Quality People. Building Solutions.

Comfort Systems USA (Arkansas), Inc.
P.O. Box 16620
Little Rock, AR 72231
Phone 501-834-3320
Fax 501-834-5416

Date: 3/11/2025
Return Request: 3/22/2024
Project: UAMS (CAMID)
Supplier: Middleton
Manufacturer: Various
Submittal: Air Duct Accessories Re-Submittal #1
Submittal Number: 23 33 00-01
Drawing # and Installation: Mechanical Drawings

ARCHITECT
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Kansas City, MO 64108
816-474-8237

ENGINEER
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GENERAL CONTRACTOR
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Notes:

CSUSA PROJECT NO.
22-6069
sean@comfortar.com

MIDDLETON, INC

P.O. BOX 506 BRYANT, AR 72089
TELEPHONE (501) 224-4888
LICENSE # 0225670422
Email: dsingleton@middletoninc.com

HVAC SUBMITTALS
03-11-25

PROJECT: UAMS Center for Animal Models of Infection & Disease
CONTRACTOR: Comfort Systems

PREPARED BY: David Singleton – **Middleton, Inc.**

CONTENTS

FURNISHED BY: **MIDDLETON, INC.**

Submittal Items : 23 33 00 – Revised **Pottorff- Fire / Smoke Dampers**
Pottorff- Fire Dampers
Pottorff- Louvers
Greenheck S.S. Bubble Dampers

CREATING CUSTOMERS FOR LIFE

POWERS

RESUBMITTAL

PRODUCT	Fire Smoke Dampers
MANUFACTURER	Pottorff
JOB NAME	UAMS Center for Animal Models of Infection & Disease
LOCATION	Little Rock, AR
ENGINEER	James R. Beecher
CONTRACTOR	Middleton Inc.
DATE	1/31/2025
SUBMITTED BY	Chris Atwood

5440 Northshore Drive - North Little Rock, Arkansas 72118 - Tel: 501.374.5420 Fax: 501.370.9298

** All Fire Smoke Dampers in round duct were revised to model FSD-125R true round dampers.

Project: UAMS Center for Animal Moc
Submittal Date: 1/31/2025
Submitted By: Chris Atwood

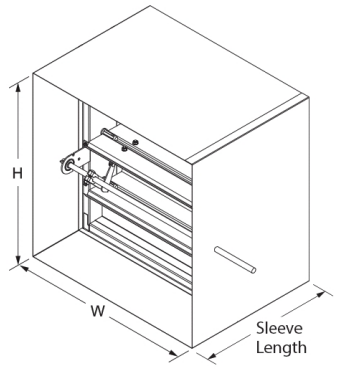
Submittal

Model FSD-141

Combination fire smoke damper, 1-1/2 hour, UL class 1, triple-V blade

General construction

Dimensions: Nominal (approximately 1/4" (6) undersize, sleeve thickness not included)
Material: Galvanized steel
Mount: Vertical
Frame: 5" x 1" (127x25) hat channel, 13 gauge equivalent
Blade style: 6" x 16 gauge, triple-v
Blade action: Parallel
Sleeve: Type: Sleeve
Axles: 1/2" (13) diameter plated steel hex
Linkage: Concealed in frame
Bearings: Stainless steel oilite, sleeve-type
Seals: Blade: Silicone; Jamb: Flexible stainless steel



Model FSD-141 with sleeve

Options

Angles: Type: Picture frame, 20 ga (2 sides)
PI-50 blade indicator: Configuration: One per actuator

Ratings

UL 555 fire resistance rating: 1-1/2 hour
UL 555S leakage class: 1 [8 cfm/sq.ft. @ 4 in.wg.] [(0.04m³/s/m²@1.0 kPa)]
UL HNLJ.V-5: Ventilation Duct Assemblies
Dynamic closure velocity (fpm): 2000
UL555S rated pressure (in.wg.): 4
Application temperature (°F): 250

Air Performance
Pottorff certifies that the model FSD-141 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 only.

Listings

UL 555 and 555S listing: R11767
CSFM listing: 3225-0368:110 and 3230-0368:111

Details

Line item	Tag	Qty	Dimensions (in.xxxx)		Sections	Sleeve or Side Plate			Actuator							
			W x H	D	Wide x High	L (in)	Gauge	Clr (in)	Qty	Model	Volt	Pos	Orien	Loc	Power consumption (per actuator)	Transformer sizing (VA) (per actuator)
1	FIRE SMOKE DAMPER	1	14 x 8		1 x 1	16	20	6	1	FSTF120	120V	PO	Perp	Ext/int	3.5VA	3.5
2	FIRE SMOKE DAMPER	1	12 x 8		1 x 1	16	20	6	1	FSTF120	120V	PO	Perp	Ext/int	3.5VA	3.5
3	FIRE SMOKE DAMPER	1	14 x 12		1 x 1	16	20	6	1	FSTF120	120V	PO	Perp	Ext/int	3.5VA	3.5
4	FIRE SMOKE DAMPER	1	22 x 18		1 x 1	16	20	6	1	FSNF120V	120V	PO	Perp	Ext/int	23VA	27
5	FIRE SMOKE DAMPER	1	60 x 30		2 x 1	16	20	6	1	FSNF120H	120V	PO	Perp	Ext/int	23VA	27

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at www.pottorff.com.

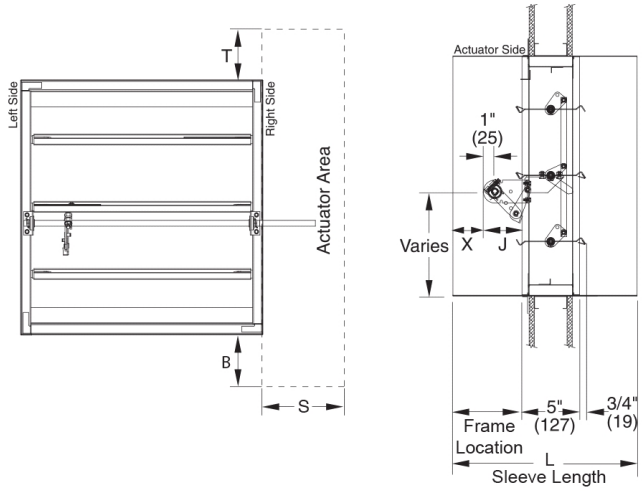
Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

Submittal

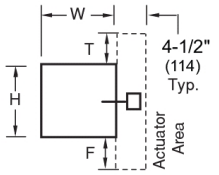
Model FSD-141

Actuator and Sleeve Interference Details

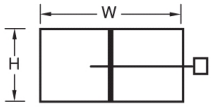


Model FSD-141

The drawings and corresponding table illustrate the position of the damper when mounted in a factory sleeve and the relative space required for a given actuator. The standard mounting locations provide enough space for installation of retaining angles and duct connections.



Detail #11-1



Detail #21-1

Dimensional Data

Line item	Tag	Qty	Dimensions (in.xxxx)		Sections	Sleeve or Side Plate		Actuator			Dimensional data (in)				
			W x H	D	Wide x High	L (in)	Clr (in)	Qty	Model	Detail	F	T	S	X	J
1	FIRE SMOKE DAMPER	1	14 x 8		1 x 1	16	6	1	FSTF120	#11-1	4	1	4.5	2.625	3.375
2	FIRE SMOKE DAMPER	1	12 x 8		1 x 1	16	6	1	FSTF120	#11-1	4	1	4.5	2.625	3.375
3	FIRE SMOKE DAMPER	1	14 x 12		1 x 1	16	6	1	FSTF120	#11-1	0	2	4.5	2.625	3.375
4	FIRE SMOKE DAMPER	1	22 x 18		1 x 1	16	6	1	FSNF120V	#11-1	0	1	4.5	2.625	3.375
5	FIRE SMOKE DAMPER	1	60 x 30		2 x 1	16	6	1	FSNF120H	#21-1	0	0	4.5	2.625	3.375

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Note: Dimensions in parentheses ( ) are millimeters.

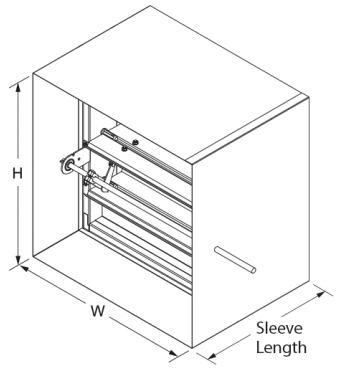
Submittal

Model FSD-141

Combination fire smoke damper, 1-1/2 hour, UL class 1, triple-V blade

General construction

Dimensions: Nominal (approximately 1/4" (6) undersize, sleeve thickness not included)
Material: Galvanized steel
Mount: Vertical
Frame: 5" x 1" (127x25) hat channel, 13 gauge equivalent
Blade style: 6" x 16 gauge, triple-v
Blade action: Parallel
Sleeve: Type: Sleeve
Axles: 1/2" (13) diameter plated steel hex
Linkage: Concealed in frame
Bearings: Stainless steel oilite, sleeve-type
Seals: Blade: Silicone; Jamb: Flexible stainless steel



Model FSD-141 with sleeve

Options

Angles: Type: Picture frame, 20 ga (2 sides)
PI-50 blade indicator: Configuration: One per actuator; Wiring: Separate connections

Ratings

UL 555 fire resistance rating: 1-1/2 hour
UL 555S leakage class: 1 [8 cfm/sq.ft. @ 4 in.wg.] [(0.04m³/s/m²@1.0 kPa)]
UL HNLJ.V-5: Ventilation Duct Assemblies
Dynamic closure velocity (fpm): 2000
UL555S rated pressure (in.wg.): 4
Application temperature (°F): 250

Air Performance
Pottorff certifies that the model FSD-141 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 only.

Listings

UL 555 and 555S listing: R11767
CSFM listing: 3225-0368:110 and 3230-0368:111

Details

Line item	Tag	Qty	Dimensions (in.xxxx)		Sections	Sleeve or Side Plate			Actuator							
			W x H	D	Wide x High	L (in)	Gauge	Clr (in)	Qty	Model	Volt	Pos	Orien	Loc	Power consumption (per actuator)	Transformer sizing (VA) (per actuator)
6	FIRE SMOKE DAMPER	1	80 x 24		3 x 1	16	20	6	2	FSNF120L	120V	PO	Perp	Ext/int	23VA	27

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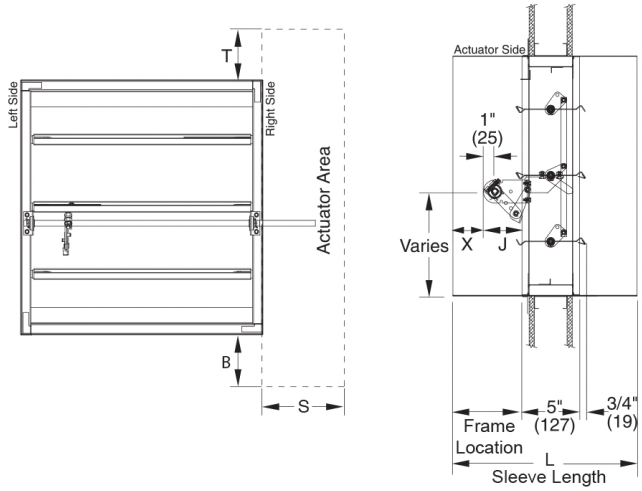
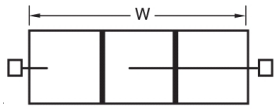
Note: Dimensions in parentheses ( ) are millimeters.

Submittal

Model FSD-141

Actuator and Sleeve Interference Details





Detail #31-2

Model FSD-141

The drawings and corresponding table illustrate the position of the damper when mounted in a factory sleeve and the relative space required for a given actuator. The standard mounting locations provide enough space for installation of retaining angles and duct connections.

Dimensional Data

Line item	Tag	Qty	Dimensions (in.xxxx)		Sections	Sleeve or Side Plate		Actuator			Dimensional data (in)				
			W x H	D	Wide x High	L (in)	Clr (in)	Qty	Model	Detail	F	T	S	X	J
6	FIRE SMOKE DAMPER	1	80 x 24		3 x 1	16	6	2	FSNF120L	#31-2	0	0	4.5	2.625	3.375

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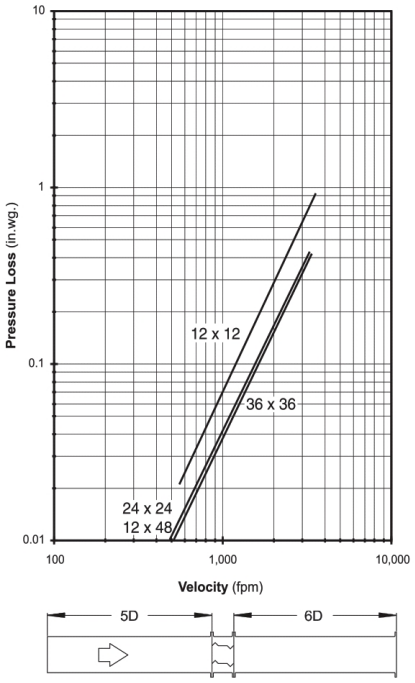
Note: Dimensions in parentheses ( ) are millimeters.

Submittal

Model FSD-141
Performance

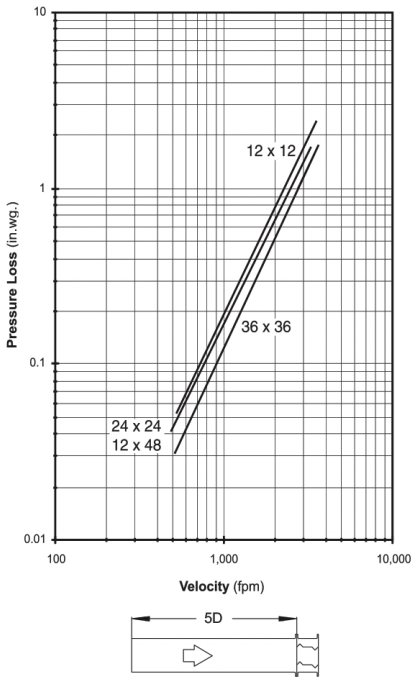
Pressure drop testing

Pressure drop testing was performed in accordance with AMCA Standard 500-D using the three configurations shown. All data has been corrected to represent air density of 0.075 lb/ft. Actual pressure drop in any ducted HVAC system is a combination of many elements. This information, along with analysis of other system influences, should be used to estimate actual pressure losses for a damper installed in a given HVAC system.



Ducted inlet and outlet

AMCA Figure 5.3 Illustrates a fully ducted damper. This configuration represents 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.



Ducted inlet

AMCA 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.

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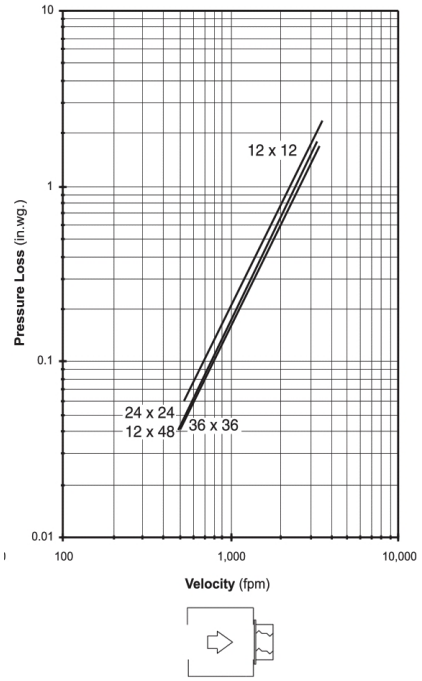

Plenum mount

AMCA 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.

Air Performance

Pottorff certifies that the model FSD141 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 only.

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Note: Dimensions in parentheses ( ) are millimeters.

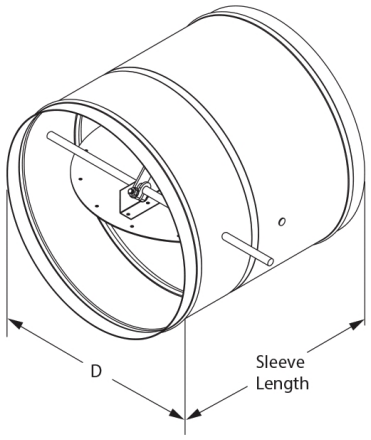
Submittal

Model FSD-125R

Combination fire smoke damper, 1-1/2 hour, UL class 1, round blade

General construction

Dimensions: Nominal (approximately 1/8" (3) undersize)
Material: Galvanized steel
Mount: Vertical
Sleeve: Type: Integral sleeve; Length (in): 16"; Gauge: 20; Clearance (in): 6"
Blade style: 14 gauge, round
Blade action: Single blade
Axles: 3/4" (19) diameter plated steel
Linkage: In the air-stream
Bearings: Bronze oilite, sleeve-type
Seals: Silicone blade edge seal
Fire closure temperature (°F): Primary: 165
Angles: Holding plate



Model FSD-125R with integral sleeve

Ratings

UL 555 fire resistance rating: 1-1/2 hour (vertical and horizontal)
UL 555S leakage class: 1 [8 cfm/sq.ft. @ 4 in.wg.] [(0.04m³/s/m²@1.0 kPa)]
Dynamic closure velocity (fpm): 2000
UL555S rated pressure (in.wg.): 4
Application temperature (°F): 250

Listings

UL555SListing: R11767
CSFM listing: 3225-0368:112 and 3230-0368:113

Details

Line item	Tag	Qty	Dimensions (in.xxxx)	Sleeve			Actuator						Power consumption	Transformer sizing (VA)
			D	L (in)	Gauge	Clr (in)	Qty	Model	Volt	Pos	Orien	Loc		
27	FSD ROUND	1	8	16	20	6	1	FSLF120-S	120V	PO	Perp	Ext	18VA	18
28	FSD ROUND	2	12	16	20	6	1	FSLF120-S	120V	PO	Perp	Ext	18VA	18
29	FSD ROUND	1	22	16	20	6	1	FSLF120-S	120V	PO	Perp	Ext	18VA	18
30	FSD ROUND	1	6	16	20	6	1	FSLF120-S	120V	PO	Perp	Ext	18VA	18

Notes: 5" DIAMETER NOT AVAILABLE. 6" IS MINIMUM SIZE.

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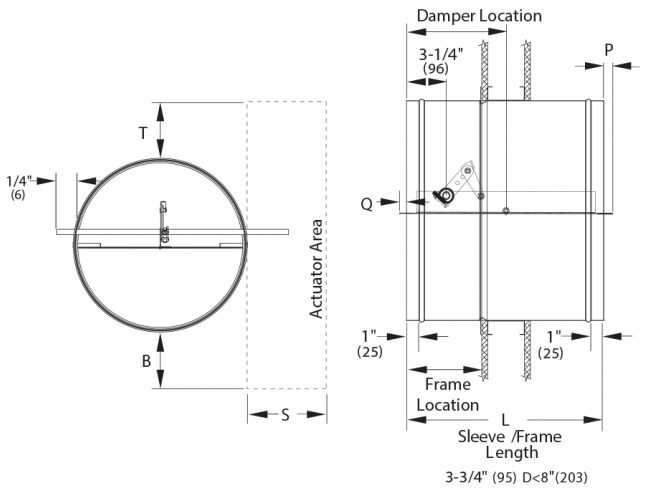
Note: Dimensions in parentheses ( ) are millimeters.

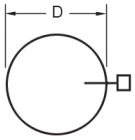
Submittal

Model FSD-125R

Actuator and Sleeve Interference Details



Model FSD-125R



Detail Round

Dimensional Data

Line item	Tag	Qty	Dimensions (in.xxxx)	Sleeve		Actuator			Dimensional data (in)				
			D	L (in)	Clr (in)	Qty	Model	Arrangement	F	T	S	P	Q
27	FSD ROUND	1	8	16	6	1	FSLF120-S	Round	2.5	0	6	0	0
28	FSD ROUND	2	12	16	6	1	FSLF120-S	Round	2.5	0	6	0	0
29	FSD ROUND	1	22	16	6	1	FSLF120-S	Round	2.5	0	6	3.5	2.25
30	FSD ROUND	1	6	16	6	1	FSLF120-S	Round	2.5	0	6	0	0

Notes: 5" DIAMETER NOT AVAILABLE. 6" IS MINIMUM SIZE.

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Information is subject to change without notice or obligation.

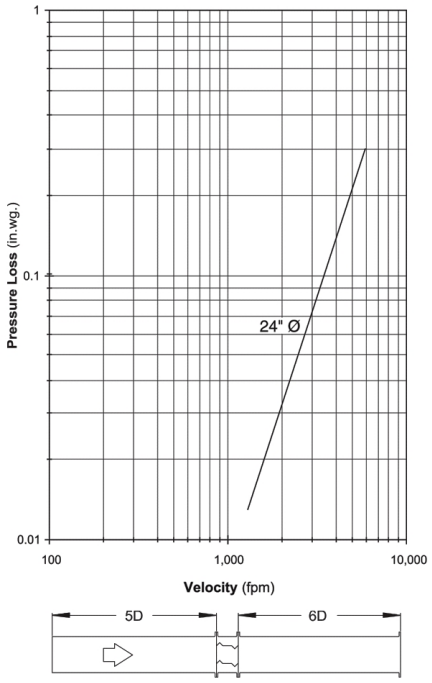
Note: Dimensions in parentheses ( ) are millimeters.

Submittal

Model FSD-125R
Performance

Pressure drop testing

Pressure drop testing was performed in accordance with AMCA Standard 500-D. All data has been corrected to represent air density of 0.075 lb/ft. Actual pressure drop in any ducted HVAC system is a combination of many elements. This information, along with analysis of other system influences, should be used to estimate actual pressure losses for a damper installed in a given HVAC system.



Ducted inlet and outlet

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at www.pottorff.com.

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POTTORFF®

model **HS-10**
fire closure device
one-temperature manually resettable

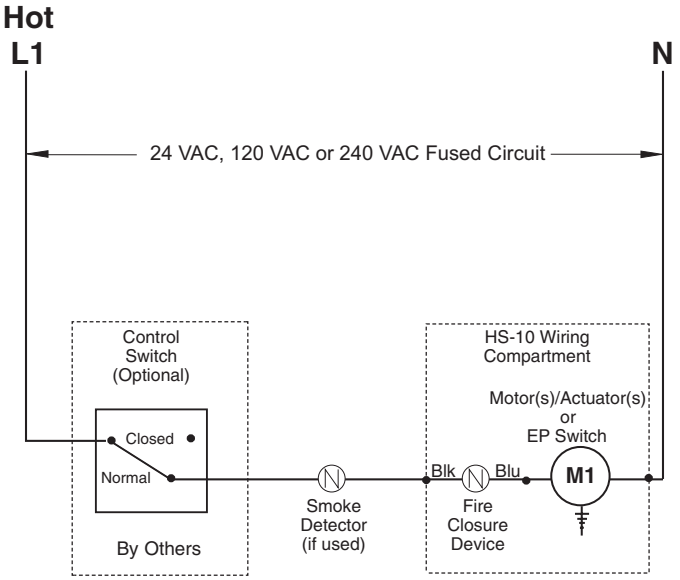
Application

The HS-10 fire closure device employs a one-temperature, manually resettable, electric thermostat sensor to interrupt the electrical power to actuators used on fire/smoke dampers to permit the controlled closure of the dampers. The HS-10 is designed to replace the fusible link. The HS-10 allows for damper testing per all NFPA specifications. The damper will close once power is removed from the HS-10 and will automatically reopen once power is restored.

Wiring Diagram

Control Switch Function

Normal



The damper remains open except in either of the following situations:

1 - The smoke detector cuts the power to the "Power-Open" motor/actuator.
2 - An elevated duct temperature causes the fire closure device to cut power to the "Power-Open" motor/operator. The damper will remain closed until the duct temperature has returned to a safe level. At that point the fire closure device can be manually reset, allowing the damper to be reopened.

Closed

The damper closes and remains closed regardless of any sensor signal.

Listings

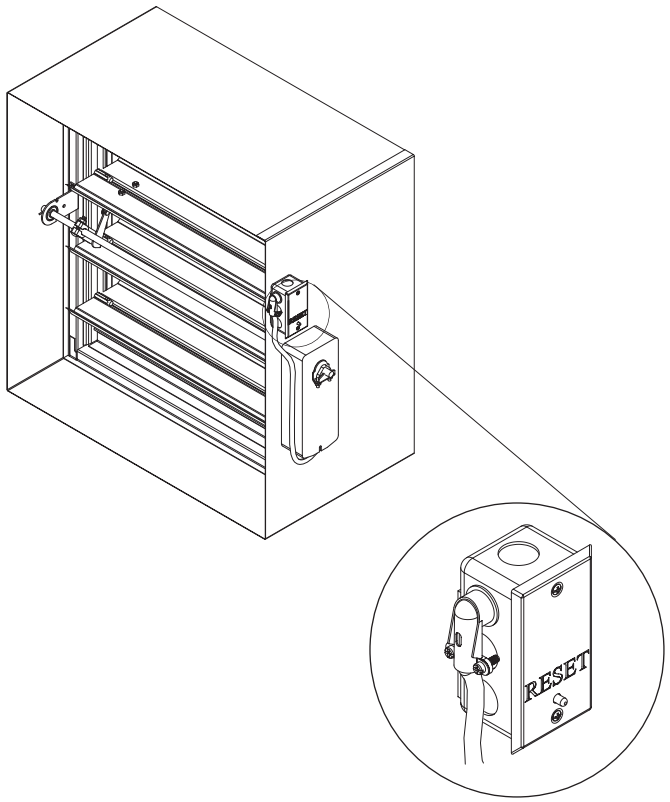
UL 555 listing: R11767

CSFM listing: 3225-0368:110, 3225-0368:111, 3225-0368:112, 3225-0368:113, 3225-0368:115, and 3225-0368:116.

New York City MEA listing: 295-98-E

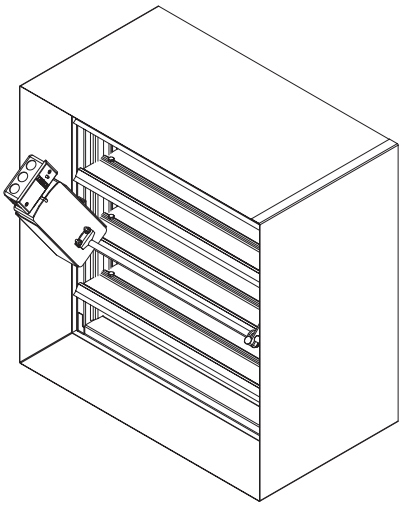
Meets NFPA Standards: 80, 90A, 92A, 92B, 101, and 105

Meets Building Code Standards: IBC, NBC, NFPA, SBC and UBC



Model **HS-10** external

Model **HS-10** internal



Information is subject to change without notice or obligation.

NOTE: Dimensions in parentheses ( ) are millimeters.

POTTORFF®

model **PI-50**
indicator switch package
in-jamb dual position

Application

The PI-50 indicator switch package employs an in-jamb assembly plate consisting of two single pole, double throw micro switches to provide full open and full closed blade indication from a remote location. The PI-50 indicator switch package is factory installed directly to a damper blade.

Ratings

125/250 VAC, 12A
250 VAC, 1/3HP; 125 VAC, 1/6HP
250 VDC, 1/4A; 125 VDC, 1/2A
Max. ambient temp. 257°F (125°C)

Listings

UL 555 listing: R11767

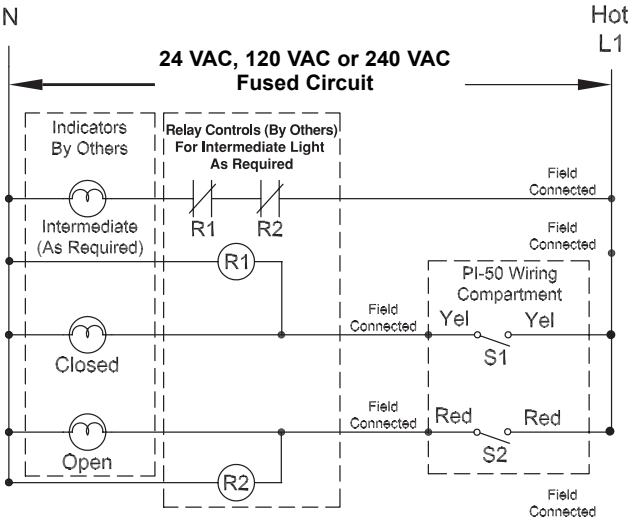
CSFM listing: 3225-0368:110, 3225-0368:111, 3225-0368:112, 3225-0368:113, 3225-0368:115, and 3225-0368:116.

New York City MEA listing: 295-98-E

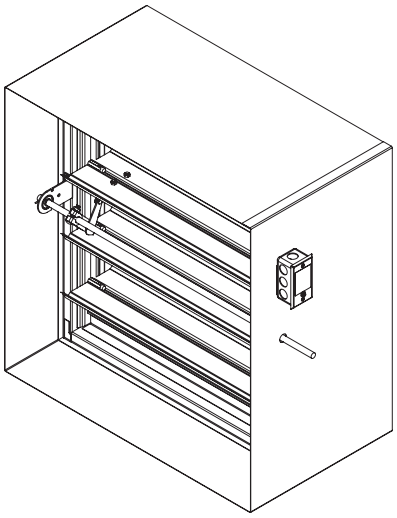
Meets NFPA Standards: 90A, 92A, 92B and 101

Meets Building Code Standards: IBC, NBC, NFPA, SBC and UBC

Wiring Diagram

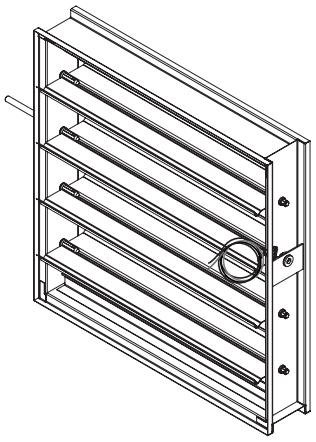


Verify continuity before final wiring.

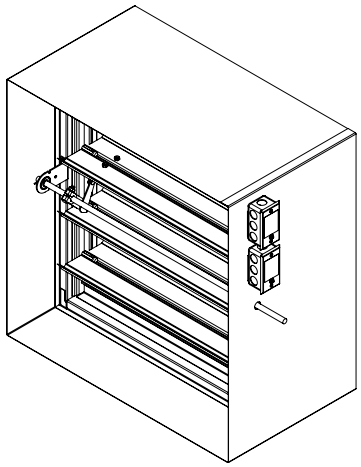


Model **PI-50** (sleeve option), external mount wiring box

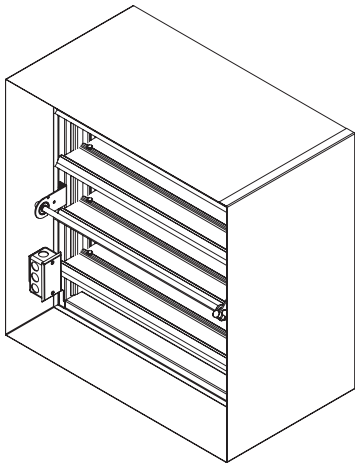
S1 & S2 - Damper position indicator switches.
S1 - Closes when damper is closed.
S2 - Closes when damper is open.
R1 - Relay control for intermediate position indication.
R2 - Relay control for intermediate position indication.



Model **PI-50** (no sleeve)



Model **PI-50** (sleeve and two per ordered size option), external mount wiring box (internal mount wiring box available)



Model **PI-50** (sleeve option), internal mount wiring box

Information is subject to change without notice or obligation.

NOTE: Dimensions in parentheses ( ) are millimeters.

BELIMO

FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

5 YEAR WARRANTY

LISTED 94 D5 TEMP. IND. & REG. EQUIP. c UL us

Application

The type FSLF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will meet requirements of UBC for 15 second opening and closing. Square footage of damper operated will depend on make and model and the temperature required.

Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

Technical Data		FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US
Power supply		
FSLF24(-S)(-FC) US		24 VAC ± 20%, 50/60 Hz
FSLF120(-S)(-FC) US		120 VAC ± 10%, 50/60 Hz
Power consumption	running	50/60 Hz, 15 VA
24 VAC	holding	50/60 Hz, 3.5 VA
	end stop	50/60 Hz 25 VA
120 VAC	running	50/60 Hz 18 VA
	holding	50/60 Hz 6.5 VA
	end stop	50/60 Hz 27 VA
Fusing*		
FSLF24		1 amp slow blow
FSLF120		0.25 amp slow blow
Transformer sizing		25 VA per 24 VAC actuator
Electrical connection		
FSLF24 US		3 ft, 18 ga, 2 color coded leads
FSLF120 US		3 ft, 18 ga, 3 color coded leads
FSLF...-S US		3 ft, 18 ga, appliance cable
Overload protection		electronic throughout 0 to 95° rotation auto-restart after temporary overload (FSLF120 US grounded enclosure)
Control		microprocessor
Angle of rotation		95°
Torque		30 in-lb [3.5 Nm] minimum from 32°F to 350°F [0°C to 177°C]
Direction of rotation	spring	can be selected by CCW/CW mounting
Position indication		visual indicator, 0° to 95°
Running time	motor	< 15 sec at rated voltage and torque 32°F to +122°F [0°C to +50°C]
	spring	<15 seconds at rated voltage and torque
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1
Housing material		zinc coated steel
Gears		permanently lubricated
Agency listings		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93
Servicing		maintenance free
Quality standard		ISO 9001
Weight		
FSLF24(-S) US		3.4 lbs [1.7 kg], (+ 0.3 lbs [+0.14 kg])
FSLF120(-S) US		4.0 lbs [1.8 kg], (+ 0.3 lbs [+0.14 kg])

FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US	
Auxiliary switch	2 x SPST 0.5 A inductive, 3A resistive @ 120/250VAC, minimum 1 mA @ 5 VDC, .3 A ind, .5A res @ 24VDC, UL listed, 10° and 85°. Double insulated ▣

SAFETY NOTES

The actuator contains no components which the user can replace or repair.
24 VAC Connect via safety isolating transformer, Class 2 supply.

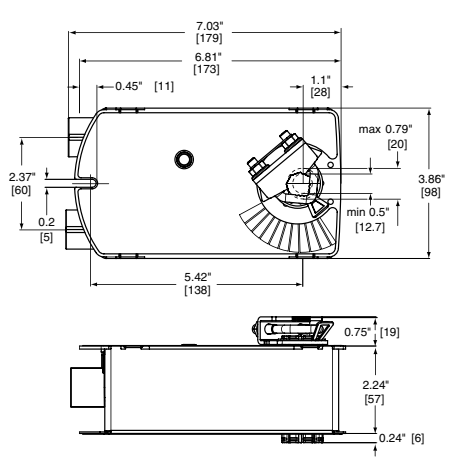
1/2" Threaded Connector

Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

3/8" Flex Connector (-FC models)

Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 1.2 Nm. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

Dimensions (Inches [mm])



***Individual Fusing or Breakers are not required by Belimo.**

The FSLF24 draws higher peak current when driving against any type of stop. Given the technology of fuses & breakers, this requires the value of fuse or breaker to be increased to avoid nuisance opening or tripping. A 1 amp slow blow should be used for 24VAC. A 0.25 amp slow blow should be used for 120VAC.

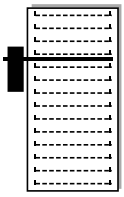
Subject to change. © Belimo Aircontrols (USA), Inc.

FSLF24(-S)(-FC) US, FSLF120(-S)(-FC) US

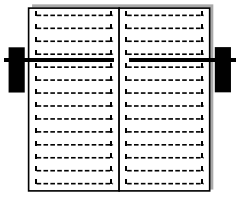
On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

Typical Applications

The typical fire and smoke damper requires from 5-15 in-lb of torque per square foot at 250°F - 350°F under dynamic load (2000 fpm velocity). The FSLF is a single section damper actuator. For the multi section dampers, use the FSNF series. This is a direct coupled actuator. If linkages are needed use the FSNF series.



Single section for one FSLF actuator



Two section for two FSLF actuators

Typical Specification

Smoke Control and Combination Fire and Smoke Control Damper Actuators

All smoke and combination fire and smoke dampers shall be provided with Belimo FSLF, FSNF, or FSAF actuators. No substitutions allowed. Damper and actuator shall have UL555S Listing for 250°F (350°F) and shall comply with UBC if required by local codes. Where proof of closure switches are required, blade switches, actuator auxiliary switches, or proximity switches are allowed.

Replacement Applications

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements. In some cases a permit and inspection may be required.

Go to **www.belimo.us/firesmoke** for a Cross Reference from old damper actuators to Belimo. Extensive retrofit installation instructions are available, along with technical training information.

CAUTION

Caution must be used when replacing failed motors with new Belimo actuators. Many old motors did not have internal springs and depended on external springs on the side of the damper or wrapped around the damper shaft to close the damper. Old motor springs must be removed or disabled. Do not remove fusible link springs if they had only fire and no smoke functions

In some cases, a BAE 165 or equal thermal sensor must be installed.

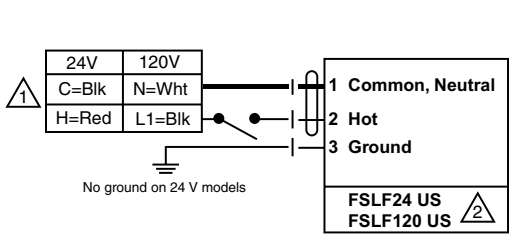
Wiring Diagrams

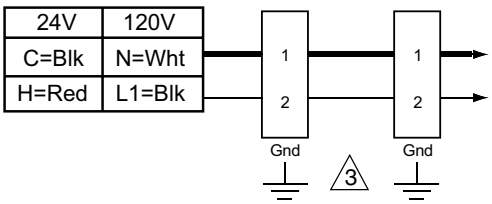
INSTALLATION NOTES

1. Provide overload protection and disconnect as required.
2. ***CAUTION** Equipment Damage!*
   Actuators may be connected in parallel.
   Power consumption and input impedance must be observed.
3. No ground on 24 V models
4. S4 makes to S6 when the actuator is powered open.
5. For end position indication, interlock control, fan startup, etc., FSLF24-S US and FSLF120-S US incorporate two built-in auxiliary switches.
6. Double insulated ⧈

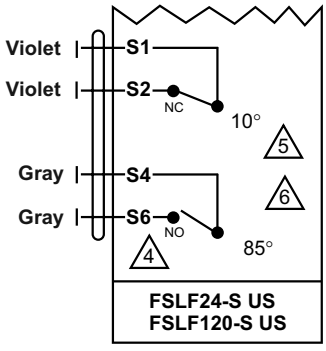
***WARNING** Live Electrical Components!*

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.





Parallel Actuator Wiring



Auxiliary switch wiring for FSLF24-S US, FSLF120-S US

Subject to change. © Belimo Aircontrols (USA), Inc.

FSNF24(-S)(-FC) US, FSNF120(-S)(-FC) US

On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

5 YEAR WARRANTY

LISTED 94 D5 TEMP.IND. & REG. EQUIP. c UL us

Application

The type FSNF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper and will open and close in 15 seconds at 350°F. Square footage of damper operated will depend on make and model of damper and the temperature 250°F or 350°F.

Operation

Mounting of the actuator to the damper axle shaft or jackshaft (3/8" to 1.05") is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

-FC Models have the same electrical and mechanical characteristics except instead of a 1/2" conduit connector a 3/8" screw flex connector is supplied.

Technical Data		FSNF24(-S)(-FC) US, FSNF120(-S)(-FC) US
Power supply		
FSNF24(-S)(-FC) US		24 VAC ± 20%, 50/60 Hz
FSNF120(-S)(-FC) US		120 VAC ± 10%, 50/60 Hz
Power consumption	running	17 W, 24 VA
24 VAC	holding	4 W, 6.5 VA
120 VAC	running	19 W, 23 VA, 0.19 A
	holding	6 W, 8.5 VA, 0.07 A
Fusing*		
FSNF24		2.5 amp slow blow
FSNF120		0.5 amp slow blow
Transformer sizing		40 VA per 24 VAC actuator
Electrical connection		
FSNF24 US		3 ft, 18 ga, 2 color coded leads
FSNF120 US		3 ft, 18 ga, 3 color coded leads
FSNF...-S US		3 ft, 18 ga, appliance cable
Overload protection		electronic throughout 0 to 95° rotation grounded enclosure, 120V
Control		microprocessor
Angle of rotation		95°
Torque		70 in-lb [7.9 Nm] minimum from 32°F to 350°F [0°C to 177°C]
Direction of rotation	spring	can be selected by CCW/CW mounting
Position indication		visual indicator, 0° to 95°
Running time		between 32°F and 350°F [0°C to 177°C] <15 seconds at rated voltage and torque
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 1
Housing material		zinc coated steel
Gears		steel, permanently lubricated
Agency listings		cULus listed to UL873 and CAN/CSA C22.2 No. 24 NYC Department of Buildings Materials and Equipment Acceptance Division MEA 197-07-M California State Fire Marshal Listing 3210-1593:101
Servicing		maintenance free
Quality standard		ISO 9001
Weight		
FSNF24(-S) US		6.0 lbs [2.75 kg], (+ 0.5 lbs [+.23 kg])
FSNF120(-S) US		6.7 lbs [3.0 kg], (+ 0.5 lbs [+.23 kg])

FSNF24-S US, FSNF120-S US, FSNF24-S-FC, FSNF120-S-FC	
Auxiliary switch	2xSPST 7A resistive, 2.5A inductive at 120V or 250V, UL Approved, double-insulated, one switch at 10°, one at 85°

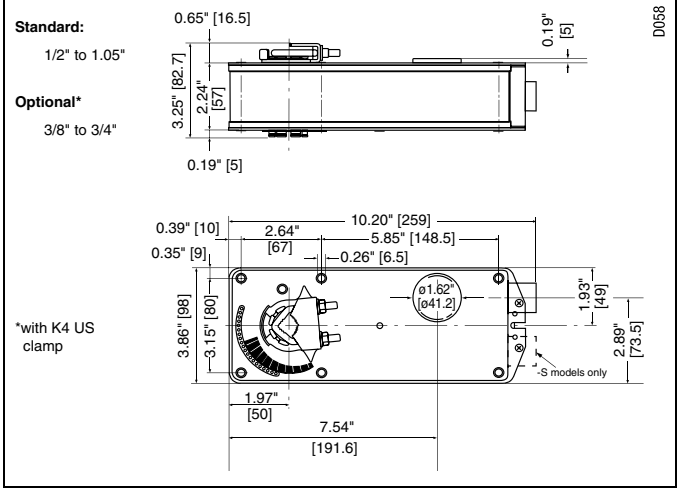
SAFETY NOTES

The actuator contains no components which the user can replace or repair.

1/2" Threaded Connector – Screw a conduit fitting into the actuator's metal bushing. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

3/8" Flexible Connector Models (-FC Screw Connector) – Mount the flexible conduit into the actuator's metal bushing by means of the provided screw with a torque of 0.9 ft-lb. Jacket the actuator's input wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

Dimensions (Inches [mm])



Accessories

All AF/NF linkages and parts except ZG-102 may be employed.

*** Individual Fusing or Breakers are not required by Belimo.**

The FSNF24 draws higher peak current when driving against any type of stop. Given the technology of fuses & breakers, this requires the value of fuse or breaker to be increased to avoid nuisance opening or tripping. A 2.5 amp slow blow should be used for 24VAC. A 0.5 amp slow blow should be used for 120VAC.

Transformers

Note that while a 100VA transformer would handle 2 actuators, a 4A breaker is insufficient.

Subject to change. © Belimo Aircontrols (USA), Inc.

FSNF24(-S)(-FC) US, FSNF120(-S)(-FC) US

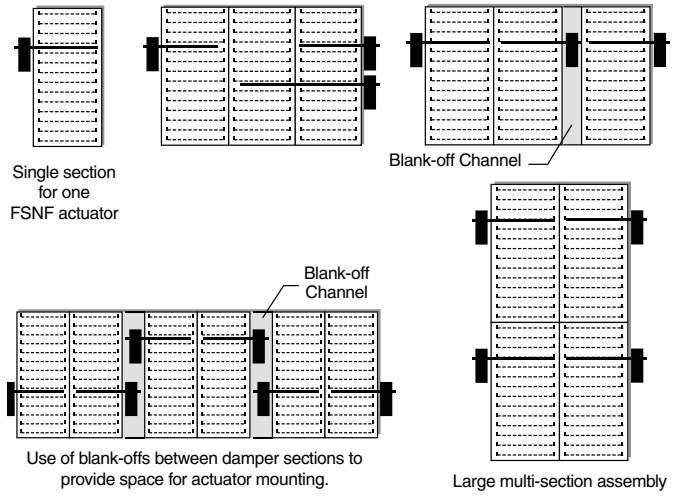
On/Off, Spring Return, 350°F for Half Hour, 15 Seconds Cycle Time

Typical Applications

Multi-section Damper Assemblies

The typical fire and smoke damper requires from 5-15 in-lb of torque per square foot at 250°F – 350°F under dynamic load (2400 fpm velocity). The FSNF will operate multi-section dampers using multiple actuators for multiple sections. Some of the methods used are shown below.

This is a direct coupled actuator. If linkages are needed use those for the FSAF series. Do not use the ZG-102 as close coupled actuators have a shortened life due to the high speed of the FSNF. Mounting at opposite ends of a jackshaft is OK.



Typical Specification

Smoke Control and Combination Fire and Smoke Control Damper Actuators

All smoke and combination fire and smoke dampers shall be provided with Belimo FSTF, FSLF, FSNF, or FSAF actuators. No substitutions allowed.

Damper and actuator shall have UL555S Listing for 250°F (350°F) and shall comply with UBC if required by local codes.

Where proof of closure switches are required, blade switches, actuator auxiliary switches, or proximity switches are allowed if permitted by local codes.

Replacement Applications

The number one "equal or better" requirement for use as a replacement for obsolete defective motors is the UL555S listing of the Belimo actuator with the damper for the application. The local authority having jurisdiction sets the requirements. In some cases a permit and inspection may be required.

Go to **www.belimo.us/firesmoke** for a Cross Reference from old damper actuators to Belimo. Extensive retrofit installation instructions are available, along with technical training information.

CAUTION

Caution must be used when replacing failed motors with new Belimo actuators. Many old motors did not have internal springs and depended on external springs on the side of the damper or wrapped around the damper shaft to close the damper. Old motor springs must be removed or disabled. Do not remove fusible link springs if they had only fire and no smoke functions

In some cases, a BAE 165 or equal thermal sensor must be installed.

Wiring Diagrams

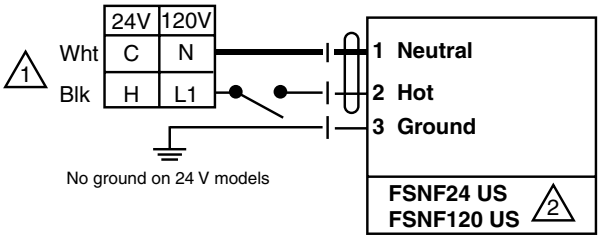
INSTALLATION NOTES

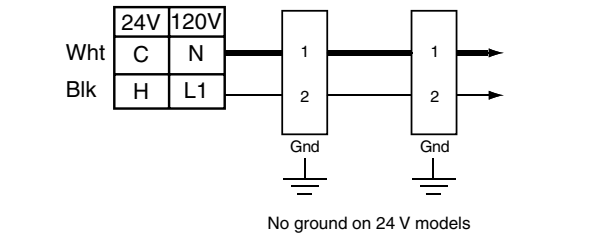
1 Provide overload protection and disconnect as required.

2 ***CAUTION** Equipment Damage!*
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.

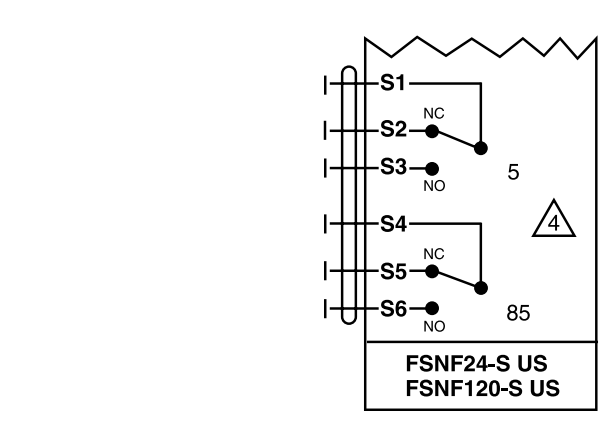
4 For end position indication, interlock control, fan startup, etc., FSNF24-S US and FSNF120-S US incorporate two built-in auxiliary switches:
2 x SPDT, 7A (2.5A inductive)@125/250 VAC, UL Approved, 10° and 85°.
Switch rating is for 250°F 1/2 hour only.

***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.





Parallel Actuator Wiring



Auxiliary switch wiring for FSNF24-S US, FSNF120-S US

Subject to change. © Belimo Aircontrols (USA), Inc.

BELIMO

FSTF120(-S) US

On/Off, Spring Return, 120 VAC

Torque min. 18 in-lb, for control of fire and smoke dampers

5 YEAR WARRANTY

LISTED 94 D5 TEMP. IND. & REG. EQUIP. c UL us

Application

The type FSTF spring-return actuator is intended for the operation of smoke and combination fire and smoke dampers in ventilation and air-conditioning systems. The actuator will meet requirements of UL555 and UL555S when tested as an assembly with the damper Square footage of damper operated will depend on make and model.

Operation

Mounting of the actuator to the damper axle shaft or jackshaft is via a cold-weld clamp. Teeth in the clamp and V-bolt dig into the metal of both solid and hollow shafts maintaining a perfect connection. The specially designed clamp will not crush hollow shafts. The bottom end of the actuator is held by an anti-rotation strap or by a stud provided by the damper manufacturer.

The actuator is mounted in its fail safe position with the damper blade(s) typically closed. Upon applying power, the actuator drives the damper to the open position. The internal spring is tensioned at the same time. If the power supply is interrupted, the spring moves the damper back to its fail-safe position.

SAFETY NOTE

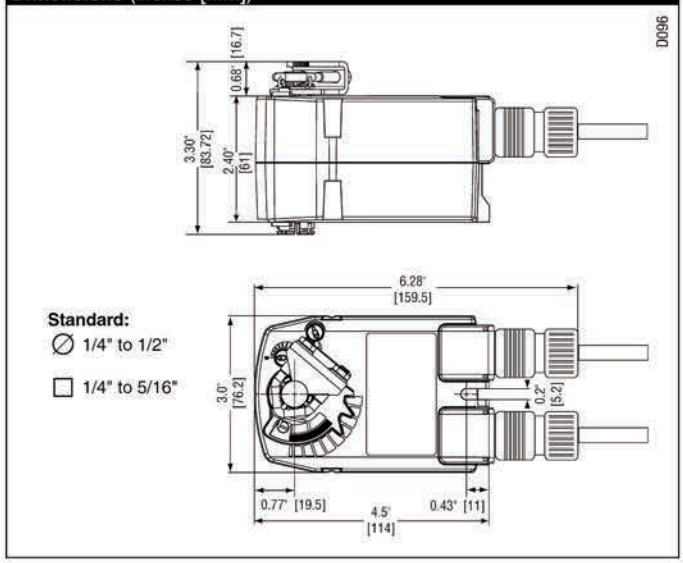
Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.

Technical Data		FSTF120(-S) US
Power supply	nominal	120 VAC, 60 Hz
	tolerance	108 to 132 VAC, 60 Hz
Power consumption	running	2 W, 3.5 VA
	holding	1.5 W, 2.5 VA
	max. inrush current	2.1A
Electrical connection (-S models have 2 cables)		3 ft, 18 GA appliance cable 1/2" conduit connector
Overload protection		electronic throughout 0 to 95° rotation
Electrical protection		actuators are double insulated
Angle of rotation		max 95°, adjust. with mechanical stop
Torque		min. 18 in-lb [2 Nm]
Direction of rotation		reversible with cw/ccw mounting
Position indication		visual indicator, 0° to 95° (0° spring return position)
Running time	motor	< 75 sec (0 to 18 in-lb)
	spring	< 25 sec @32°F to 122°F [0°C to 50°C]
Humidity		5 to 95% RH non-condensing
Ambient temperature		32°F to 122°F [0°C to 50°C]
Operating temperature		Up to 250°F for 1/2 hour per UL555S test
Housing		NEMA type 2 / IP42, UL enclosure type 2
Housing material		UL94-5VA. UL2043 Listed for plenum use
Agency listings†		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02). UL2043 smoke rated
Noise level (max)	running	< 50 db (A)
	spring return	62 dB (A)
	holding	inaudible
Servicing		maintenance free
Quality standard		ISO 9001
Weight	FSTF120 US	1.26 lbs (0.57 kg)
	FSTF120-S US	1.5 lbs (0.68 kg)

† Rated Impulse Voltage 4kV, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

FSTF120-S US	
Auxiliary switch	2 x SPST 3A (0.5A) @ 120 VAC, UL approved One fixed at 10° and one fixed at 80°

Dimensions (Inches [mm])



FSTF120(-S) US

On/Off, Spring Return, 120 VAC

Accessories

Tool-06	8mm and 10 mm wrench
KH-TF	Crank arm for up to 1/2" round shaft
ZG-TF2	Crank arm adaptor kit for FSTF
ZG-TF112	Mounting bracket, kit for FSTF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
10379-00001	Limit stop

NOTE: When using FSTF120 US and FSTF120-S US actuators, only use accessories listed on this page or those provided by damper manufacturers.

For actuator wiring information and diagrams, refer to Belimo Wiring Guide.

Typical Specification

On/Off fire and smoke spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 1/2" diameter and center a 1/2" shaft. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switches shall be provided. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

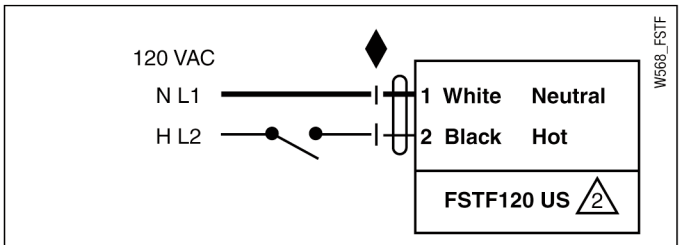
2 ***CAUTION** Equipment Damage!*
Actuators may be connected in parallel.
Power consumption must be observed.

4 Two SPST auxiliary switches for position indication. NC switch opens at 10° and NO switch closes at 80°

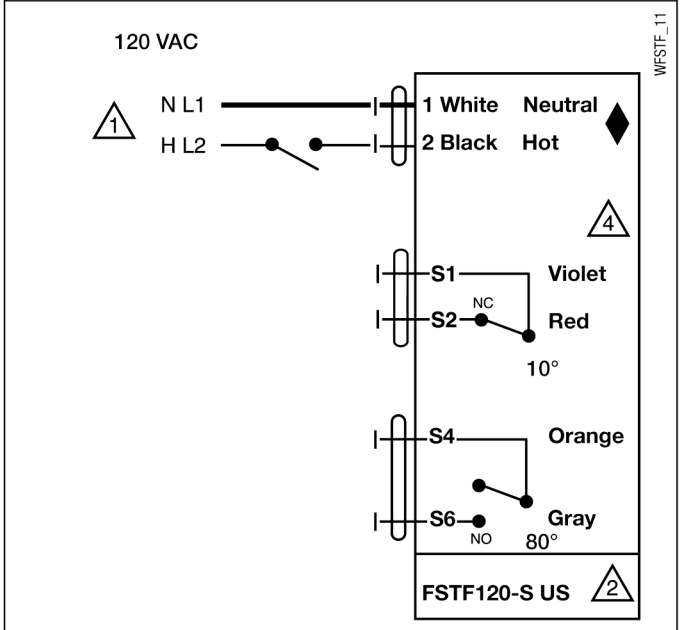
APPLICATION NOTES

Meets cULus requirements without the need of an electrical ground connection.

***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



On/Off wiring for FSTF120 US



On/Off wiring for FSTF120-S US

CREATING CUSTOMERS FOR LIFE

POWERS

RESUBMITTAL

PRODUCT	Fire Damper
MANUFACTURER	Pottorff
JOB NAME	UAMS Center for Animal Models of Infection & Disease
LOCATION	Little Rock, AR
ENGINEER	James R. Beecher
CONTRACTOR	Middleton Inc.
DATE	1/31/2025
SUBMITTED BY	Chris Atwood

5440 Northshore Drive - North Little Rock, Arkansas 72118 - Tel: 501.374.5420 Fax: 501.370.9298

** This fire damper was kept in the submittal as it is located near the inlet of VAV-161 on Sheet M1.02, tagged "FD-1". ASI#01 has increased the size to 10" diameter. Please advise if this is supposed to be another type of damper.

Project: UAMS Center for Animal Moc
Submittal Date: 1/31/2025
Submitted By: Chris Atwood

Submittal

Model VFD-10D

Fire damper, 1-1/2 hour, dynamic rated, curtain blade

General construction

Dimensions: Nominal (approximately 1/4" (6) undersize)
Material: Galvanized steel
Application mount: Vertical
Frame: 20 gauge
Blade style: 24 gauge, curtain
Fire closure device: Fusible link
Fire closure temperature (°F): 165

Options

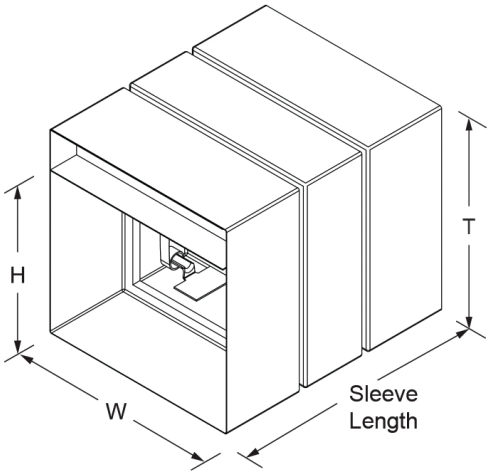
Style: B
Sleeve: Type: Integral sleeve; Length (in): 12; Gauge: 20; Clearance (in): 4.25
Transition: Front: Type: Round; Ship: Mounted
Transition: Rear: Type: Round; Ship: Mounted
PI-10 blade indicator: Configuration:One per ordered size; Ship: Mounted; Mount: External
Angles: Type: Picture frame, 20 ga (2 sides)

Ratings

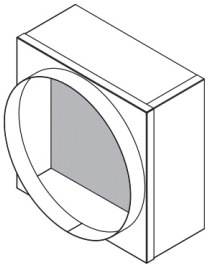
UL 555 fire resistance rating: 1-1/2 hour (vertical and horizontal)
UL HNLJ.V-5: Ventilation Duct Assemblies
Dynamic closure velocity (fpm): 2000
UL555S rated pressure (in.wg.): 4

Listings

UL 555 listing: R11767
CSFM listing: 3225-0368:101



Model VFD-10D-B with integral sleeve



Round transition

Details

Line Item	Tag	Qty	Duct (in.xxxx)		Sections	Damper assembly (in.xxxx)
			W x H	D	Wide x High	W x T (in)
10	FIRE DAMPER @ VAV-161 (size increased per ASI#01)	1	10 x 10	10	1 x 1	10 x 12

This submittal sheet reflects only the construction and options selected and is not indicative of all constructions and options that are available for the product. For more information, please contact your local representative or visit us at www.pottorff.com.

Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

Application

The PI-10 indicator switch package employs a single pole and double throw micro switches to provide full closed blade indication on curtain style dampers from a remote location. The PI-10 indicator switch package can be factory installed directly to a damper frame, sleeve, or shipped loose for field mounting.

Ratings

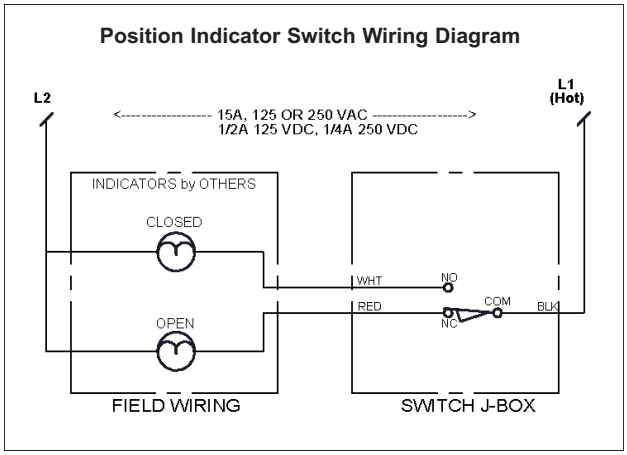
15A/125 or 250 VAC
10A/24 VAC
1.5A/ 124 VDC

Maximum Temperature: -13°F to 176°F (-25°C to 80°C)

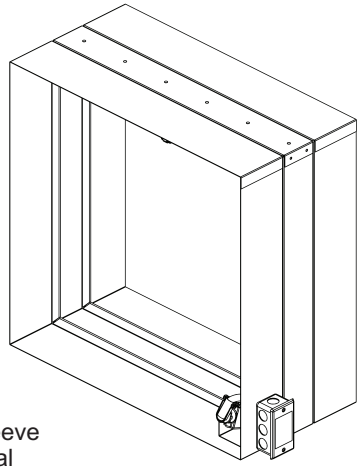
Listings

UL 1054 listing: E12252

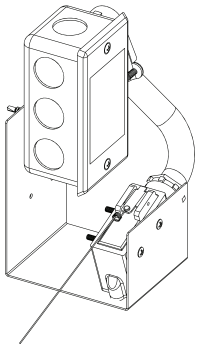
Wiring Diagram



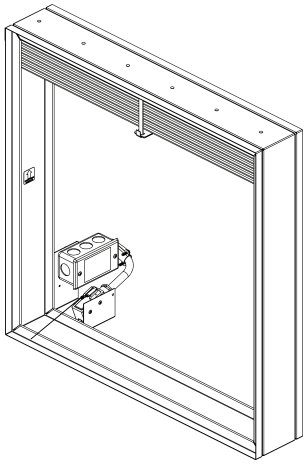
Verify continuity before final wiring.



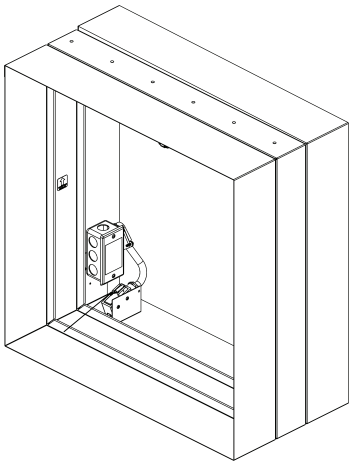
Model **PI-10** (sleeve option), external mount wiring box



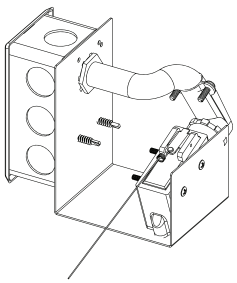
PI-10 Ship Loose - Internal Mount



Model **PI-10** (no sleeve)



Model **PI-10** (sleeve option), internal mount wiring box



PI-10 Ship Loose - External Mount

Information is subject to change without notice or obligation.

NOTE: Dimensions in parentheses ( ) are millimeters.

CREATING CUSTOMERS FOR LIFE

POWERS

RESUBMITTAL

PRODUCT	Louvers
MANUFACTURER	Pottorff
JOB NAME	UAMS Center for Animal Models of Infection & Disease
LOCATION	Little Rock, AR
ENGINEER	James R. Beecher
CONTRACTOR	Middleton Inc.
DATE	1/31/2025
SUBMITTED BY	Chris Atwood

5440 Northshore Drive - North Little Rock, Arkansas 72118 - Tel: 501.374.5420 Fax: 501.370.9298

** Performance data has been included for these louvers.

Project: UAMS Center for Animal Moc
Submittal Date: 1/31/2025
Submitted By: Chris Atwood

Submittal

Model ECV-545

Extruded aluminum louver, 5" deep, 45 degree vertical blade

General construction

Dimensions: Nominal (approximately 1/2" (12) undersized)
Material: 6063-T6 extruded aluminum
Material thickness (in): 0.081
Frame: 5" deep channel
Blade orientation: Right (standard)
Flange type: No flange
Blade: 45° chevron style

Options

Screen 1 configuration: Material: Aluminum; Type: Bird screen; Pattern: 3/4" x 0.050"
Screen 1 finish: Match louver
Installation hardware: Continuous angles
Finish: Baked enamel, Standard color name: TBD
Finish warranty: 5 years
Sill flashing: Closed end
Sill flashing depth: 5"

Ratings

Free area: [48" x 48" (1219 x 1219) unit]: 8.7 ft² (0.81 m²) 54.8% (1 side)
Velocity @ 0.15 in.wg. Pressure Loss: 912 fpm (4.63 m/s)
Std. Design Load: 130 psf

Listings

AMCA CRP Listing: 'Air, Water, Wind'
AMCA: 540 (impact resistant), 550 (high velocity rain resistant)

Performance at beginning point of water penetration

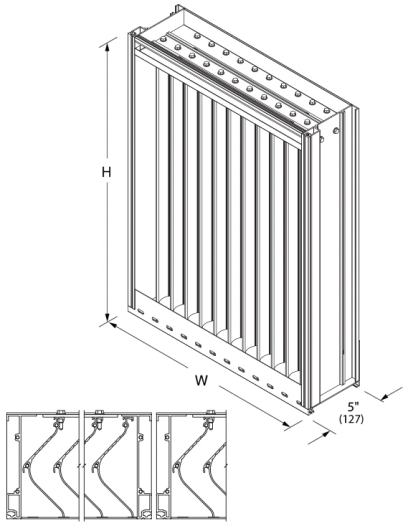
Free area velocity: 1250 fpm (6.35 m/s)
Air volume delivered: 10963 cfm (5.17 m³/s)
Pressure loss: 0.28 in.wg. (70 Pa)

Wind Driven Rain Performance – AMCA 500-L [29 mph, 3 in/hr]

Airflow and core velocity:: 10601 CFM; 985 FPM
Effectivness Ratio (%): 100
Wind class: A (effectiveness, 1.000 to 0.99)
Discharge class: 3 (loss coefficient = 0.2 to 0.299)

Wind Driven Rain Performance – AMCA 500-L [50 mph, 8 in/hr]

Airflow and core velocity:: 10605 CFM; 985 FPM
Effectivness Ratio (%): 99.7
Wind class: A (effectiveness, 1.000 to 0.99)
Discharge class: 3 (loss coefficient = 0.2 to 0.299)



Model ECV-545

Details

Line item	Tag	Qty	Louver size (in.xxxx)	Sections	Ratings			Free area		Approx. weight (lbs)
			W x H	Wide x High	CFM	FPM	PD (in.w.g.)	ft²	%	
16	LOUVER L-1	1	120 x 48	1 x 1	25000	1108	0.24	22.57	57.3	220

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Note that performance data in the details section of this submittal are calculated values, and are not AMCA certified.

Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

Submittal

Model ECV-545

Extruded aluminum louver, 5" deep, 45 degree vertical blade

General construction

Dimensions: Nominal (approximately 1/2" (12) undersized)
Material: 6063-T6 extruded aluminum
Material thickness (in): 0.081
Frame: 5" deep channel
Blade orientation: Right (standard)
Flange type: No flange
Blade: 45° chevron style
Screen 1 configuration: Material: Aluminum; Type: Bird screen; Pattern: 1/2" x 0.063"

Options

Screen 1 finish: Match louver
Installation hardware: Continuous angles
Finish: Baked enamel, Standard color name: TBD
Finish warranty: 5 years

Ratings

Free area: [48" x 48" (1219 x 1219) unit]: 8.7 ft² (0.81 m²) 54.8% (1 side)
Velocity @ 0.15 in.wg. Pressure Loss: 912 fpm (4.63 m/s)
Std. Design Load: 130 psf

Listings

AMCA CRP Listing: 'Air, Water, Wind'
AMCA: 540 (impact resistant), 550 (high velocity rain resistant)

Performance at beginning point of water penetration

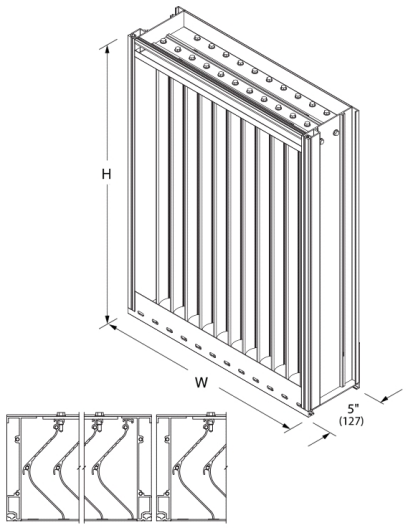
Free area velocity: 1250 fpm (6.35 m/s)
Air volume delivered: 10963 cfm (5.17 m³/s)
Pressure loss: 0.28 in.wg. (70 Pa)

Wind Driven Rain Performance – AMCA 500-L [29 mph, 3 in/hr]

Airflow and core velocity:: 10601 CFM; 985 FPM
Effectivness Ratio (%): 100
Wind class: A (effectiveness, 1.000 to 0.99)
Discharge class: 3 (loss coefficient = 0.2 to 0.299)

Wind Driven Rain Performance – AMCA 500-L [50 mph, 8 in/hr]

Airflow and core velocity:: 10605 CFM; 985 FPM
Effectivness Ratio (%): 99.7
Wind class: A (effectiveness, 1.000 to 0.99)
Discharge class: 3 (loss coefficient = 0.2 to 0.299)



Model ECV-545

Details

Line item	Tag	Qty	Louver size (in.xxxx)	Sections	Ratings			Free area		Approx. weight (lbs)
			W x H	Wide x High	CFM	FPM	PD (in.w.g.)	ft²	%	
17	LOUVER L-2	1	30 x 56	1 x 1	3000	498	0.05	6.03	53	66

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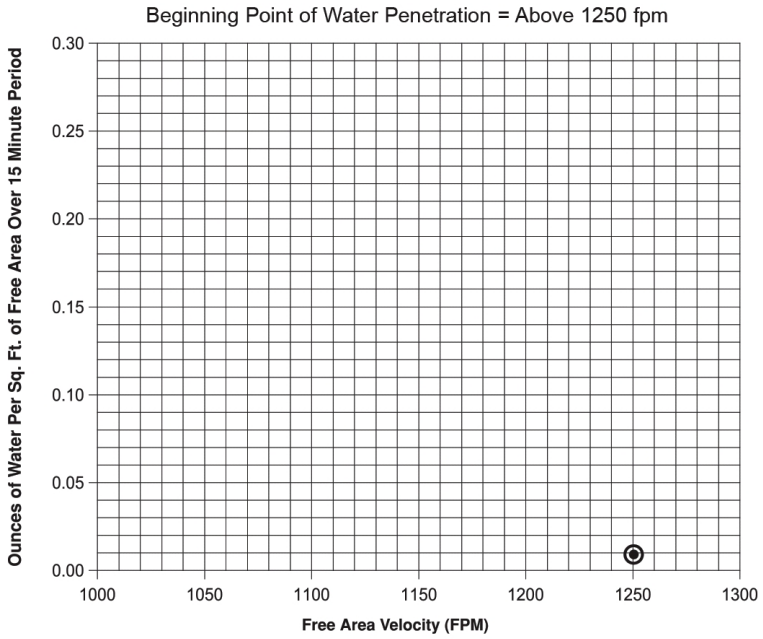
Submittal

Model ECV-545

Performance



HIGH VELOCITY
RAIN RESISTANT
AND IMPACT RESISTANT
LOUVER
Enhanced Protection
See www.AMCA.org for all certified or listed products

This label does not signify AMCA certified performance certification

Water penetration

AMCA defines the beginning point of water penetration as the free area velocity at the intersection of a simple linear regression of test data and the line of 0.01 ounces of water per square foot of free area and is measured through a 48" x 48" louver during a 15 minute period. The AMCA water penetration test provides a method for comparing louver models and designs as to their efficiency in resisting the penetration of rainfall under specific lab conditions. Pottorff recommends that intake louvers are selected with a reasonable margin of safety below the beginning point of water penetration in order to avoid unwanted penetration during severe storm conditions.

AMCA 540, and AMCA 550

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Information is subject to change without notice or obligation.

Note: Dimensions in parentheses ( ) are millimeters.

POTTORFF®

Standard Finish colors for aluminum products and acoustical louvers

Apollo White M-18136 M-19136	**Bone White** M-18137 M-19137	**Colonial White** M-18138 M-19138	**Ivory** M-18162 M-19162	**Sandstone** M-18139 M-19139
Nantucket Dune M-18140 M-19140	**Beige** M-18141 M-19141	**Seawolf** M-18142 M-19142	**Fashion Gray** M-18143 M-19143	**Colonial Gray** M-18144 M-19144
Charcoal Gray M-18145 M-19145	**Light Blue** M-18146 M-19146	**Interstate Blue** M-18147 M-19147	**Aged Copper** M-18148 M-19148	**Hartford Green** M-18149 M-19149
Brick Red M-18150 M-19150	**Burgundy** M-18151 M-19151	**Sage Brown** M-18152 M-19152	**Statuary Bronze** M-18153 M-19153	**Black** M-18154 M-19154

The first M number is for the standard Fluoropolymer finish and the second number is for the same color in Polyester.

Premium Pearl finish colors for aluminum products and acoustical louvers

El Cajon Silver M-18155 M-19155	**Champagne** M-18156 M-19156	**Light Bronze** M-18157 M-19157	**Medium Bronze** M-18158 M-19158	**Dark Bronze** M-18159 M-19159

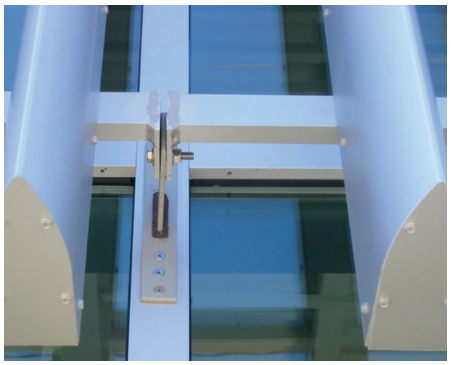
Premium Pearl colors use mica pigments to simulate the appearance of anodized finishes. The first M number is for the standard Fluoropolymer finish and the second number is for the same color in Polyester.

The color samples shown are not the actual paint. The samples are as close as possible to actual colors offered. Actual coating samples are available upon request. Please call us at 817-509-2300 or e-mail us at info@pottorff.com to request a sample of our color chart.

Our superior performance paint systems are available in a wide range of colors and we can also custom color match to any of your specifications. Our expertise in applying architectural coatings assures you of a high quality finish. With our color options, you get the color you need when you need it!

PRODUCT FACTS

Finish Type	Description/Application	Color Selection	Warranty
Fluoropolymer Decaflon and Newlar meet AAMA 2605. Dry film thickness 2 mil. equivalent to Kynar 500®/Hylar 5000®, Duranar®, Fluoropon®	Our premier finish for extruded aluminum. Tough, long lasting, environmentally friendly powder coating has superior color retention and abrasive properties. Resists chalking, fading, chemical abrasion and weathering.	Standard Colors: 20 standard colors plus Premium Pearl finishes. Custom colors are available. Consult factory.	10 Years (consult factory for availability of extended warranty up to 20 years).
Polyester Powder Coat meets AAMA 2604 dry film thickness 2 mil. equivalent to Baked Enamel.	Environmentally friendly powder coating has good color retention and abrasive properties. Resists chalking, fading, chemical abrasion and weathering.	20 standard colors for aluminum products and acoustical louvers, 18 colors for steel. Custom colors are available. Consult factory.	5 Years
Integral Color Anodize AA-M10C22A42 (>0.7 mil)	Electrochemically deposited inorganic color pigment which is sealed to convert an aluminum oxidation into a corrosion resistant finish. Some shade variation will occur.	Champagne; Light, Medium or Dark Bronze; Black	5 Years
Clear Anodize 215 R-1 AA-M10C22A41 (>0.7 mil)	Electrochemically oxidized aluminum surface for uniform clear finish. More resistant to natural oxidizing. Improved luster and less glossy than mill finish.	Clear	5 Years
Alkyd Prime Coat	Preparation for field applied epoxy, vinyl, urethane, or other heavy-duty coatings. Must be finished within 6 months of application. Contamination can occur in transit and in the field; requires field cleaning prior to painting.	N/A	N/A
Mill	Aluminum or Galvanized Steel. Normal weathering will occur.	N/A	N/A



Finishes enhance louver appearance by matching or contrasting with adjacent surfaces and extending weather resistance. Color matching is available upon request.

5101 Blue Mound Road, Fort Worth, Texas 76106 • Phone: 817-509-2300 • Fax: 817-831-3110 • www.pottorff.com

CC 7/2018

CREATING CUSTOMERS FOR LIFE

POWERS

RESUBMITTAL

PRODUCT	Bubble Tight Dampers
MANUFACTURER	Greenheck
JOB NAME	UAMS Center for Animal Models of Infection & Disease
LOCATION	Little Rock, AR
ENGINEER	James R. Beecher
CONTRACTOR	Middleton Inc.
DATE	1/31/2025
SUBMITTED BY	Chris Atwood

5440 Northshore Drive - North Little Rock, Arkansas 72118 - Tel: 501.374.5420 Fax: 501.370.9298

** All Bubble Tight Dampers have been revised to 304 Stainless Steel.

HBT-221 Rectangular Bubble Tight Damper

APPLICATION & DESIGN

The HBT-221 is a heavy duty rectangular damper designed for isolation and decontamination applications. The damper has bubble tight leakage performance per AMCA 500-D up to 10 in. wg. The damper frame is flanged for easy mounting and the blade seal is mechanically fastened to the blade.

DAMPER RATINGS

Pressure:	Up to 10 in. wg - pressure differential
Velocity:	Up to 4,000 ft/min
Leakage:	Bubble tight per AMCA 500-D
Temperature:	-40 F to 250 F

PRODUCT DETAILS

Frame Material:	304 SS
Flange Width (D):	2.000 in.
Blade Material:	304SS
Blade Thickness:	12 ga
Blade Seal:	Silicone
Blade Action:	Parallel
Linkage Material:	304 SS
Axle Material:	303 SS
Axle Bearings:	Outboard Ball
Axle Seal:	Double Gland
Temperature:	250 F

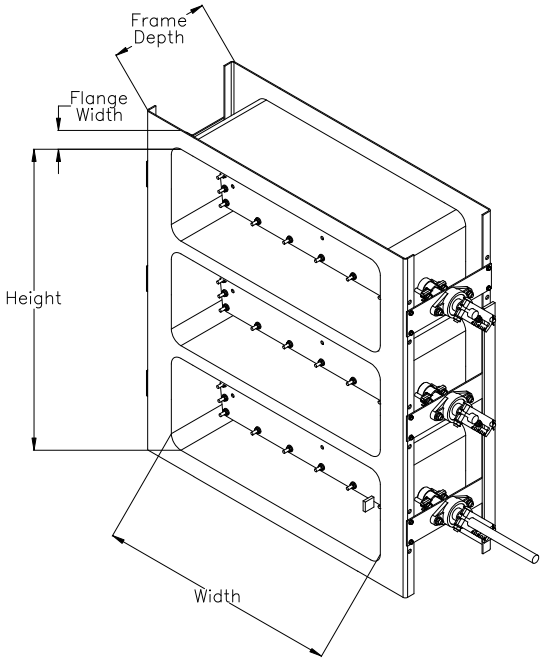
ACTUATOR INFORMATION

Actuator Type:	24 VDC
Operating Mode:	Two Position
Actuator Mounting:	External
Actuator Manufacturer:	All
NEMA Enclosure:	1
Auxiliary Switches:	0

Please verify damper voltage before ordering.

OPTIONS & ACCESSORIES

Replacement Blade Seal:	No



• This drawing shows a general damper configuration and is not intended to depict the exact configuration of all dampers in this submittal.
• Width and Height are based on inside dimensions. Actual sizing only.

• Installation instructions available at www.greenheck.com.

SUMMARY

ID #	TAG	QTY	WIDTH	HEIGHT	CONFIGURATION			
1-1		1	12.000 in.	8.000 in.	**Number of Blades:** 1	**Required Assy Torque:** 105 lb-in.	**Frame Depth:** 8.000 in.	**Axle Diameter:** 0.750 in.
					Frame Thickness: 12 ga	**Actuator Model:** AMB24-3	**Actuator Manufacturer:** Belimo	**Actuator Qty:** 1
					Actuator Location: Right	**Actuator Operation:** PO/PC	**Actuator Fail Position:** In Place	
1-2		4	12.000 in.	10.000 in.	**Number of Blades:** 1	**Required Assy Torque:** 132 lb-in.	**Frame Depth:** 10.000 in.	**Axle Diameter:** 0.750 in.
					Frame Thickness: 12 ga	**Actuator Model:** AMB24-3	**Actuator Manufacturer:** Belimo	**Actuator Qty:** 1
					Actuator Location: Right	**Actuator Operation:** PO/PC	**Actuator Fail Position:** In Place	

ID #	TAG	QTY	WIDTH	HEIGHT	CONFIGURATION			
1-3		1	14.000 in.	14.000 in.	**Number of Blades:** 1	**Required Assy Torque:** 209 lb-in.	**Frame Depth:** 14.000 in.	**Axle Diameter:** 0.750 in.
					Frame Thickness: 12 ga	**Actuator Model:** GMB24-3	**Actuator Manufacturer:** Belimo	**Actuator Qty:** 1
					Actuator Location: Right	**Actuator Operation:** PO/PC	**Actuator Fail Position:** In Place	

HBTR-151 Round Bubble Tight Damper

APPLICATION & DESIGN

The HBTR-151 is a heavy duty round bubble tight damper designed for isolation and decontamination applications. The damper has bubble tight leakage per AMCA 500-D up to 10 in. wg. The damper frame is flanged for easy mounting and the blade seal is mechanically fastened to the blade. Every HBTR-151 is factory leakage tested to ensure bubble tight seal and is recommended for two position shut off applications.

DAMPER RATINGS

Pressure:	Up to 10 in. wg - pressure differential
Velocity:	Up to 3,900 ft/min
Leakage	Bubble tight per AMCA 500-D
Temperature:	-40 F to 250 F

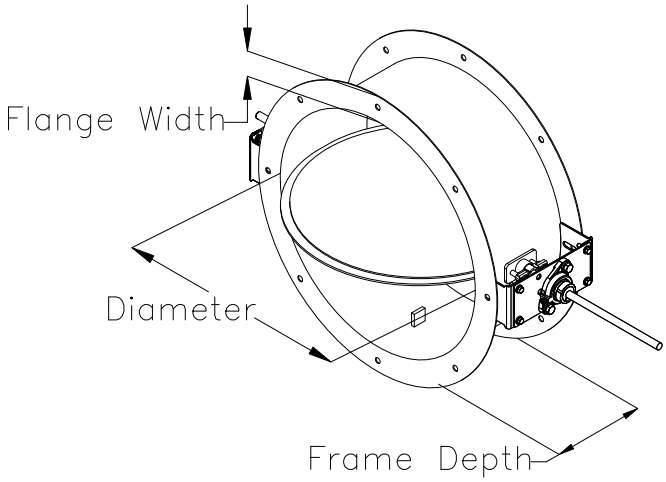
PRODUCT DETAILS

Frame Type	Flanged Channel
Material	304 SS
Blade Type	Round, center pivoted, double skin
Blade Seal	Silicone Rubber
Axle/Linkage	303 SS
Axle Bearings	Outboard Ball
Axle Seals	Double Gland
Sizing	Actual

ACTUATOR INFORMATION

Actuator Type	24 VDC
Actuator Mounting	External
Operating Mode	Two Position
NEMA Enclosure Type	1
Auxiliary Switches	No

Please verify damper voltage before ordering.



- *This drawing shows a general damper configuration and is not intended to depict the exact configuration of all dampers in this submittal.*
- *Electrical accessory wiring terminates at the accessory. Field wiring is required to individual components.*
- *Dampers constructed of 304 stainless steel may be made of 316 stainless steel at our discretion based on material availability or manufacturing processes. If 316SS material is unacceptable to your application, please contact the factory.*

OPTIONS & ACCESSORIES

Mounting Holes	Both Flanges
Hole Placement	OnCenterline
Finish Type	None

SUMMARY

ID #	TAG	QTY	DIAMETER (D)	CONFIGURATION			
2-1		1	8.000 in.	**Assembly Torque** 64 lb-in.	**Frame Depth (J)** 6.000 in.	**Frame Thickness** 0.105 in.	**Flange Width (F)** 1.500 in.
				Axle Diameter 0.500 in.	**Blade Thickness** 0.105 in.	**Mtg Holes Edited** False	**Bolt Circle Dia (L)** 9.750 in.
				Qty of Holes (N) 4	**Hole Diameter (M)** 0.375 in.	**Actuator Location** Right Side	**Actuator Mfr.** Belimo
				Actuator Model NMB24	**Actuator Qty** 1	**Actuator Fail Position** In Place	**Actuator Operation** PO/PC
2-2		1	10.000 in.	**Assembly Torque** 100 lb-in.	**Frame Depth (J)** 6.000 in.	**Frame Thickness** 0.105 in.	**Flange Width (F)** 1.500 in.
				Axle Diameter 0.500 in.	**Blade Thickness** 0.105 in.	**Mtg Holes Edited** False	**Bolt Circle Dia (L)** 11.750 in.
				Qty of Holes (N) 8	**Hole Diameter (M)** 0.438 in.	**Actuator Location** Right Side	**Actuator Mfr.** Belimo
				Actuator Model AMB24-3	**Actuator Qty** 1	**Actuator Fail Position** In Place	**Actuator Operation** PO/PC

ID #	TAG	QTY	DIAMETER (D)	CONFIGURATION			
2-3		3	12.000 in.	**Assembly Torque** 144 lb-in.	**Frame Depth (J)** 6.000 in.	**Frame Thickness** 0.105 in.	**Flange Width (F)** 1.500 in.
				Axle Diameter 0.500 in.	**Blade Thickness** 0.105 in.	**Mtg Holes Edited** False	**Bolt Circle Dia (L)** 13.750 in.
				Qty of Holes (N) 8	**Hole Diameter (M)** 0.438 in.	**Actuator Location** Right Side	**Actuator Mfr.** Belimo
				Actuator Model AMB24-3	**Actuator Qty** 1	**Actuator Fail Position** In Place	**Actuator Operation** PO/PC
2-4		1	14.000 in.	**Assembly Torque** 196 lb-in.	**Frame Depth (J)** 8.000 in.	**Frame Thickness** 0.105 in.	**Flange Width (F)** 1.500 in.
				Axle Diameter 0.750 in.	**Blade Thickness** 0.105 in.	**Mtg Holes Edited** False	**Bolt Circle Dia (L)** 15.750 in.
				Qty of Holes (N) 8	**Hole Diameter (M)** 0.438 in.	**Actuator Location** Right Side	**Actuator Mfr.** Belimo
				Actuator Model GMB24-3	**Actuator Qty** 1	**Actuator Fail Position** In Place	**Actuator Operation** PO/PC

Bubble Tight Damper Supplemental Information

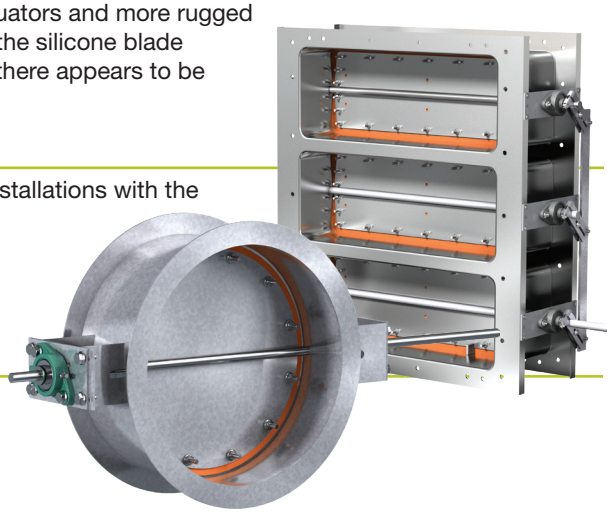
HBT and HBTR Series

QA and Testing

All Greenheck industrial dampers are produced under our ISO9001-2015 Quality Assurance Program in Schofield, WI. Each bubble tight damper is tested before shipment. We test every unit per the AMCA Standard 500D test procedures. Test pressure is applied to the damper based on the models rated pressure, plus a minimum of 10% extra. All welded seams, axle penetrations and bolted connections are verified for zero leakage. The units are tested in both directions, so installation direction is irrelevant. We place a "bubble tight tested" sticker on the unit and attach a test report form to the damper for shipment to the job site. Greenheck retains copies of the test report in our systems if additional copies are needed.

Seals

Bubble tight dampers are designed with a full perimeter sweep seal. This seal is made of silicone rubber for best sealing results and the lowest torque requirements. Dampers were prototyped to 10,000 cycles without failure to the seal. Other seal materials have been used, but Greenheck does not recommend using alternate seal materials. They tend to increase the torque value to 2-4 times that of silicone and generally have a shorter life span. They will also require larger actuators and more rugged blade and axles sizes which can significantly increase costs. Every 5-7 years, the silicone blade seal should be evaluated for wear or dry rotting. The seal should be replace if there appears to be damaged or degraded in any way.



Blade Direction

Dampers are designed for blades to be horizontal after installation. Damper installations with the damper blade vertically are not recommended as the weight of the damper blade can cause the axles to sag and prevent the blade seals from being properly centered. If vertically bladed units are required, please contact your representative for special design request information.

Temperature

Many damper applications for bubble tight dampers are designed for -40°F to 250°F (-40°C to 121°C) temperatures. The HBTR and HBT series dampers are ideally designed for this temperature range. There are times when requests for temperatures greater than 250°F (121˚C)are asked for. Above 250°F (121°C), the blade and axles will have excessive movement due to the thermal expansion of the materials. These expansions can be unpredictable in which direction might see more or less expansion, thus these expansions could cause the damper seals to not properly seat against the damper and may cause the damper seals to lose their effectiveness. Therefore, 250°F (121°C) is the maximum temperature rating of our HBTR/HBT series dampers.

Actuators

Bubble tight dampers are designed as 2-position dampers – fully open or full closed. They are not designed to be modulated due to the blade seal configuration. The blade seal is a fold-over sweep seal design and modulating the damper may cause problems with the folding of the seal and prevent the bubble tight effectiveness of the seal.

Greenheck strongly recommends that actuators be ordered and installed from the factory. This allows us to properly install, set up and cycle the actuators on the damper and ship them complete to the job site. If dampers are ordered without actuators, then Greenheck will supply two actuator mounting angles on the damper frame ("bracket only" in CAPS). The job site will be responsible for actuators and actuator mounting plates for commercial style actuators, or actuators, actuator mounting plates and actuator couplings for industrial type actuators.

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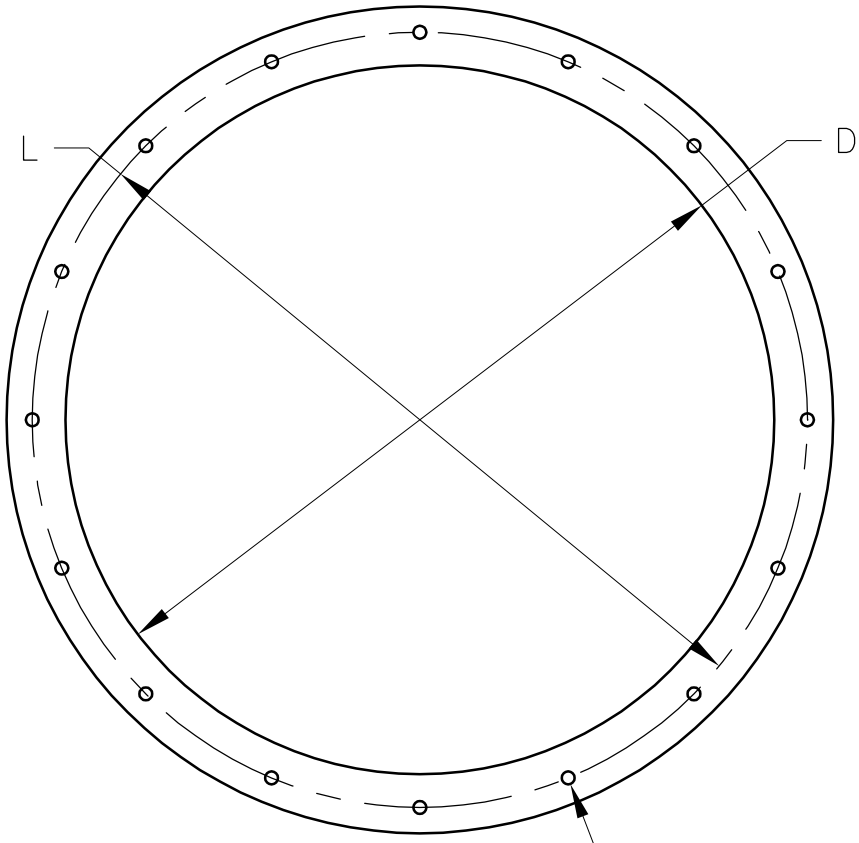
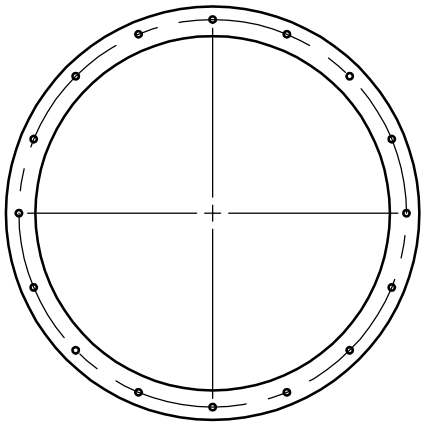
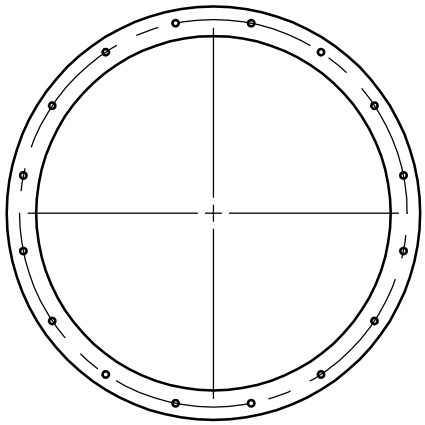




ON CENTERLINE



STRADDLE CENTERLINE

ROUND DAMPER MOUNTING HOLE PATTERN

S9999-0104