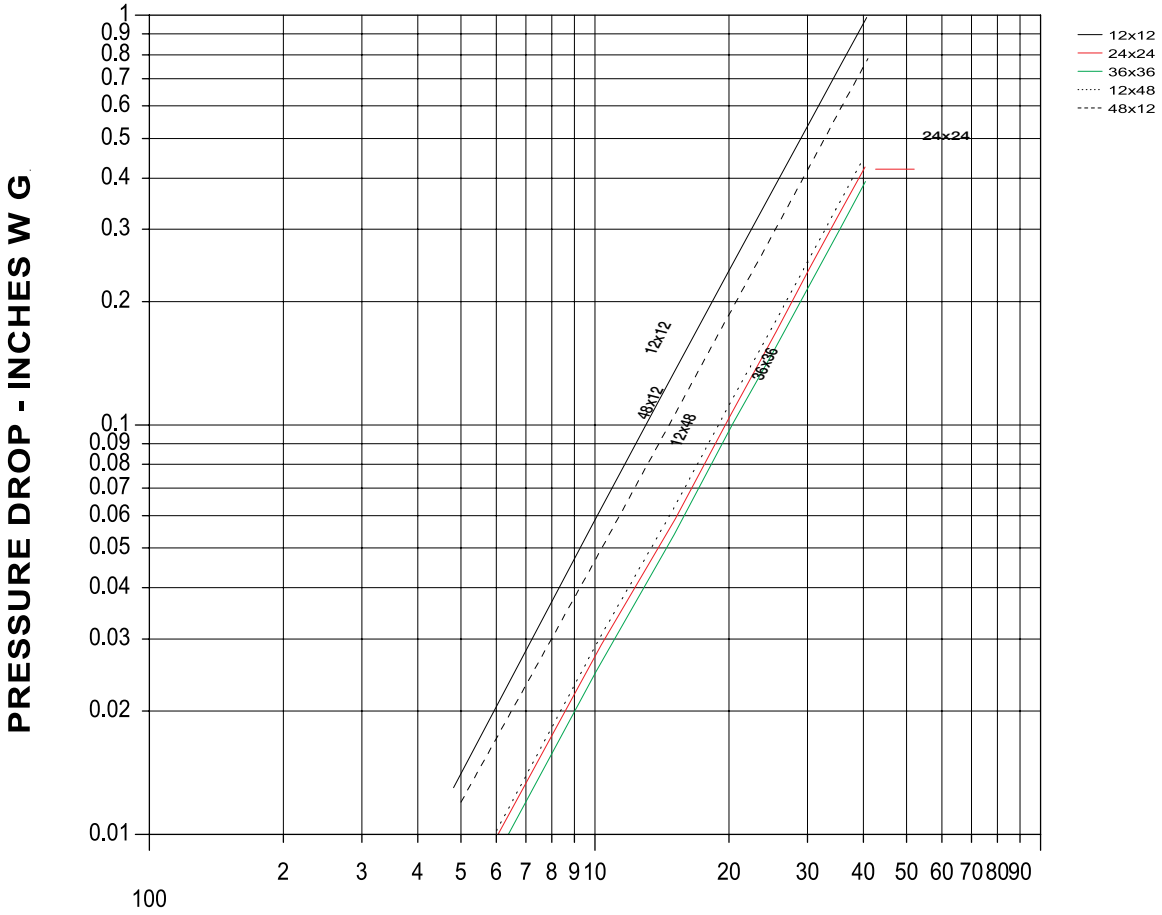
AMCA 5.3 Pressure Drop

IMO-311



VELOCITY VS. PRESSURE DROP



* Sizes are in inches.

FACE VELOCITY - FEET/MINUTE

AMCA FIG. 5.3

12 in. x 12 in. (305mm x 305mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.06
1500	0.13
2000	0.23
2500	0.37
3000	0.53
3500	0.73
4000	0.95

24 in. x 24 in. (610mm x 610mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.02
1500	0.06
2000	0.10
2500	0.16
3000	0.23
3500	0.32
4000	0.42

36in. x 36 in. (914mm x 914mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.02
1500	0.05
2000	0.09
2500	0.14
3000	0.21
3500	0.29
4000	0.38

12in. X 48 in. (305mm x 1219mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.02
1500	0.06
2000	0.10
2500	0.16
3000	0.24
3500	0.33
4000	0.43

48 in. x 12 in. (1219mm x 305mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.01
1000	0.04
1500	0.10
2000	0.18
2500	0.29
3000	0.42
3500	0.57
4000	0.74

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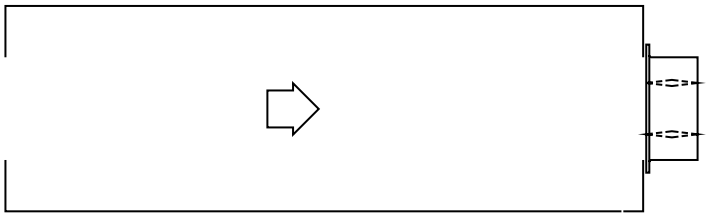
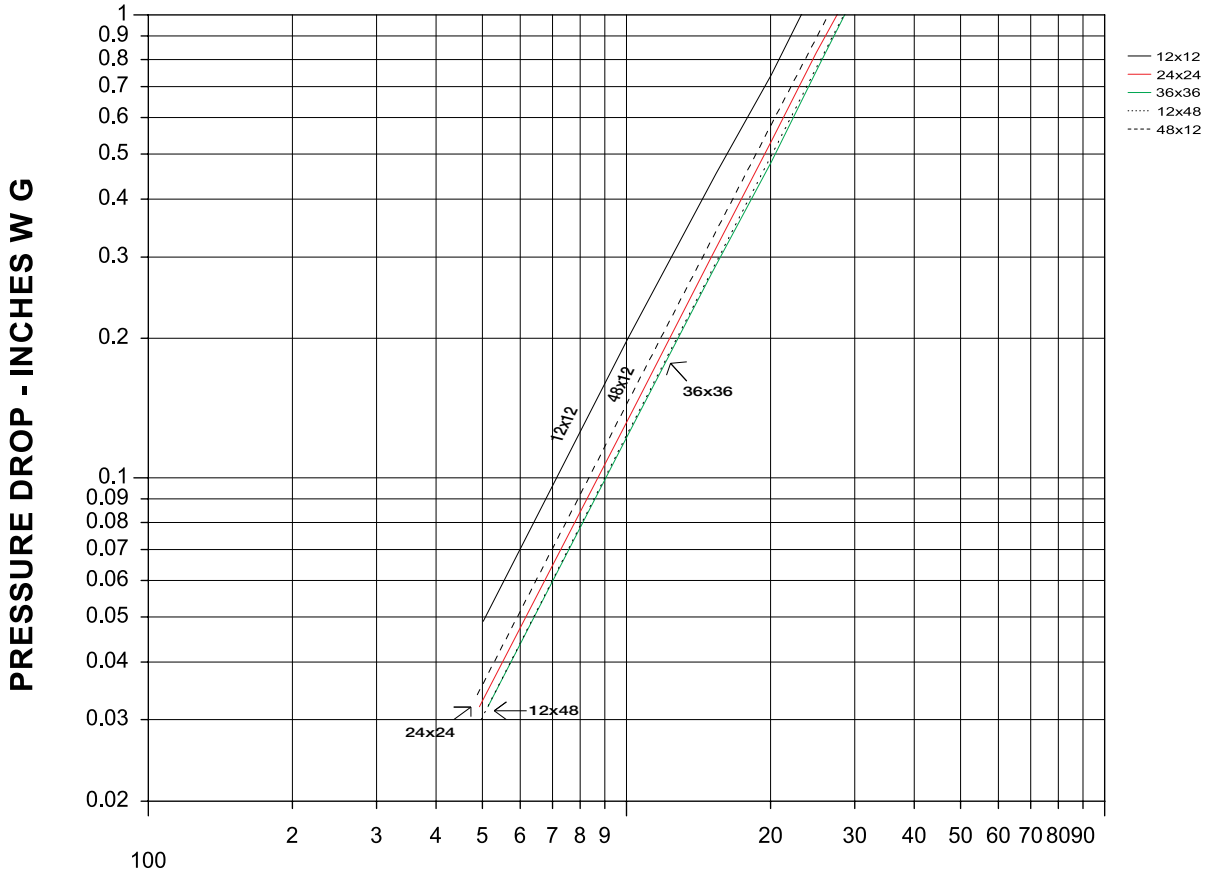
AMCA 5.5 Pressure Drop

IMO-311



VELOCITY VS. PRESSURE DROP



AMCA FIG. 5.5

* Sizes are in inches.

12 in. x 12 in. (305mm x 305mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.04
1000	0.18
1500	0.42
2000	0.75
2500	1.17
3000	1.68
3500	2.29
4000	2.09

24 in. x 24 in. (610mm x 610mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.03
1000	0.13
1500	0.29
2000	0.52
2500	0.81
3000	1.17
3500	1.60
4000	2.14

36in. x 36 in. (914mm x 914mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.03
1000	0.12
1500	0.27
2000	0.48
2500	0.75
3000	1.08
3500	1.48
4000	1.93

12in. X 48 in. (305mm x 1219mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.03
1000	0.12
1500	0.27
2000	0.49
2500	0.77
3000	1.11
3500	1.51
4000	1.97

48 in. x 12 in. (1219mm x 305mm)

Velocity (fpm)	Pressure Drop (in. wg)
500	0.03
1000	0.14
1500	0.32
2000	0.57
2500	0.89
3000	1.28
3500	1.75
4000	2.29

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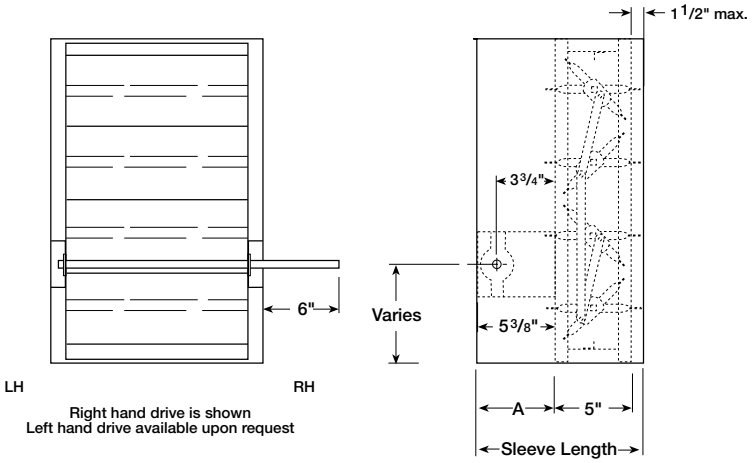
Application Data

Damper Sleeve Dimensional Data

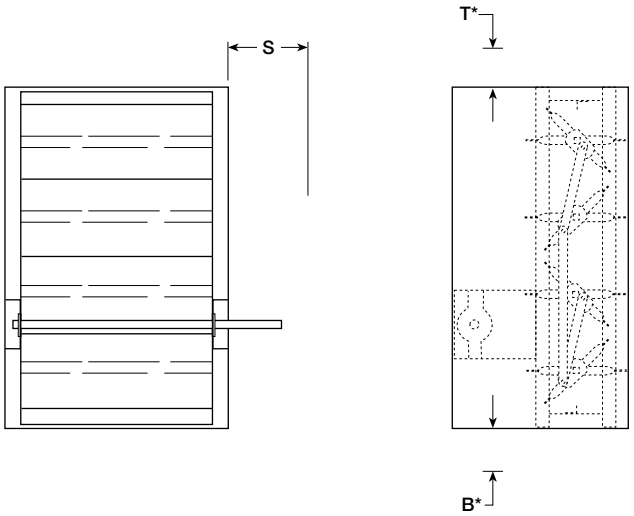
The drawings below and corresponding table show the position of the IMO-311 damper when mounted in a factory sleeve. The standard mounting locations provide enough space for the mounting of actuators, controls and allow space for installation of retaining angles and duct connections.

The standard location of a damper mounted in a factory sleeve ("A" dimension) is shown below. The damper can be positioned at other locations within a range of 6 in. (152mm) to 12 in. (305mm) for the "A" dimension.



	"A" Dimension	
	Standard	Maximum
All damper*	6 3/16 in. (157mm)	12 in. (305mm)
When H is 10 in. (254mm) or less w/ OCI or RRL	12 in. (305mm)	12 in. (305mm)

*With the exception of damper 10 in. (254mm) high.



Actuators and Accessories Space Envelopes

Externally mounted actuators always require space outside of the damper sleeve. The “S” dimension illustrates the clearance required for various available actuators.

On damper less than 18 in. (457mm) high, actuators may also require clearances above and/or below the sleeve. “B” and “T” dimensions are ***worst*** case clearance requirements for some damper less than 18 in. (457 mm) high. All damper sizes under 18 in. (457mm) high do not require these worst case clearances. If space availability above or below the damper sleeve is limited, each damper size should be individually evaluated.

Actuator Type/Model	B* With OCI or RRL	T* With OCI or RRL	S
120 Volt AC			
ML-4115 Series Honeywell	5 1/4 in. (133mm)	3/4 in. (19mm)	6 in. (152mm)
MS-4XXX Series Honeywell	6 in. (152mm)	3/8 in. (10mm)	6 in. (152mm)
24 Volt AC			
ML-8115 Series Honeywell	5 1/4 in. (133mm)	3/4 in. (19mm)	6 in. (152mm)
MS-8XXX Series Honeywell	6 in. (152mm)	3/8 in. (10mm)	6 in. (152mm)
MS-8120 Series Honeywell	6 in. (152mm)	3/8 in. (10mm)	6 in. (152mm)
Pneumatic (20 or 25 psi min.)			
331-4551 Powers	1 in. (25mm)	6 1/4 in. (159mm)	6 1/2 in. (165mm)
331-2976 Powers	2 3/8 in. (60mm)	12 1/8 in. (308mm)	9 1/4 in. (235mm)
MK2-7121 Barber-Colman	3 3/4 in. (95 mm)	16 1/2 in. (419mm)	10 in. (254mm)

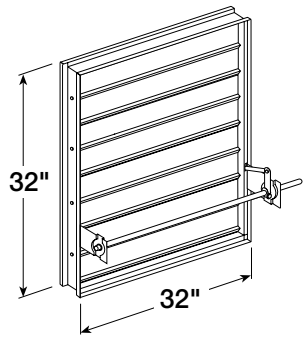
* For damper 18 in. (457mm) or more in height these dimensions are 0 in.

Specifications

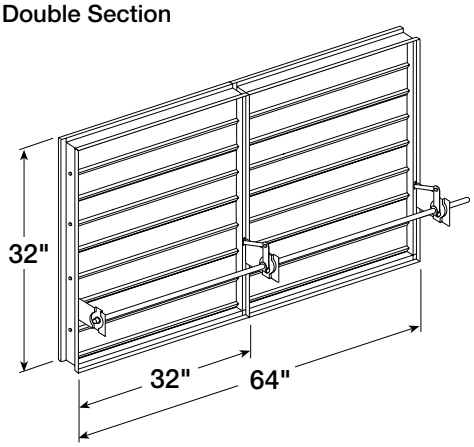
Damper Sizing Information

Dampers larger than maximum single section size are supplied as a factory assembly of two or more sections of equal size. The following figures show maximum damper section size and assembly configurations for multi-section damper.

Single Section



Double Section



Damper Weights- Weights are approximate and include actuators. Sizing is in inches (mm).

	Actual Size	weight- lb (kg)
IMO-311/ SSIMO-311	8 x 8 (203x203)	16 (7.3)
	10 x 10 (254x254)	19 (8.6)
	12 x12 (305x305)	22 (10)
	18 x 18 (457x457)	33 (15)
	20 x 20 (508x508)	36 (16.3)
	24 x 24 (610x610)	44 (20)
	30 x 30 (762x762)	57 (26)
	32 x 32 (813x813)	63 (28.5)
	64 x 32 (1626x813)	103 (46.7)

Specifications

Greenheck's marine combination fire smoke damper meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules.

Dampers shall consist of : a 16 gauge (1.5mm) galvanized steel channel frame with 14 in. (356mm) minimum depth and 1 1/2 in. (38mm) double flanges on 20 ga. (1mm) sleeve; double skin airfoil type blades fabricated from two layers of 20 ga. (1mm) galvanized steel; 1/2 in. (13mm) dia. plated steel axles turning in bronze bearings; and external (out of airstream) blade-to-blade linkage.

Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures up to 4 in. wg (1 kPa) velocities to 3000 fpm (15.24 m/s) and temperatures to 212ºF (100ºC).

Damper shall be equipped with blade and jamb seals for low leakage performance. Blade seals shall be silicone rubber for 400ºF (204ºC) maximum temperature. Jamb seals shall be flexible stainless steel.

Basis of design is Greenheck IMO-311.

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