



NX Series
Main-Standby Transmitter
System

All India Radio (AIR)

APPENDIX G

VENTILATION SYSTEM

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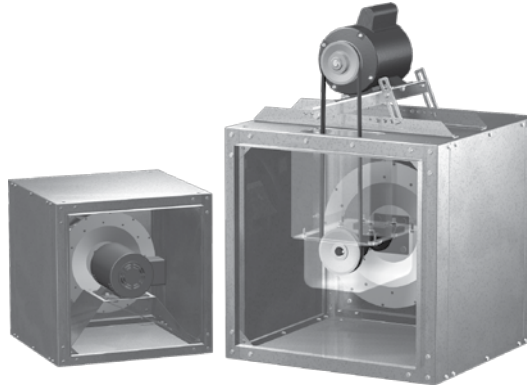
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Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

Model SQ Direct Drive

Model SQ is a direct drive centrifugal inline exhaust fan. These fans are specifically designed for inline applications. Performance capabilities range up to 5,000 cfm (8,500 m³/hr) and up to 2.0 in. wg (498 Pa) of static pressure. SQ fans are available in thirteen sizes with nominal wheel diameter ranging from 6 to 16 inches (152 to 406 mm) (060 - 160 unit sizes). Each fan shall bear a permanently affixed manufacturers engraved metal nameplate containing the model number and individual serial number.



Model BSQ Belt Drive

Model BSQ is a belt drive centrifugal inline exhaust fan. These fans are specifically designed for inline applications. Performance capabilities range up to 27,200 cfm (46,200 m³/hr) and up to 4.0 in. wg (996 Pa) of static pressure. BSQ fans are available in fourteen sizes with nominal wheel diameter ranging from 7 to 42 inches (178 to 1067 mm) (070 - 420 unit sizes). Each fan shall bear a permanently affixed manufacturers engraved metal nameplate containing the model number and individual serial number.

General Safety Information

Only qualified personnel should install this fan. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if seismic activity is present. If more information is needed, contact a licensed professional engineer before moving forward.

DANGER

Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

CAUTION

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

CAUTION

Precaution should be taken in explosive atmospheres.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. The rotation of the wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than max cataloged fan RPM. Adjustments to fan speed significantly effects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.
7. Never open access doors to a duct while the fan is running.

Receiving

Upon receiving the product check to make sure all items are accounted for by referencing the bill of lading to ensure all items were received. Inspect each crate for shipping damage before accepting delivery. Notify the carrier if any damage is noticed. The carrier will make notification on the delivery receipt acknowledging any damage to the product. All damage should be noted on all the copies of the bill of lading which is countersigned by the delivering carrier. A Carrier Inspection Report should be filled out by the carrier upon arrival and reported to the Traffic Department. If damaged upon arrival, file a claim with carrier. Any physical damage to the unit after acceptance is not the responsibility of Greenheck Fan Corporation.

Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

Handling

Move fan to desired location and determine position of access panels, discharge and motor. Make sure the inlet and outlet have at least 2½ times the wheel diameter (duct diameter) before any obstructions like an elbow or transition. Attach the fan to a suitable framework as specified; hanging or base vibration isolators are recommended. See the SQ & BSQ Fan Dimensions table on page 3 for physical dimensions, utilizing Figures 1 and 2. Mounting dimensions and vibration isolator centerline information is provided on pages 4 and 5. The motor's amperage and voltage ratings must be checked for compatibility to supply voltage prior to final electrical connection. Electrical lead-in wires are then connected to the factory supplied safety disconnect switch. All wiring must conform to local and national codes.

Fan Storage

Fans are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

Indoor Storage

The ideal environment for the storage of fans and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain or snow. Temperatures should be evenly maintained between 30° to 110°F (-1° to 43°C) (wide temperature swings may cause condensation and “sweating” of metal parts). All accessories must be stored indoors in a clean, dry atmosphere. Remove any accumulations of dirt, water, ice or snow

and wipe dry before moving to indoor storage. To avoid “sweating” of metal parts allow cold parts to reach room temperature. To dry parts and packages use a portable electric heater to get rid of any moisture buildup. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3½ in. (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

Outdoor Storage

Fans designed for outdoor applications may be stored outdoors, if absolutely necessary. Roads or aisles for portable cranes and hauling equipment are needed.

The fan should be placed on a level surface to prevent water from leaking into the fan. The fan should be elevated on an adequate number of wooden blocks so that it is above water and snow levels and has enough blocking to prevent it from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight and space for periodic inspection. To minimize water accumulation, place all fan parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

Fan wheels should be blocked to prevent spinning caused by strong winds.

Inspection and Maintenance During Storage

While in storage, inspect fans once per month. Keep a record of inspection and maintenance performed. If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant on motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with special coatings may require special techniques for touch-up or repair. Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Thoroughly wipe clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive, WD-40® or the equivalent.

Removing From Storage

As fans are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the fan equipment goes into operation.

SQ & BSQ Fan Dimensions

Model	A	B	C	*D	E	*F	*G	*H	Damper	SQ Weight [^]	BSQ Weight [^]
SQ 60-75	12 (305)	13 (330)	12 (305)	8 ⁷ / ₈ (225)	1 (25)	-	-	-	9 (229)	26 (12)	-
SQ 80-95	15 (381)	16 (406)	15 (381)	11 ⁷ / ₈ (302)	1 (25)	-	-	-	12 (305)	41 (19)	-
BSQ 70-80	15 (381)	21 (533)	15 (381)	11 ⁷ / ₈ (302)	1 (25)	15 ¹ / ₂ (394)	14 (356)	12 ¹ / ₂ (318)	12 (305)	-	76 (34)
BSQ 90	15 (381)	21 (533)	15 (381)	11 ⁷ / ₈ (302)	1 (25)	15 ¹ / ₂ (394)	14 (356)	12 ¹ / ₂ (318)	12 (305)	-	84 (38)
SQ-BSQ 100	17 (432)	21 (533)	17 (432)	13 ³ / ₈ (352)	1 (25)	15 ¹ / ₂ (394)	14 (356)	12 ¹ / ₂ (318)	14 (356)	56 (25)	83 (38)
SQ-BSQ 120	19 (483)	21 (533)	19 (483)	15 ¹ / ₈ (403)	1 (25)	17 ¹ / ₈ (454)	16 (406)	12 ¹ / ₂ (318)	16 (406)	67 (30)	97 (44)
SQ-BSQ 130 (HP)	21 (533)	21 (533)	21 (533)	17 ¹ / ₈ (454)	1 (25)	17 ¹ / ₈ (454)	16 (406)	12 ¹ / ₂ (318)	18 (457)	67 (35)	97 (44)
SQ-BSQ 140 (HP)	23 (584)	22 (559)	23 (584)	19 ¹ / ₈ (505)	1 (25)	17 ¹ / ₈ (454)	16 (406)	12 ¹ / ₂ (318)	20 (508)	104 (47)	111 (50)
SQ-BSQ 160 (HP)	26 (660)	26 (660)	26 (660)	22 ¹ / ₈ (581)	1 (25)	20 ¹ / ₂ (521)	17 (432)	13 ³ / ₈ (340)	23 (584)	160 (73)	208 (94)
BSQ 180 (HP)	28 (711)	28 (711)	28 (711)	23 ³ / ₈ (606)	1 ¹ / ₂ (38)	24 ³ / ₈ (619)	18 (457)	13 ³ / ₈ (349)	24 (610)	26 (12)	245 (111)
BSQ 200 (HP)	32 (813)	32 (813)	32 (813)	27 ¹ / ₈ (708)	1 ¹ / ₂ (38)	28 (711)	20 (508)	16 (406)	28 (711)	26 (12)	314 (142)
BSQ 240 (HP)	39 (991)	34 (864)	39 (991)	34 ¹ / ₈ (886)	1 ¹ / ₂ (38)	32 ¹ / ₈ (835)	22 (559)	19 (483)	35 (889)	26 (12)	415 (188)
BSQ 300 (HP)	46 (1168)	38 (965)	46 (1168)	41 ¹ / ₈ (1064)	1 ¹ / ₂ (38)	34 (864)	22 (559)	18 (457)	42 (1067)	26 (12)	537 (244)
BSQ 360 (HP)	52 (1321)	42 (1067)	52 (1321)	47 ¹ / ₈ (1216)	1 ¹ / ₂ (38)	34 (864)	22 (559)	18 (457)	48 (1219)	26 (12)	686 (311)
BSQ 420 (HP)	58 (1473)	50 (1270)	58 (1473)	53 ¹ / ₈ (1368)	1 ¹ / ₂ (38)	34 (864)	22 (559)	18 (457)	54 (1372)	26 (12)	789 (358)

All dimensions in inches (millimeters) and weight is shown in pounds (kilograms). *May be greater depending on motor.

[^]Weight shown is largest cataloged Open Drip Proof motor.

Filter Option Dimensions

Model	A	B	C	D	WT.	Filter Size	Filter Quantity
SQ 60-75	22 ¹ / ₈ (562)	12 (305)	8 ⁷ / ₈ (225)	1 (25)	40 (18)	10 x 12 (254 x 305)	1
SQ 80-95	45 ⁵ / ₈ (1159)	15 (381)	11 ⁷ / ₈ (302)	1 (25)	74 (34)	14 x 25 (356 x 635)	1
SQ 100	47 ¹ / ₄ (1200)	17 (432)	13 ³ / ₈ (352)	1 (25)	88 (40)	16 x 20 (406 x 508)	2
SQ 120	52 ³ / ₁₆ (1326)	19 (483)	15 ¹ / ₈ (403)	1 (25)	114 (52)	16 x 25 (406 x 635)	2
SQ 130	46 ³ / ₈ (1178)	21 (533)	17 ¹ / ₈ (454)	1 (25)	120 (54)	20 x 20 (508 x 508)	2
SQ 140	52 ³ / ₈ (1330)	23 (584)	19 ¹ / ₈ (505)	1 (25)	174 (79)	20 x 25 (508 x 635)	2
SQ 160	51 ³ / ₈ (1305)	26 (660)	22 ¹ / ₈ (581)	1 (25)	246 (112)	20 x 20 (508 x 508)	4
BSQ 70-80-90	50 ⁵ / ₈ (1286)	15 (381)	11 ⁷ / ₈ (302)	1 (25)	117 (53)	14 x 25 (356 x 635)	1
BSQ 100	47 ¹ / ₄ (1200)	17 (432)	13 ³ / ₈ (352)	1 (25)	120 (54)	16 x 20 (406 x 508)	2
BSQ 120	52 ³ / ₁₆ (1326)	19 (483)	15 ¹ / ₈ (403)	1 (25)	144 (79)	16 x 25 (406 x 635)	2
BSQ 130 (HP)	46 ³ / ₈ (1178)	21 (533)	17 ¹ / ₈ (454)	1 (25)	140 (64)	20 x 20 (508 x 508)	2
BSQ 140 (HP)	52 ³ / ₈ (1330)	23 (584)	19 ¹ / ₈ (505)	1 (25)	181 (82)	20 x 25 (508 x 635)	2
BSQ 160 (HP)	51 ³ / ₈ (1305)	26 (660)	22 ¹ / ₈ (581)	1 (25)	294 (133)	20 x 20 (508 x 508)	4
BSQ 180 (HP)	55 ¹ / ₁₆ (1399)	28 (711)	23 ³ / ₈ (606)	1 ¹ / ₂ (38)	344 (156)	20 x 25 (508 x 635)	4
BSQ 200 (HP)	66 ¹ / ₁₆ (1694)	32 (813)	27 ¹ / ₈ (708)	1 ¹ / ₂ (38)	441 (200)	12 x 25 (305 x 635)	3
						16 x 25 (406 x 635)	3
BSQ 240 (HP)	68 ⁷ / ₈ (1749)	39 (991)	34 ¹ / ₈ (886)	1 ¹ / ₂ (38)	573 (260)	20 x 25 (508 x 635)	4
						16 x 25 (406 x 635)	4
BSQ 300 (HP)	72 ¹ / ₈ (1832)	46 (1168)	41 ¹ / ₈ (1064)	1 ¹ / ₂ (38)	759 (344)	20 x 25 (508 x 635)	8
BSQ 360 (HP)	79 ¹ / ₄ (2013)	52 (1321)	47 ¹ / ₈ (1216)	1 ¹ / ₂ (38)	957 (434)	16 x 25 (406 x 635)	10
						20 x 25 (508 x 635)	5
BSQ 420	93 ¹ / ₈ (2365)	58 (1473)	53 ³ / ₈ (1368)	1 ¹ / ₂ (38)	1185 (538)	16 x 25 (406 x 635)	5
						20 x 25 (508 x 635)	10

Note: 24-inch side clearance is recommended for accessing and removing filters. All dimensions in inches (millimeters) and weight (WT.) in pounds (kilograms).

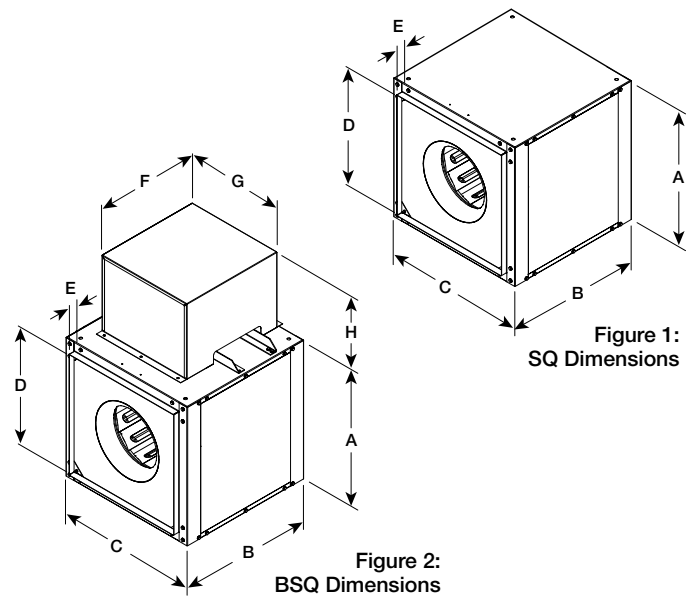


Figure 1:
SQ Dimensions

Figure 2:
BSQ Dimensions

Figure 3: Model SQ - Filter Options

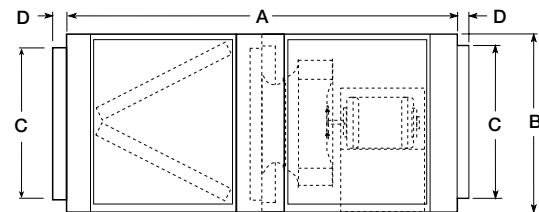
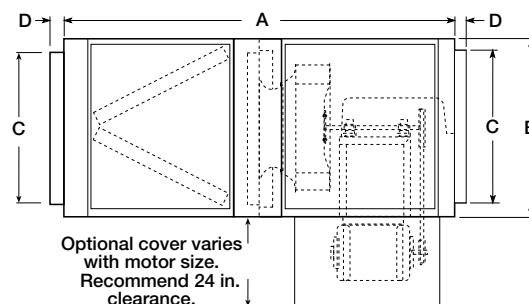


Figure 4: Model BSQ - Filter Options



Mounting: SQ /BSQ

All SQ and BSQ fan models can be mounted horizontally, vertically or at an angle. For ease of installation, knockouts are provided at each location where mounting brackets are shown in Figures 5, 6 and 7. Optional brackets are universally adjustable to mount in any of these locations.

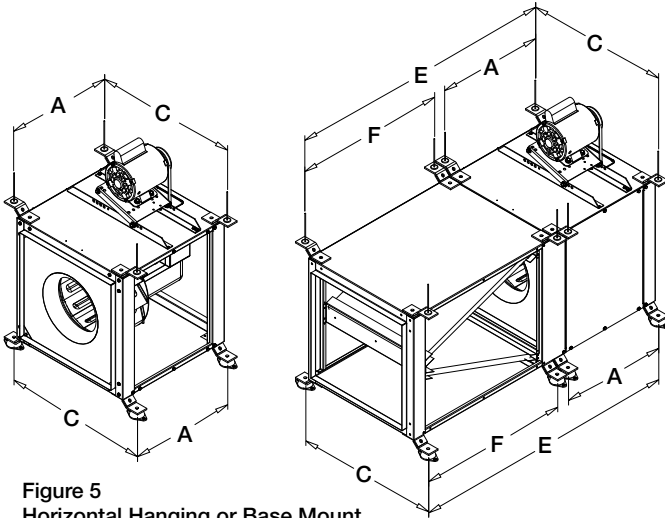


Figure 5
Horizontal Hanging or Base Mount

With either a hanging or base mount the motor may be located on either side. The base mount allows top access panels only.

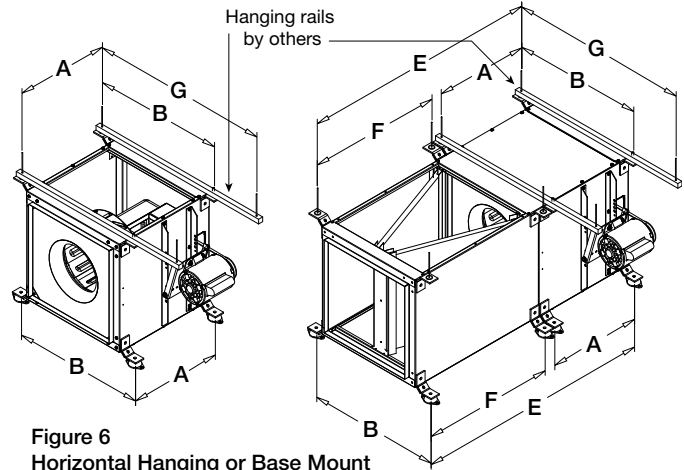


Figure 6
Horizontal Hanging or Base Mount

With a hanging mount, the motor may be located on either top or bottom. The base mount allows top motor location only. Both options provide access panels on two sides.

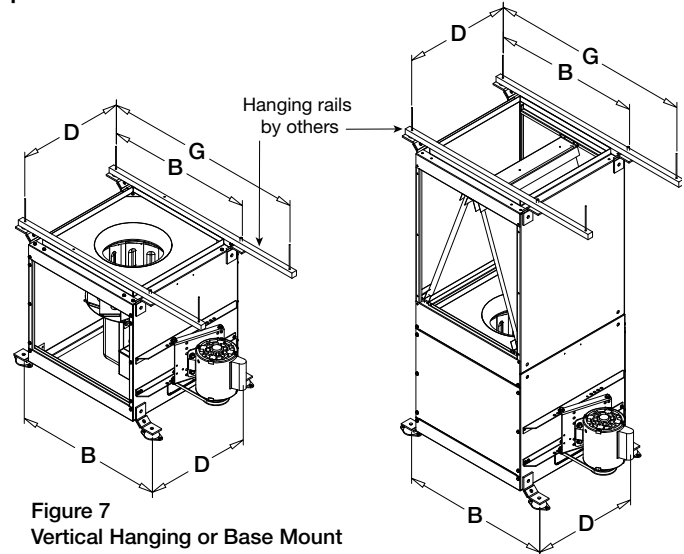


Figure 7
Vertical Hanging or Base Mount

Mounting brackets are turned 90° for vertical mounting. Access panels are located on the two sides adjacent to the motor.

Mounting Dimensional Data							
Model	A	B	C	D	E	F	G
SQ 60-75	10 ⁵ / ₈ (270)	17 (432)	15 ³ / ₄ (400)	8 ⁷ / ₈ (225)	19 ³ / ₄ (502)	7 (178)	Hanging rails not included. Supplied by others.
SQ 80-95	13 ¹ / ₄ (337)	20 (508)	18 ³ / ₄ (476)	11 ⁷ / ₈ (302)	43 (1092)	27 ³ / ₈ (695)	
BSQ 70-90	18 ⁵ / ₈ (473)	20 ⁷ / ₈ (511)	18 ³ / ₄ (476)	11 ⁷ / ₈ (302)	48 ⁵ / ₁₆ (1227)	27 ³ / ₈ (695)	
SQ-BSQ 100	18 ⁵ / ₈ (473)	22 ⁷ / ₈ (562)	20 ³ / ₄ (527)	13 ⁷ / ₈ (352)	44 ⁷ / ₈ (1140)	24 (610)	
SQ-BSQ 120	18 ⁵ / ₈ (473)	24 (610)	22 ³ / ₄ (578)	16 (406)	49 ⁵ / ₈ (1254)	28 ⁷ / ₈ (714)	
SQ-BSQ 130	18 ⁵ / ₈ (473)	26 ⁷ / ₈ (664)	24 ³ / ₄ (629)	17 ⁷ / ₈ (454)	44 (1118)	23 (584)	
SQ-BSQ 140	19 ⁵ / ₈ (498)	28 ⁷ / ₈ (714)	26 ³ / ₄ (679)	19 ⁷ / ₈ (505)	50 ¹ / ₁₆ (1272)	28 (711)	
SQ-BSQ 160	23 ¹ / ₂ (597)	31 (787)	29 ³ / ₄ (756)	22 ⁷ / ₈ (581)	49 ⁵ / ₈ (1260)	23 ³ / ₈ (600)	Hanging rails not included. Supplied by others.
BSQ 180	25 ¹ / ₂ (648)	33 ¹ / ₂ (851)	29 ⁹ / ₁₆ (751)	22 ³ / ₄ (578)	52 ⁹ / ₁₆ (1335)	24 ¹ / ₂ (622)	
BSQ 200	29 ¹ / ₈ (740)	37 (940)	33 ³ / ₄ (857)	26 ³ / ₄ (679)	64 ³ / ₁₆ (1630)	32 ¹ / ₄ (819)	
BSQ 240	31 ¹ / ₈ (803)	44 ¹ / ₄ (1124)	40 ³ / ₄ (1035)	33 ³ / ₈ (860)	66 ¹ / ₂ (1689)	32 ¹ / ₈ (816)	
BSQ 300	35 (889)	51 (1295)	47 ³ / ₄ (1213)	40 ⁷ / ₈ (1038)	69 ⁵ / ₈ (1756)	31 ³ / ₈ (797)	
BSQ 360	38 ³ / ₄ (974)	57 ¹ / ₄ (1454)	53 ¹ / ₂ (1359)	46 ³ / ₄ (1187)	76 (1930)	34 ¹ / ₁₆ (881)	
BSQ 420	47 ¹ / ₈ (1197)	63 (1600)	59 ⁷ / ₈ (1521)	59 ⁷ / ₈ (1521)	90 ¹ / ₂ (2299)	40 ¹ / ₂ (1029)	

All dimensions in inches (millimeters).

Duct Length: The inlet and outlet duct length should be approximately two to three wheel diameters long before and after the fan to achieve cataloged performance.

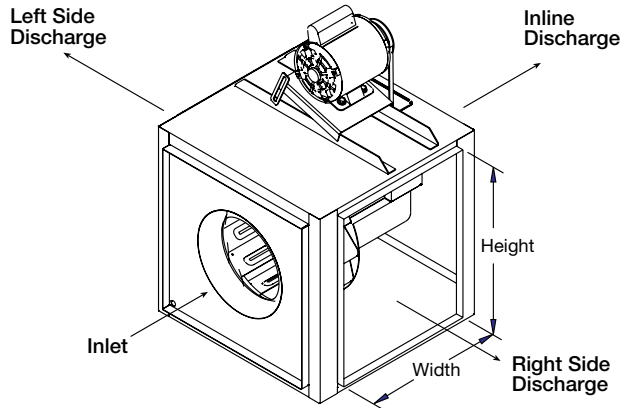


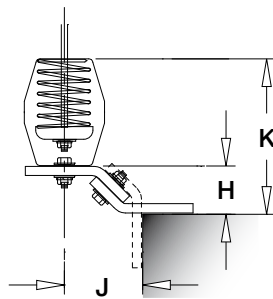
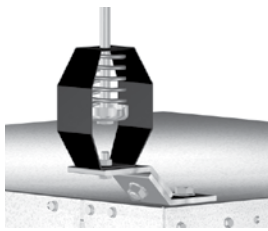
Figure 8

Side Discharge: Make sure discharge is orientated in the same direction as originally ordered, performance will change with different discharge positions. Refer to Figure 8 for proper side discharge definition and the Side Discharge chart for dimensions. Refer to the CAPS program or consult factory for performance corrections.

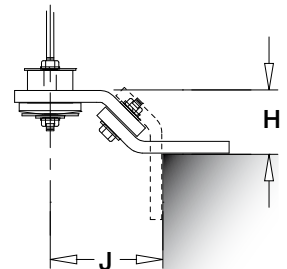
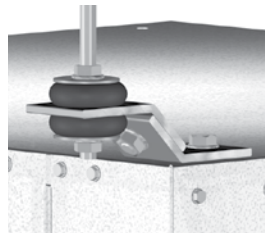
Side Discharge Duct Openings		
Unit Size	Width	Height
BSQ 70-80-90	11 ⁷ / ₈ (302)	11 ⁷ / ₈ (302)
SQ 60-75	9 ⁷ / ₈ (251)	8 ⁷ / ₈ (225)
SQ 80-95	12 ⁷ / ₈ (327)	11 ⁷ / ₈ (302)
SQ 100/BSQ 100	13 ⁷ / ₈ (352)	13 ⁷ / ₈ (352)
SQ 120/BSQ 120	15 ⁷ / ₈ (403)	15 ⁷ / ₈ (403)
SQ 130/BSQ 130 (HP)	17 ⁷ / ₈ (454)	17 ⁷ / ₈ (454)
SQ 140/BSQ 140 (HP)	19 ⁷ / ₈ (505)	19 ⁷ / ₈ (505)
SQ 160/BSQ 160 (HP)	22 ⁷ / ₈ (581)	22 ⁷ / ₈ (581)
BSQ 180 (HP)	23 ⁷ / ₈ (606)	23 ⁷ / ₈ (606)
BSQ 200 (HP)	27 ⁷ / ₈ (708)	27 ⁷ / ₈ (708)
BSQ 240 (HP)	28 ⁷ / ₈ (733)	34 ⁷ / ₈ (886)
BSQ 300 (HP)	31 ⁷ / ₈ (810)	41 ⁷ / ₈ (1064)
BSQ 360 (HP)	32 ⁷ / ₈ (835)	37 ⁷ / ₈ (962)
BSQ 420	34 ⁷ / ₈ (886)	43 ⁷ / ₈ (1114)

All dimensions in inches (millimeters).

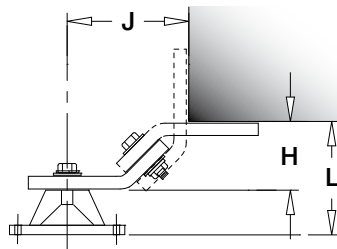
Hanging Spring Isolator



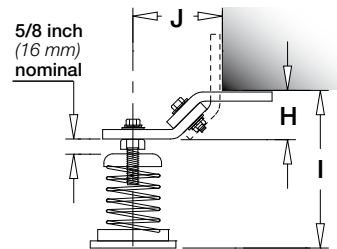
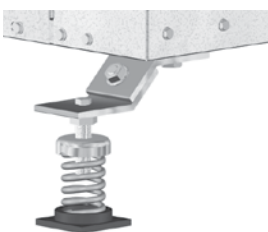
Hanging Neoprene Isolator



Standing Neoprene Isolator



Standing Spring Isolator



Isolator Dimensional Data					
Model	H	I	J	K	L
SQ 60-75					
SQ 80-95					
BSQ 70-90					
SQ-BSQ 100	1 ⁷ / ₈ (35)	5 ¹ / ₂ (140)	2 (51)	6 ³ / ₄ (171)	2 ⁵ / ₁₆ (59)
SQ-BSQ 120					
SQ-BSQ 130					
SQ-BSQ 140					
SQ-BSQ 160					
BSQ 180					
BSQ 200					
BSQ 240	1 ⁷ / ₈ (35)	5 ¹ / ₂ (140)	2 (51)	6 ³ / ₄ (171)	2 ⁵ / ₈ (67)
BSQ 300					
BSQ 360					
BSQ 420					

All dimensions in inches (millimeters).

Pre Start-Up Checks

1. Check all fasteners for tightness. The wheel should rotate freely and be aligned as shown in Figure 9. Wheel position is preset and the unit is tested at the factory. Movement may occur during shipment, and realignment may be necessary. Centering can be accomplished by loosening the bolts holding the inlet (venturi) panel and repositioning. Wheel and inlet cone overlap can be adjusted by loosening the setscrews in the wheel and moving the wheel to the desired position.

Wheel Overlap Dimensions

Model	G - Overlap in. (mm)	H - Gap in. (mm)
SQ 60-95	-	1/8 (3)
SQ 100-160	1/4 (6)	-
BSQ 70-160	1/4 (6)	-
BSQ 180-240	3/8 (10)	-
BSQ 300-420	1/2 (13)	-

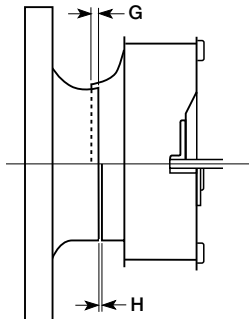


Figure 9

2. **Wheel Rotation:** Direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible burnout. Check wheel rotation by momentarily energizing the unit (all SQ and BSQ fans have clockwise wheel rotation when viewed from top of fan). Rotation should be clockwise as shown in Figure 10 and correspond to the rotation decal on the unit.

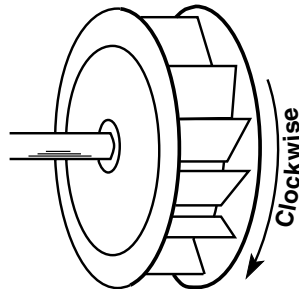


Figure 10

WARNING

Correct direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible burnout.

3. **Vibration Isolators:** After fan is moved to desired location, punch out the four knockout holes which are located on the unit top and bottom panels. Assemble the brackets to the unit according to the appropriate drawings on page 5 and refer to respective parts list on page 11. Make certain all connectors are tight and that all washers are in.
4. **For BSQ Fans:** If adjustments are made, it is very important to check the pulleys for proper alignment. Misaligned pulleys lead to excessive belt wear, vibration, noise, and power loss. (see Figure 11).

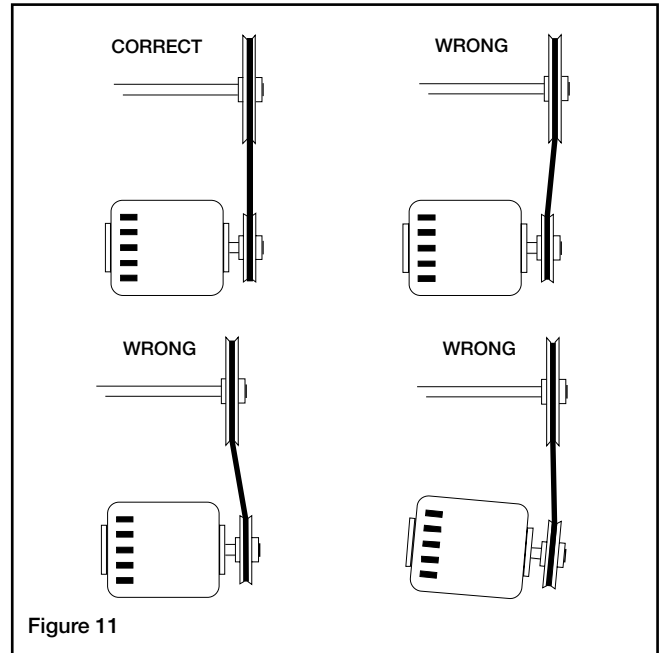


Figure 11

5. **For BSQ Fans:** Belt tension can be adjusted by loosening four fasteners marked "R" on the drive frame. (refer to Figure 13 on page 7). The motor plate slides on the slotted adjusting arms. Belt tension should be adjusted to allow 1/64 inch of deflection per inch of belt span. For example, a 15 inch belt span should have 15/64 inch (or about 1/4 inch) of deflection with moderate thumb pressure at mid-point between pulleys (see Figure 12). Over-tightening will cause excessive bearing wear and noise. Too little tension will cause slippage at start-up and uneven wear.

Figure 12

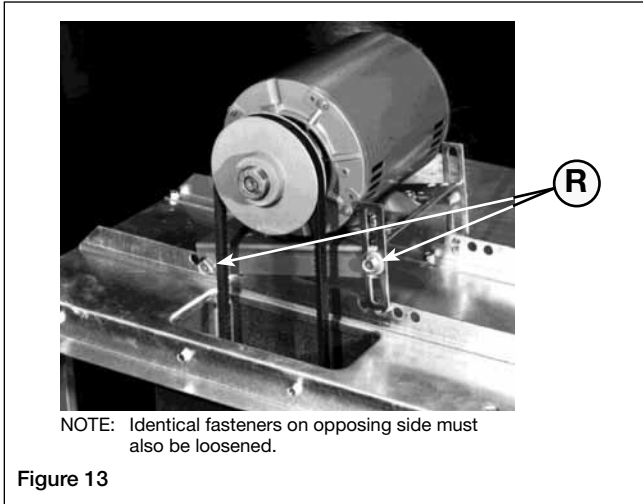
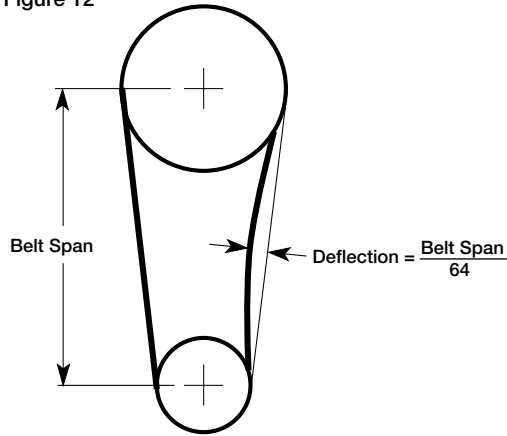


Figure 13

- The adjustable motor pulley is factory set for the RPM specified. Speed can be increased by closing or decreased by opening the adjustable motor sheave. Two groove variable pitch pulleys must be adjusted an equal number of turns open or closed. Any increase in speed represents a substantial increase in the horsepower required by a unit. Motor amperage should always be checked to avoid serious damage to the motor when speed is varied.

WARNING

The fan has been checked for mechanical noises at the factory prior to shipment. If mechanical noise should develop, suggested corrective actions are offered in the Troubleshooting section.

IMPORTANT

Over-tightening will cause excessive bearing wear and noise. Too little tension will cause slippage at start-up and uneven wear.

IMPORTANT

Adjust (tighten) belt tension after the first 24-48 hours of operation.

Operation: SQ / BSQ

- Before starting up or operating fan, check all fasteners for tightness. In particular, check the setscrews in wheel hub (and pulleys, if applicable).
- While in the OFF position or before connecting the fan to power, turn the fan wheel by hand to be sure it is not striking the venturi or any obstacle.
- Start the fan and shut it off immediately to check rotation of the wheel with directional arrow in the motor compartment, see Figure 10.
- When the fan is started, observe the operation and check for any unusual noises.
- With the system in full operation and all ductwork attached, measure current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.
- Keep inlets and approaches to fan clean and free from obstruction.

Inspection: SQ / BSQ

Inspection of the fan should be conducted at the first 30 minute and 24 hour intervals of satisfactory operation.

30 Minute Interval

Inspect bolts, setscrews and motor mounting bolts. Adjust and tighten as necessary.

24 Hour Interval

Check all internal components. On BSQ unit only, inspect belt alignment and tension. Adjust and tighten as necessary.

Maintenance: SQ / BSQ

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and who are experienced with this type of equipment.

Motor maintenance is generally limited to cleaning and lubrication (where applicable). Cleaning should be limited to exterior surfaces only. Removing dust buildup on motor housing ensures proper motor cooling.

Greasing of motors is only intended when fittings are provided. Many fractional horsepower motors are permanently lubricated and should not be lubricated after installation. Motors supplied with grease fittings should be greased in accordance with manufacturers' recommendations. Where motor temperatures do not exceed 104°F (40°C), the grease should be replaced after 2,000 hours of running time as a general rule.

Wheels require very little attention when moving clean air. Occasionally, oil and dust may accumulate causing imbalance. When this occurs the wheel and housing should be cleaned to ensure smooth and safe operation.

All fasteners should be checked for tightness each time maintenance checks are performed prior to restarting unit.

A proper maintenance program will help these units deliver years of dependable service.

WARNING

Always disconnect, lock and tag power source before servicing. Failure to disconnect power source can result in fire, shock or serious injury.

CAUTION

Uneven cleaning of the wheel will produce an out of balance condition that will cause vibration in the fan.

WARNING

This unit should be made non-functional when cleaning the wheel or housing (fuses removed, disconnect locked off).

Belt/Bearing Maintenance BSQ Unit

1. Belts tend to stretch after a period of time. They should be checked periodically for wear and tightness. When replacing belts, use the same type as supplied with the unit.
2. Matched belts should always be used on units with multi-groove pulleys.
3. For belt replacement, loosen the tensioning device enough to allow removal of the belt by hand. Do not force belts on or off. This may cause cords to break, leading to premature belt failure.
4. Once installed, adjust belts as shown in "Pre-Start-Up Checks."

5. Shaft bearings can be classified in two groups: relubricating and non-relubricating. All bearings on standard model BSQ fans are factory lubricated and require no further lubrication under normal use (between -20°F and 180°F in a relatively clean environment).
6. Units installed in hot, humid or dirty locations should be equipped with special bearings. These bearings will require frequent lubrication. Caution should be employed to prevent overpacking or contamination.
7. Grease fittings should be wiped clean. The unit should be in operation while lubricating. Extreme care should be used around moving parts.
8. Grease should be pumped in very slowly until a slight bead forms around the seal. A high grade lithium base grease should be used.

Recommended Relubrication Frequency in Months

NOTE: If unusual environment conditions exist (extreme temperature, moisture or contaminants) more frequent lubrication is required.

A good quality lithium base grease, conforming to NLGI Grade 2 consistency, such as those listed here may be used.

Suggested Fan Bearing Greasing Intervals

Interval (months)	Type of Service
1 to 3	Heavy duty in dirty, dusty locations; high ambient temperatures; moisture laden atmosphere; vibration.
3 to 6	12 to 24 hours per day, heavy duty, or if moisture is present
6 to 12	8 to 16 hours per day in clean, relatively dry atmosphere
12 to 18	Infrequent operation or light duty in clean atmosphere

Grease Manufacturers

Manufacturer	Grease (NLGI #2)
U.S. Electric Motors	Grease No. 83343
Chevron U.S.A. Inc	Chevron SRI Grease #2
Mobil Oil Corporation	Mobilith
	Mobil 532
Texaco, Inc.	Premium BRB #2
	Texaco Multifak #2
Amoco Oil Co.	Rykon Premium #2
Exxon	Unirex N2
Shell	B Shell Alvania #2

Maintenance Documentation

Job Information

Job Name: _____
Address: _____
City: _____
State: _____ Zip: _____
Phone: _____
Contact Person: _____

Service Organization: _____
Address: _____
City: _____
State: _____ Zip: _____
Phone: _____
Work Done By: _____

Nameplate Information

Model: _____
Volts: _____ Hertz: _____ Phase: _____
Amps: _____ Mark: _____
Supply hp: _____ Exhaust hp: _____
Serial Number: _____
Model Voltage: _____
Motor Amperage: _____
Fan RPM: _____

Field Start-Up Documentation

Actual Voltage: _____ Hertz: _____ Phase: _____
Actual Amperage: _____
Blower Rotation: _____
Air Volume: Design cfm: _____
Actual cfm: _____
Level of fan (L or H): _____
Fan RPM Range (min.) _____ (max.) _____

Maintenance Log

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
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Date _____ Time _____ AM/PM
Notes: _____

Parts List

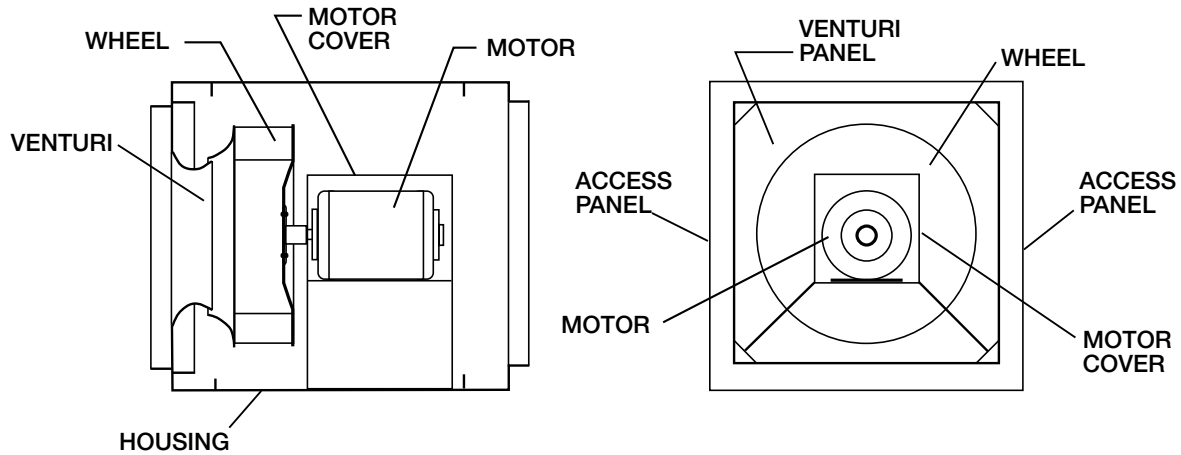
NOTE

Each fan bears a manufacturer's nameplate with model number and serial number embossed. This information will assist the local Greenheck representative and the factory in providing service and replacement parts. Before taking any corrective action, make certain unit is not capable of operation during repairs.

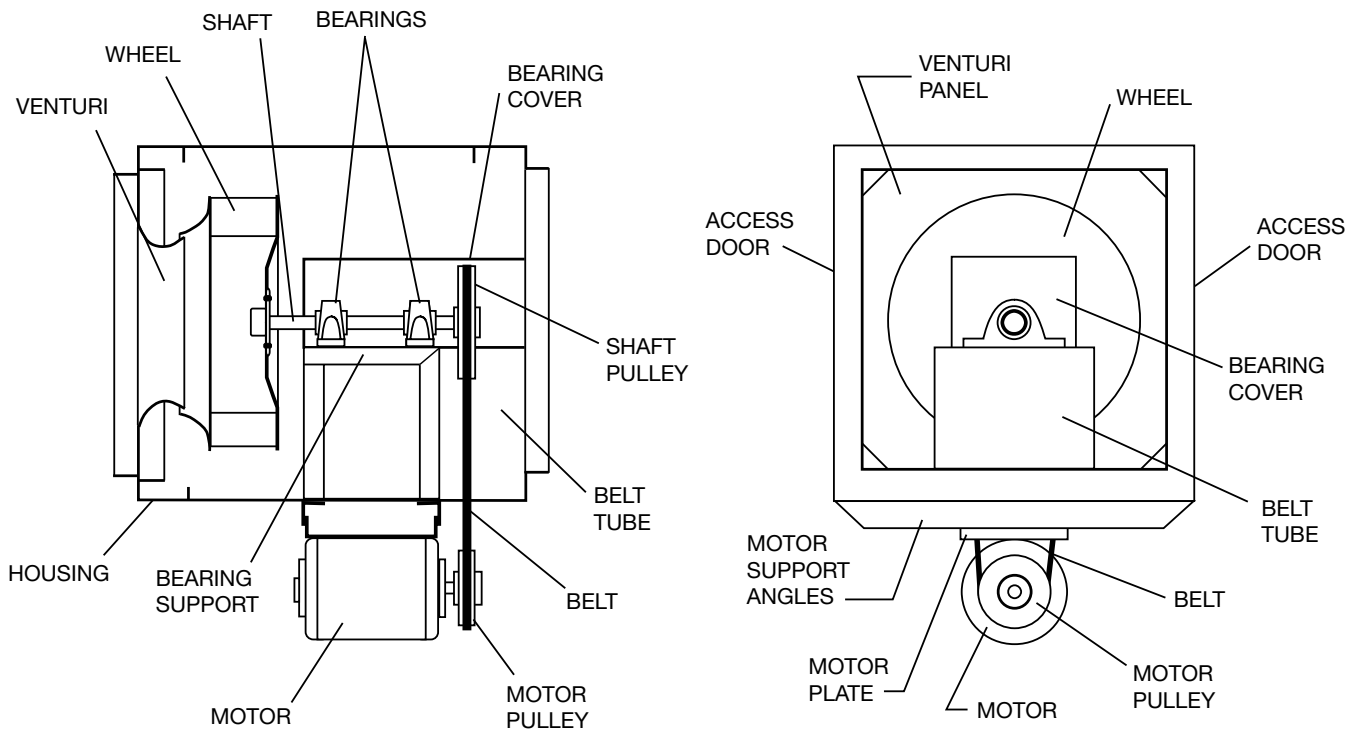
CAUTION

A fan manufactured with an explosion resistant motor does not certify the entire unit to be explosion proof. Refer to UL Listing Mark for the fans approved usage.

SQ Direct Drive Centrifugal Inline Exhaust Fan



BSQ Belt Drive Centrifugal Inline Exhaust Fan

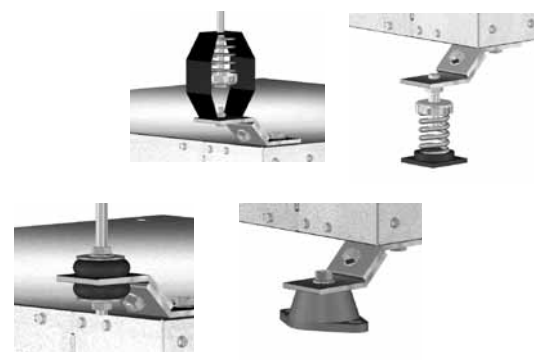


Isolator Parts List

STANDING SUPPORT ISOLATOR					HANGING SUPPORT ISOLATOR				
					<p>NOTE: Top bracket is reversible for mounting unit 90° from indicated.</p>				
No.	Qty.	Description	SQ-60 thru 140 BSQ-100 thru 140	SQ-160 BSQ-160 thru 420	No.	Qty.	Description	SQ-60 thru 140 BSQ-100 thru 140	SQ-160 BSQ-160 thru 420
1	8	Cadium plated hex head bolts	3/8 in. - 16 x 1 in.	3/8 in.-16 x 1 1/4 in.	1	8	Cadium plated hex head bolts	3/8 in. - 16 x 1 in.	3/8 in.-16 x 1 1/4 in.
2	8	Cadium plated hex nuts	3/8 in. - 16	3/8 in. - 16	2	16	Cadium plated hex nuts	3/8 in. - 16	3/8 in. - 16
3	4	Cadium plated hex head bolts	5/16 in. - 18 x 1 in.	3/8 in. - 16 x 1 in.	3	4	Std. mount bracket with (1) 1/4 in. hole	3/16 in.	1/4 in.
4	8	Std. mount bracket with (2) 7/16 in. holes	3/16 in.	1/4 in.	4	4	Std. mount bracket with (2) 7/16 in. holes	3/16 in.	1/4 in.
5	20	Cadium plated washer	7/8 in. O.D. x 3/8 in. I.D. x 1/16 in.	7/8 in. O.D. x 3/8 in. I.D. x 1/16 in.	5	24	Cadium plated washer	7/8 in. O.D. x 3/8 in. I.D. x 1/16 in.	7/8 in. O.D. x 3/8 in. I.D. x 1/16 in.
6	12	Cadium plated lock washer	3/8 in.	3/8 in.	6	12	Cadium plated lock washer	3/8 in.	3/8 in.
7	4	Cadium plated washer	1 3/8 in. O.D. x 9/16 in. I.D. x 3/32 in.	1 3/8 in. O.D. x 9/16 in. I.D. x 3/32 in.	7	12	Cadium plated washer	1 3/8 in. O.D. x 9/16 in. I.D. x 3/32 in.	1 3/8 in. O.D. x 9/16 in. I.D. x 3/32 in.
8	4	Neoprene or Spring Isolator	Reference appropriate table below for replacement Isolator(s)		8	4	Neoprene or Spring Isolator	Reference appropriate table below for replacement Isolator(s)	

REPLACEMENT SPRING ISOLATOR(S)						
MODEL	FAN SIZES					
BSQ	----	70-130	140-180	200	240-300	360-420
SQ	60-100	120-140	160	----	----	----
BASE MOUNT	FDS-1-35 BLUE	FDS-1-70 GREEN	FDS 1-120 GRAY	FDS 1-120 GRAY	FDS-1-220 BROWN	FDS-1-370 ORANGE
HANGING	SH-1-35 BLUE	SH-1-70 GREEN	SH-1-125 GRAY	SH-1-245 BROWN	SH-1-245 BROWN	SH-1-370 ORANGE

REPLACEMENT NEOPRENE ISOLATOR(S)			
MODEL	FAN SIZE		
BSQ	70-140	160-200	240-420
SQ	60-140	160	----
BASE MOUNT	R-1 GREEN	R-2 BLACK	R-2 RED
HANGING	40DUR BLACK	50DUR BLACK	50DUR BLACK



Troubleshooting

WARNING: Before taking any corrective action, make certain unit is not capable of operation during repairs.

PROBLEM	CAUSE	CORRECTIVE ACTION
Excessive noise or vibration	Wheel unbalance	Clean all dirt off wheel. Check wheel balance, rebalance in place if necessary.
	Bad bearings	Replace.
	Belts too tight or too loose	Adjust tension, see Figure 12.
	Wheel improperly aligned and rubbing	Center wheel on inlet, see Figure 9.
	Loose drive or motor pulleys	Align and tighten. See "Pre Start-Up Checks", see page 6-7.
	Foreign objects in wheel or housing	Remove objects, check for damage or unbalance.
Reduced airflow	System resistance too high	Check system: Proper operation of backdraft or control dampers, obstruction in ductwork, clean dirty filters.
	Unit running backwards	Correct as shown in Figure 10.
	Excessive dirt buildup on wheels	Clean wheel.
	Improper wheel alignment	Center wheel on inlets, see Pre Start-Up Checks and Figure 9.

Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the shipment date. Any units or parts which prove to be 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.

Greenheck's Centrifugal Inline Fans catalog, Models SQ and BSQ provides additional information describing the equipment, fan performance, available accessories, and specification data.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.



Phone: (715) 359-6171 • Fax: (715) 355-2399 • E-mail: gfcinfo@greenheck.com • Website: www.greenheck.com

Product Data Sheet



Line Voltage Staging Thermostat

Manufacturer: Columbus Electric

Model: ETD5SS

Features: On-Off Control
Heat / Cool
Single Pole Double Throw

Description

The ETD5SS thermostat provides on/off control of motors, valves, contactors, electric heating elements and other HVAC equipment in response to changes in space temperature.

Specifications

Rated Voltage: 120-277 VAC

Electrical Ratings:

Non-Inductive: 22 Amps @ 125 to 277 VAC

Inductive: $\frac{3}{4}$ HP @ 125 VAC
1-1/12 HP @ 250/277 VAC

Setpoint

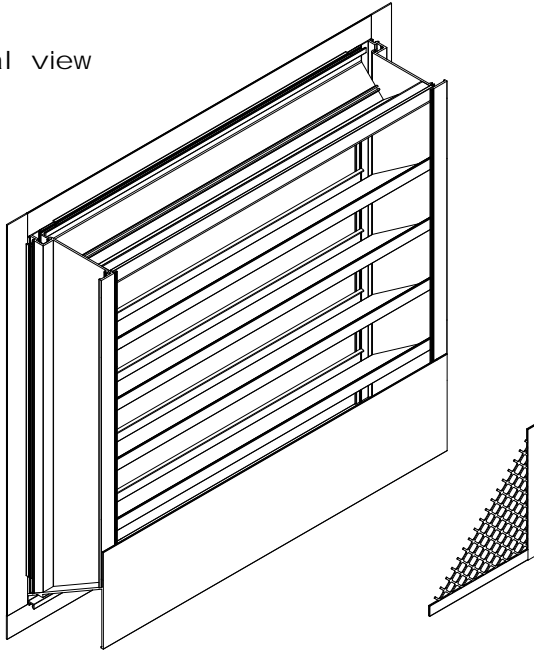
Adjustment Range: 50° to 90°F

Differential: 2°F Heating; 4°F Cooling

Sensing Element: Bimetal

Switch Type: Snap Acting

Internal view



ESD-635
6" Frame, 35° Blade
Application & Design

ESD-635 is a weather louver designed to protect air intake and exhaust openings in building exterior walls. Design incorporates drain gutters in the head member and horizontal blades to channel water to the jambs where water is further channeled through vertical downspouts and out at the sloped sill. The ESD-635 is an extremely efficient louver with AMCA LICENSED PERFORMANCE DATA enabling designers to select and apply with confidence.

Width and Height furnished approximately 0.250 in. under size.

Construction Features

Frame Depth (in.):	6	Frame Thickness (in.):	0.081	Louver Material:	Aluminum
Sizing:	Nominal	Fixed Blade Thick. (in.):	0.081		
Shape:	Rectangular				
Frame Type:	Flanged				
Product Warranty:	1-Year Standard				

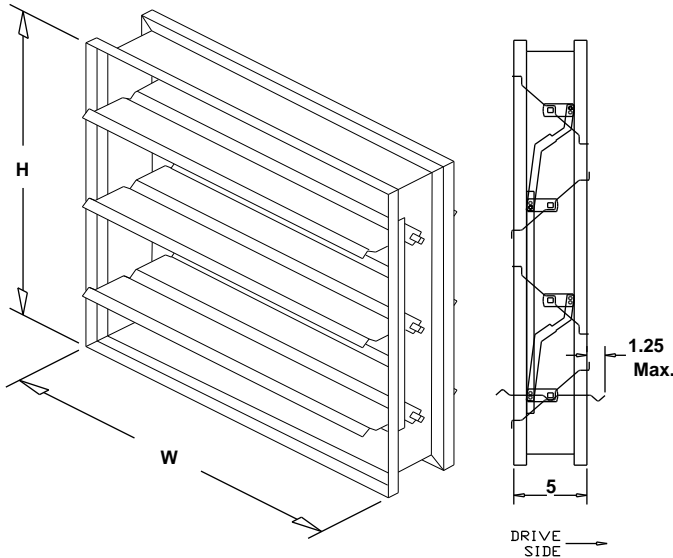
Options and Accessories

Flange Location:	Exterior	Flange Extension (in.):	1.5	Bird Screen Mat'l:	Aluminum
Bird Screen:	Internal	Bird Screen Type:	Flat Expanded		
Bird Screen Finish:	Mill				
Welded Construction:	No				

Summary

ID #	Tag	Qty.	W (in.)	H (in.)	Free Area (ft2)	Sect. Wide	Sect. High	Sect. Ship
1-1		1	36.000	36.000	4.98	1	1	1

Larger openings may require field assembly of multiple louver panels to make up the overall opening size. Individual louver panels are designed to withstand a 25 PSF wind-load (please consult Greenheck if the louvers must withstand higher wind-loads). Design, materials and installation of structural reinforcement required to adequately support large sections or multiple section assemblies within a large opening are not provided by Greenheck. Unless specifically indicated, the following are NOT included in the quote provided: structural steel, installation hardware (anchors, angle clips, continuous angles, shims, fasteners, inserts, backer rod and sealant), field measuring and/or installation, miscellaneous flashing, trim or enclosures, blank off panels, mullion covers or mullion hardware, hinged frames or removable subframes, custom bird/insect screen, 3-coat, metallic and/or exotic paint finishes, bituminous paints for unlike metals, any applicable taxes, stamped and sealed structural calculations or seismic calculations.



VCD-23

Low Leakage Control Damper

Application & Design

The model VCD-23 is a low leakage control damper for application as an automatic control or manual balancing damper. This model is intended for applications in low to medium pressure and velocity systems. A wide range of electric and pneumatic actuators are available. Non-jackshafted dampers will be supplied with a blade drive lever for internal actuator mounting. When external actuator mounting is specified in which case an extension pin with clip kit will be provided. Note: The extension pin with clip kit includes the extension pin and clip.

RATINGS

Pressure: 5 in. wg
Velocity: 3,000 ft/min
Leakage: Class 1A @ 1 in. wg, Class 1 @ 4 in. wg
Temperature: 200.0 F-250.0 F. Consult factory for higher temperatures.

Installation instructions available at www.greenheck.com.

Notes: All dimensions shown are in units of inches.

W & H furnished approximately 0.25 in. undersized and only refer to damper dimensions (sleeve thickness is not included).

Electrical accessory wiring terminates at the accessory.
Field wiring is required to individual components.

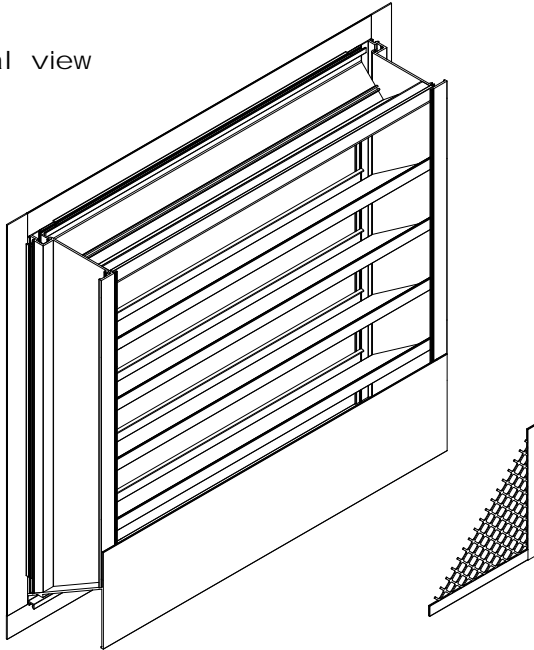
CONSTRUCTION FEATURES

Blade Action:	Opposed	Sizing:	Nominal
Frame Type:	Channel	Frame Thickness (ga):	16
Material:	Galvanized	Actuator Type:	120 VAC
Axle Material:	Steel	Actuator Mount:	External Kit
Axle Bearings:	Synthetic	Actuator Location:	Left Side
Linkage Material:	Steel	Fail Position:	Closed
Blade Seal:	TPE	Cycle:	50 Cycle
Jamb Seal Mat.:	304 SS	Temp. Rating (F):	180



ID #	Tag	Qty	W (in.)	H (in.)	Drive Arr.	Actuator	Act. Qty.
5-1		2	36.000	36.000	Drive-CC-11-1FEL-0	FSNF120	1

Internal view



ESD-635
6" Frame, 35° Blade
Application & Design

ESD-635 is a weather louver designed to protect air intake and exhaust openings in building exterior walls. Design incorporates drain gutters in the head member and horizontal blades to channel water to the jambs where water is further channeled through vertical downspouts and out at the sloped sill. The ESD-635 is an extremely efficient louver with AMCA LICENSED PERFORMANCE DATA enabling designers to select and apply with confidence.

Width and Height furnished approximately 0.250 in. under size.

Construction Features

Frame Depth (in.):	6	Frame Thickness (in.):	0.081	Louver Material:	Aluminum
Sizing:	Nominal	Fixed Blade Thick. (in.):	0.081		
Shape:	Rectangular				
Frame Type:	Flanged				
Product Warranty:	1-Year Standard				

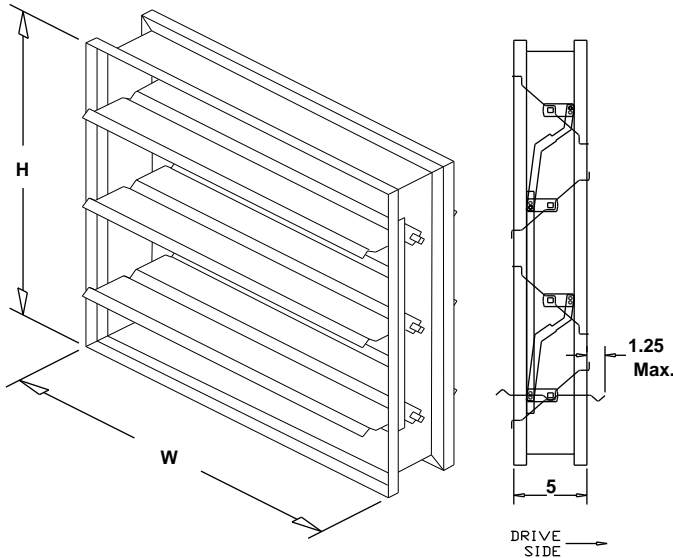
Options and Accessories

Flange Location:	Exterior	Flange Extension (in.):	1.5	Bird Screen Mat'l:	Aluminum
Bird Screen:	Internal	Bird Screen Type:	Flat Expanded		
Bird Screen Finish:	Mill				
Welded Construction:	No				

Summary

ID #	Tag	Qty.	W (in.)	H (in.)	Free Area (ft2)	Sect. Wide	Sect. High	Sect. Ship
6-1		1	46.000	46.000	8.46	1	1	1

Larger openings may require field assembly of multiple louver panels to make up the overall opening size. Individual louver panels are designed to withstand a 25 PSF wind-load (please consult Greenheck if the louvers must withstand higher wind-loads). Design, materials and installation of structural reinforcement required to adequately support large sections or multiple section assemblies within a large opening are not provided by Greenheck. Unless specifically indicated, the following are NOT included in the quote provided: structural steel, installation hardware (anchors, angle clips, continuous angles, shims, fasteners, inserts, backer rod and sealant), field measuring and/or installation, miscellaneous flashing, trim or enclosures, blank off panels, mullion covers or mullion hardware, hinged frames or removable subframes, custom bird/insect screen, 3-coat, metallic and/or exotic paint finishes, bituminous paints for unlike metals, any applicable taxes, stamped and sealed structural calculations or seismic calculations.



VCD-23

Low Leakage Control Damper

Application & Design

The model VCD-23 is a low leakage control damper for application as an automatic control or manual balancing damper. This model is intended for applications in low to medium pressure and velocity systems. A wide range of electric and pneumatic actuators are available. Non-jackshafted dampers will be supplied with a blade drive lever for internal actuator mounting. When external actuator mounting is specified in which case an extension pin with clip kit will be provided. Note: The extension pin with clip kit includes the extension pin and clip.

RATINGS

Pressure: 5 in. wg
Velocity: 3,000 ft/min
Leakage: Class 1A @ 1 in. wg, Class 1 @ 4 in. wg
Temperature: 200.0 F-250.0 F. Consult factory for higher temperatures.

Installation instructions available at www.greenheck.com.

Notes: All dimensions shown are in units of inches.

W & H furnished approximately 0.25 in. undersized and only refer to damper dimensions (sleeve thickness is not included).

Electrical accessory wiring terminates at the accessory.
Field wiring is required to individual components.

CONSTRUCTION FEATURES

Blade Action:	Opposed	Sizing:	Nominal
Frame Type:	Channel	Frame Thickness (ga):	16
Material:	Galvanized	Actuator Type:	120 VAC
Axle Material:	Steel	Actuator Mount:	External Kit
Axle Bearings:	Synthetic	Actuator Location:	Left Side
Linkage Material:	Steel	Fail Position:	Closed
Blade Seal:	TPE	Cycle:	50 Cycle
Jamb Seal Mat.:	304 SS	Temp. Rating (F):	180



ID #	Tag	Qty	W (in.)	H (in.)	Drive Arr.	Actuator	Act. Qty.
7-1		1	46.000	46.000	Drive-CC-11-1FEL-0	AFBUP	1

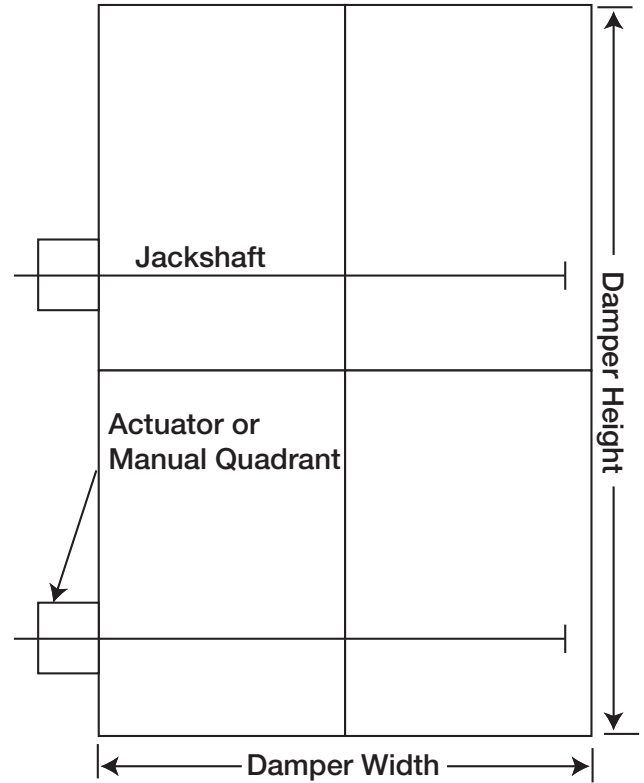
Drive Arrangement Definition

On multi-blade dampers (except vertical blade and Face & Bypass), they are given a drive arrangement code that helps describe the construction of the damper. The following breaks down what each number and letter represents.

22-2FEL-2

① ② ③ ④ ⑤ ⑥ ⑦

- ① Number of sections wide
- ② Number of sections high
- ③ Number of actuators or manual quadrants
- ④ Who supplies the actuators or manual quadrants
F - Factory
C - Customer Supplied (field mounted)
- ⑤ Actuator or manual quadrant mounting
E - External
I - Internal
B - Both internal and external
- ⑥ Actuator or manual quadrant location
L - Left hand drive
R - Right hand drive
B - Both right and left
- ⑦ Number of jackshafts



On vertical blade and face & bypass dampers, they are given a configuration ID number that helps describe the construction of the damper. See the following examples:

Model	Drive Arrangement Prefix
AMD-23, 33, 42	AMD
AMD-42V	VB
DFD-210, 230; DFDAF-310; DFDTF-210; SEDFD-210	MLS
FBH & FBV	FB
FSD, OFSD, CFSD, SMD, SEFSD, SSFSD, SESMD, SSSMD series (except vertical blade models)	MLS
FSD-311V, SMD-301V	VB
GFSD series	GFSD
ICD series	CC
IMO series	MLS
VCD series (except vertical blade models)	CC
VCD-xxV (vertical blade models)	VB

Belimo AFBUP & AFBUP-S Series

Application

The AFB series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides consistent torque to the damper with and without power applied to the actuator. The AFBUP-S version is provided with 2 built in auxiliary switches.

Torque rating (at rating voltage)

180 in. lb (20N•m) constant

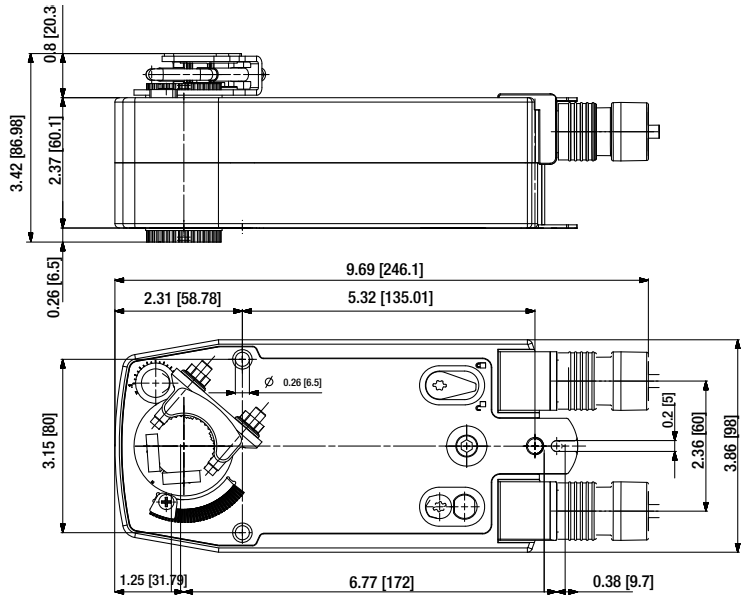
Timing (at rated torque and voltage)

Motor: Less than 75 seconds

Spring : Less than 20 seconds @ -4° to 122°F (-20° to 50°C)
 Less than 60 seconds @ - 22°F (-30°C)

Environmental Protection Ratings:

Nema 2

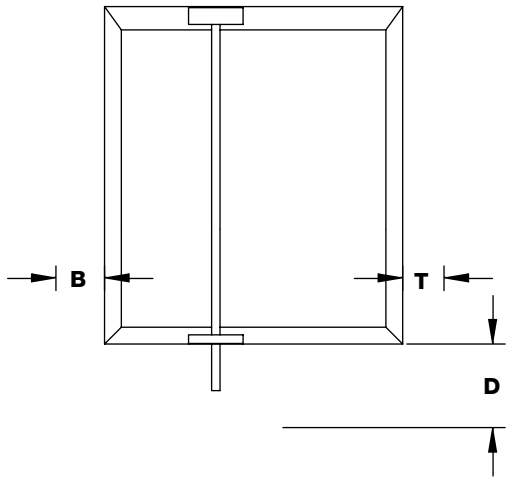


Cross Reference	
Old Model	New Model
AF-24	AFBUP
AF-120	
AF-230	
AF-24S	AFBUP-S
AF-120S	
AF-230-S	

Model	Auxiliary Switch	Power Consumption		Voltage Input in Vac
		Running	Holding	
AFBUP	No	7W	3.5W	24 to 240 VAC; 24 to 125 VDC
AFBUP-S	Yes			

Space Envelopes for FSD, SMD and VCD Series

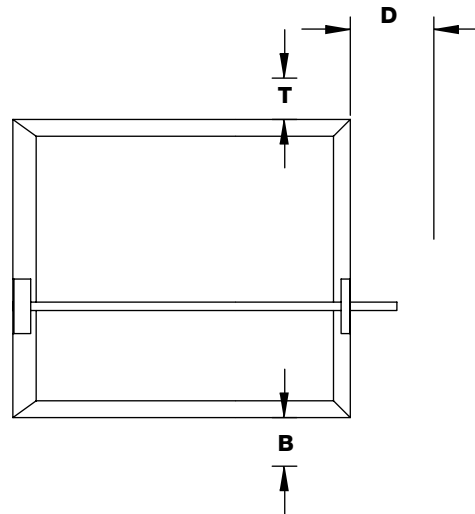
For Vertical Blade



Width	"T"	"B"	"D"
≥6 (152) to <10 (254)	0	12.75 (324)	6 (152)
≥10 (254) to <18 (457)	0	2 (51)	6 (152)
≥18 (457)	0	0	6 (152)

Dimensions are in inches (mm).

For Horizontal Blade



Height	"T"	"B"	"D"
≥6 (152) to <10 (254)	0	12.75 (324)	6 (152)
≥10 (254) to <18 (457)	0	2 (51)	6 (152)
≥18 (457)	0	0	6 (152)

Dimensions are in inches (mm).

Due to continuous product improvement, the actuator manufacturer reserves the right to change specifications without notice. For the most up-to-date information and maintenance, go to www.belimo.us

AFBUP, AFBUP-S, AFXUP, AFXUP-S

On/Off, Spring Return, 24 to 240 VAC



Technical Data		AFBUP, AFBUP-S, AFXUP, AFXUP-S
Power supply		24...240 VAC -20% / +10%, 50/60 Hz 24...125 VDC ±10%
Power consumption	running	7 W
	holding	3.5 W
Transformer sizing		7 VA @ 24 VAC (class 2 power source) 8.5 VA @ 120 VAC 18 VA @ 240 VAC
Electrical connection	AFBUP...	3 ft, 18 GA appliance cable, 1/2" conduit connector -S models: Two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
	AFXUP...	3 ft [1m], 10 ft [3m] or 16 ft [5m] 18 GA appliance cable, with or without 1/2" conduit connector -S models: Two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection		Electronic throughout 0 to 95° rotation
Control		On/Off
Torque		180 in-lb [20 Nm] minimum
Direction of rotation	spring	reversible with CW/CCW mounting
Mechanical angle of rotation		95° (adjustable with mechanical end stop, 35° to 95°)
Running time	motor	< 75 sec
	spring	20 sec @ -4°F to 122°F [-20°C to 50°C]; < 60 sec @ -22°F [-30°C]
Position indication		visual indicator, 0° to 95° (0° is full spring return position)
Manual override		5 mm hex crank (3/16" Allen), supplied
Humidity		max. 95% RH non-condensing
Ambient temperature		-22°F to 122°F [-30°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		Nema 2, IP54, Enclosure Type2
Housing material		Zinc coated metal and plastic casing
Agency listings †		cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC
Noise level		<50dB(A) motor @ 75 seconds ≤62dB(A) spring return
Servicing		maintenance free
Quality standard		ISO 9001
Weight		4.6 lbs (2.1 kg), 4.9 lbs (2.25 kg) with switches
† Rated Impulse Voltage 4kV, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.		
AFBUP-S, AFXUP-S		
Auxiliary switches		2 x SPDT 3A (0.5A) @ 250 VAC, UL Approved one set at +10°, one adjustable 10° to 90°

Torque min. 180 in-lb, for control of air dampers

Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact, or a manual switch.

The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

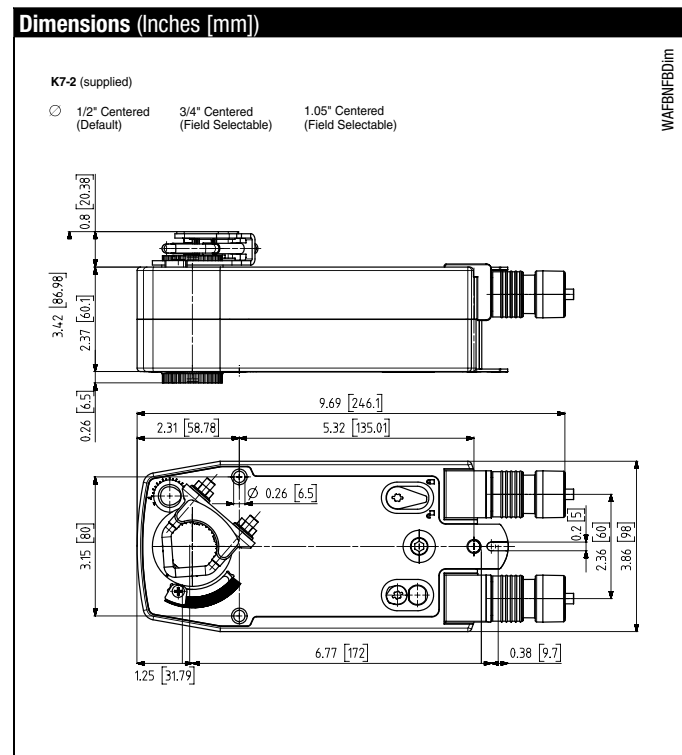
Operation

The AFB and AFX series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator.

The AFB and AFX series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°.

The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches.

The AFBUP-S and AFXUP-S versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at +10°, the other switch function is adjustable between +10° to +90°. The AFBUP, AFBUP-S, AFXUP and AFXUP-S actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.



M40024 - 05/10 - Subject to change. © Belimo Aircontrols (USA), Inc.

Accessories

AV 8-25	Shaft extension
IND-AFB	Damper position indicator
K7-2	Universal clamp for up to 1.05" dia jackshafts
KH-AFB	Crank arm
TF-CC US	Conduit fitting
Tool-06	8mm and 10 mm wrench
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-118	Mounting bracket for Barber Colman® MA 3../4..., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crank arm type installations
ZG-AFB	Crank arm adaptor kit
ZG-AFB118	Crank arm adaptor kit
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

Note: When using AFBUP, AFBUP-S, AFXUP, AFXUP-S actuators, only use accessories listed on this page.

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

Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. 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 switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus approved 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 and input impedance must be observed.

3 No ground connection is required.

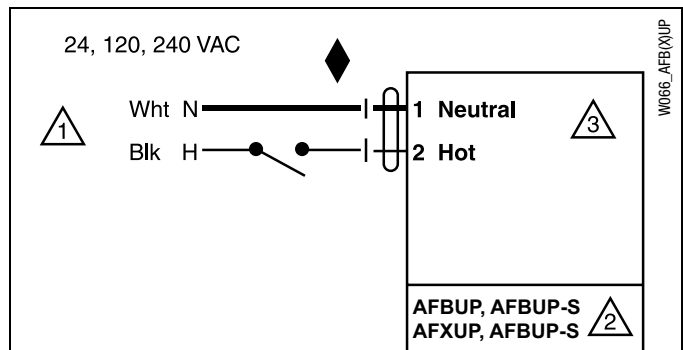
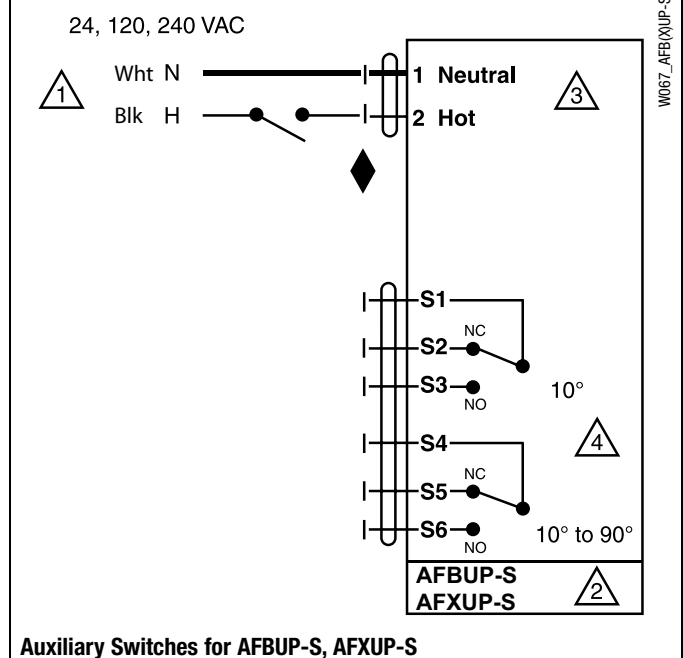
4 For end position indication, interlock control, fan startup, etc., AFBUP-S and AFXUP-S incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 VAC, UL Approved, one switch is fixed at +10°, one is adjustable 10° to 90°.

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 AFBUP, AFXUP

Auxiliary Switches for AFBUP-S, AFXUP-S

Model: BSQ-240-30

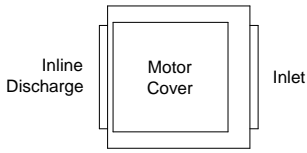
Belt Drive Centrifugal Inline Fan

Standard Construction Features:

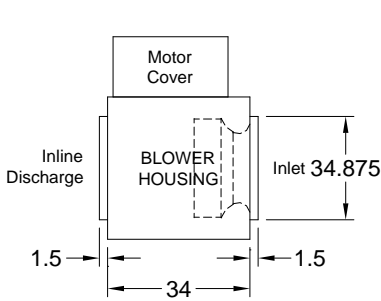
- Galvanized steel housing - Backward inclined aluminum wheel - Two bolted access panels - Integral duct connection flanges - Ball bearing motors - Adjustable motor pulley - Adjustable motor plate - Fan shaft mounted in ball bearing pillow blocks - Static free belts - Corrosion resistant fasteners

Options & Accessories:

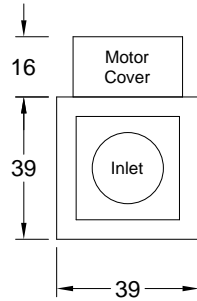
Motor with Class F Insulation
UL/cUL 705 Listed - "Power Ventilators"
Switch, NEMA-1, Toggle, Junction Box Mounted & Wired
Motor Cover
Isolators & Brackets (Qty:4), Spring Hanging (PN 850346)(Shipped Loose)
Bearings with Grease Fittings, L10 life of 100,000 hrs (L50 avg. life 500,000 hrs)



PLAN VIEW



ELEVATION VIEW



END VIEW

Dimensional

Qty	Weight w/o Accessories (lb)	Weight with Accessories (lb)
2	426	482

Performance

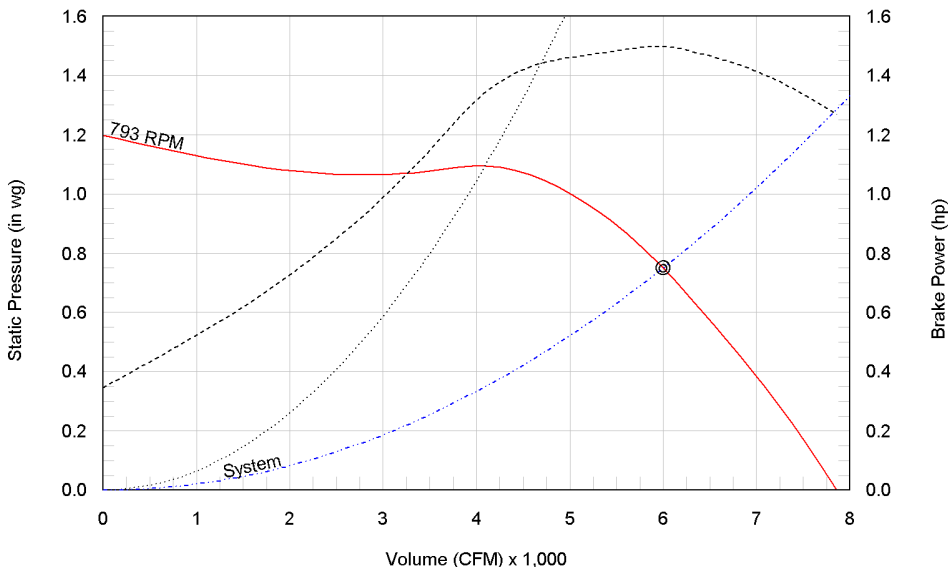
Requested Volume (CFM)	Actual Volume (CFM)	Requested SP (in wg)	Actual SP (in wg)	Fan RPM	Operating Power (hp)	Elevation (ft)	Airstream Temperature (F)	Drive Loss (%)	Tip Speed (ft/min)	SE (%)
6,000	6,000	0.75	0.75	793	1.5	0	70	5.3	5,085	49.9

Motor

Motor Mounted	Size (hp)	V/C/P	Encl.	Motor RPM	Windings	NEC FLA* (Amps)
Yes	3	400/50/3	TEFC	1425	1	NA

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	81	85	82	75	73	69	62	55	79	68	16.3
Radiated	84	86	78	69	65	54	44	39	75	63	12.8



— RPM Curve
- - - System Curve
- - - Brake Power Curve
- - - Do not select to the left of this surge curve
⊗ Desired operating point
⊙ Actual operating point



Notes:

All dimensions shown are in units of in.
*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighed sound pressure level, based on 11.5 dB attenuation per Octave band at 5.0 ft - dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5.0 ft

Disconnect Switch

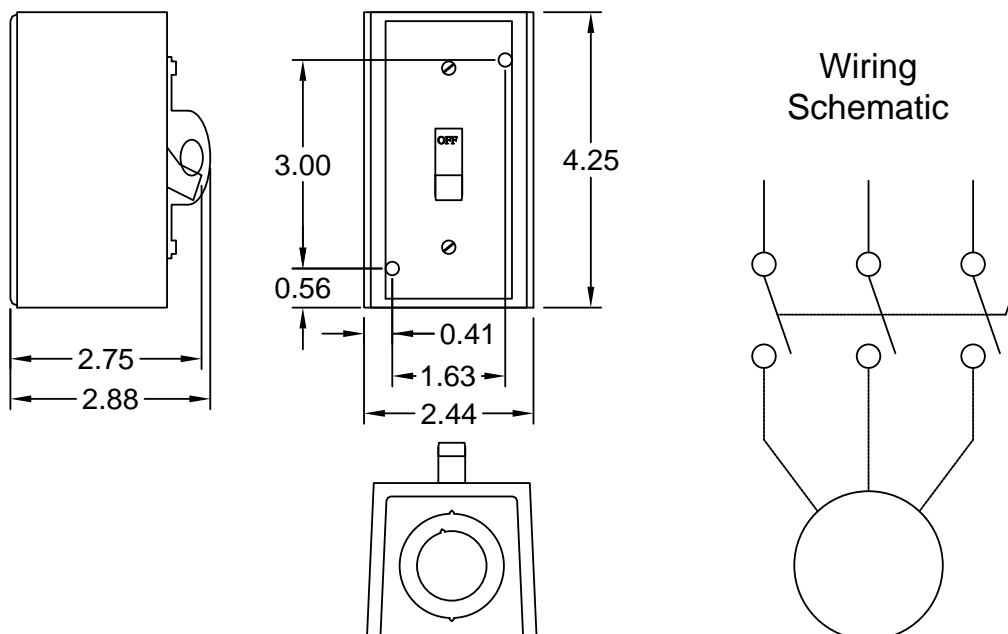
Enclosure Rating: NEMA-1
Standard Construction Features:

Enclosure constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dust. This enclosure meets the rod entry and the indoor corrosion protection design tests. The rod entry test is intended to simulate incidental contact with enclosure equipment. Enclosure is equipped with provision to lockout in the off position with customer supplied lock.

Disconnect Switch Configuration

Type:	Toggle	Motor Size:	3 hp	Voltage:	400	UL Listed:	Yes
Manufacturer:	Square D	Cycle:	50	Amperage:	30	CSA Approved:	Yes
Overload Protection:	None	Phase:	3	Switch Pole(s):	3	Rating:	10 hp
Mounting:	Mounted and Wired	RPM:	1425	Wiring (Exp. Resist.):	None		

Electrical Drawing Details



Notes: All dimensions shown are in units of in

Isolator

Type: Spring Hanging

Standard Construction Features:

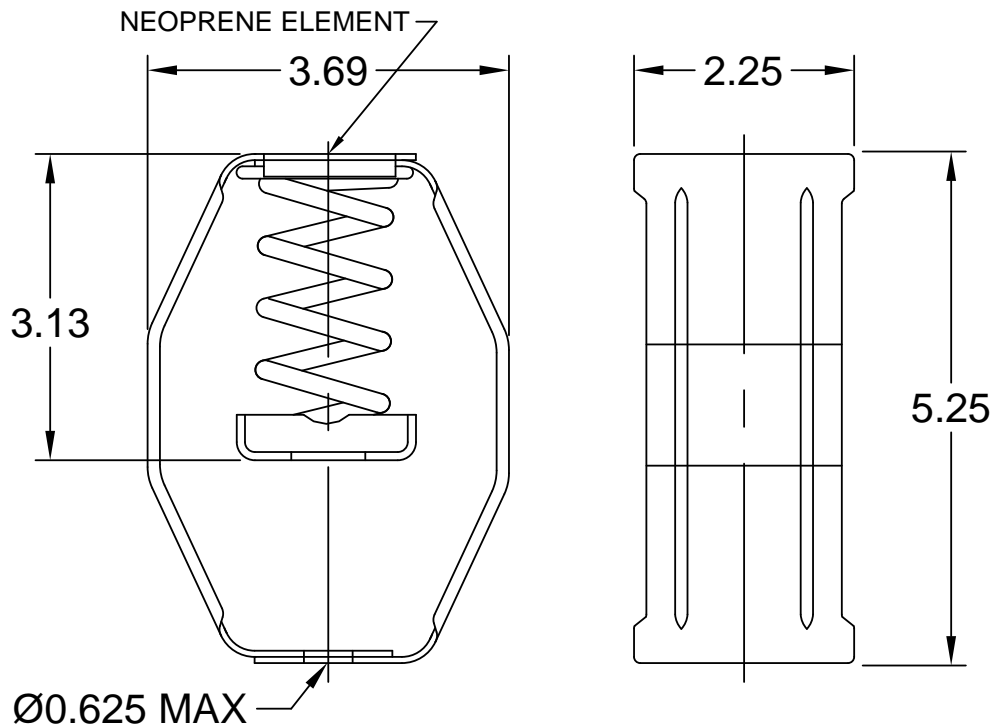
The spring hanging isolator is designed to reduce the transmission of vibration and noise produced by suspended equipment and piping. To assure stability, the spring element has a minimum lateral stiffness of 1.0 times the rated vertical stiffness. The hanger will allow a support rod misalignment through a 30 degree arc and the isolation brackets will carry a 500% overload without failure. The isolator has an epoxy powder coated bracket and spring coil which is color coded according to the load capacity and has a noise isolation pad, all which is assembled into a stamped or welded hanger bracket.

This part number includes 4 isolators.

Isolator Configuration

Description:	SH-1-245	Color:	Brown
Manufacturer:	Kinetics Noise Control	Mounting:	Hanging
Load Capacity:	245 lb	Kit Part Number:	850346
Deflection:	1.19 in		

Spring Hanging - Vibration Isolator



Notes: All dimensions shown are in units of in

Model: BSQ-180-15

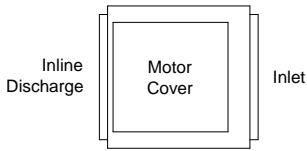
Belt Drive Centrifugal Inline Fan

Standard Construction Features:

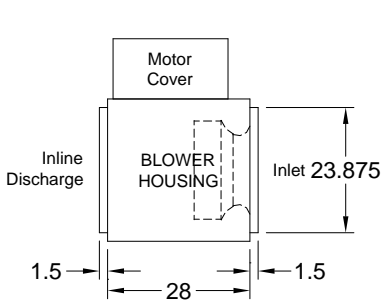
- Galvanized steel housing - Backward inclined aluminum wheel - Two bolted access panels - Integral duct connection flanges - Ball bearing motors - Adjustable motor pulley - Adjustable motor plate - Fan shaft mounted in ball bearing pillow blocks - Static free belts - Corrosion resistant fasteners

Options & Accessories:

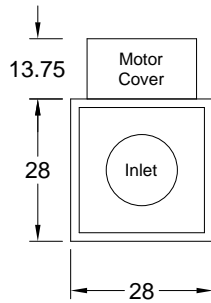
- Motor with CSA Approval
- Motor with Class F Insulation
- UL/cUL 705 Listed - "Power Ventilators"
- Switch, NEMA-1, Toggle, Junction Box Mounted & Wired
- Motor Cover
- Isolators & Brackets (Qty:4), Spring Hanging (PN 850345)(Shipped Loose)
- Bearings with Grease Fittings, L10 life of 100,000 hrs (L50 avg. life 500,000 hrs)



PLAN VIEW



ELEVATION VIEW



END VIEW

Dimensional

Qty	Weight w/o Accessories (lb)	Weight with Accessories (lb)
2	240	277

Performance

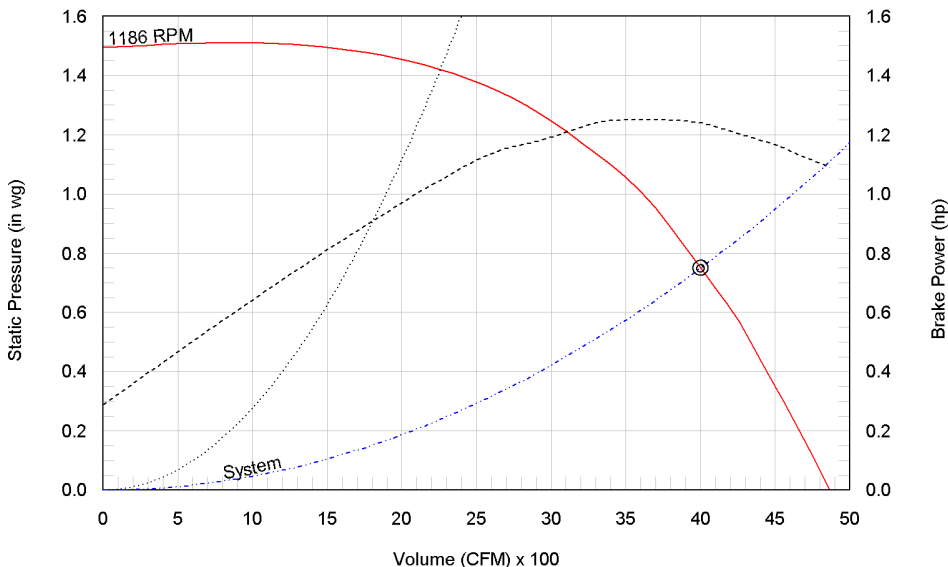
Requested Volume (CFM)	Actual Volume (CFM)	Requested SP (in wg)	Actual SP (in wg)	Fan RPM	Operating Power (hp)	Elevation (ft)	Airstream Temperature (F)	Drive Loss (%)	Tip Speed (ft/min)	SE (%)
4,000	4,000	0.75	0.75	1186	1.24	0	70	5.7	5,745	40.4

Motor

Motor Mounted	Size (hp)	V/C/P	Encl.	Motor RPM	Windings	NEC FLA* (Amps)
Yes	1 1/2	400/50/3	TEFC	1425	1	NA

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	81	80	82	78	70	67	62	60	79	68	15.7
Radiated	84	81	78	72	62	52	44	44	74	62	11.2



RPM Curve
 System Curve
 Brake Power Curve
 Do not select to the left of this surge curve
 Desired operating point
 Actual operating point



Notes:

All dimensions shown are in units of in.
 *FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
 LwA - A weighted sound power level, based on ANSI S1.4
 dBA - A weighed sound pressure level, based on 11.5 dB attenuation per Octave band at 5.0 ft - dBA levels are not licensed by AMCA International
 Sones - calculated using AMCA 301 at 5.0 ft

Disconnect Switch

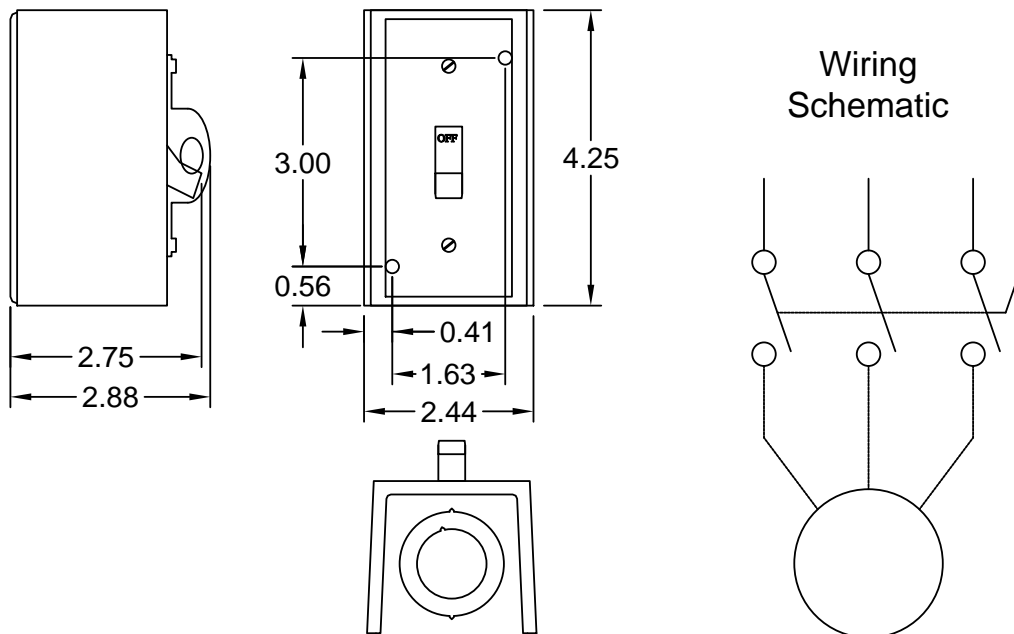
Enclosure Rating: NEMA-1 Standard Construction Features:

Enclosure constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dust. This enclosure meets the rod entry and the indoor corrosion protection design tests. The rod entry test is intended to simulate incidental contact with enclosure equipment. Enclosure is equipped with provision to lockout in the off position with customer supplied lock.

Disconnect Switch Configuration

Type:	Toggle	Motor Size:	1 1/2 hp	Voltage:	400	UL Listed:	Yes
Manufacturer:	Square D	Cycle:	50	Amperage:	30	CSA Approved:	Yes
Overload Protection:	None	Phase:	3	Switch Pole(s):	3	Rating:	10 hp
Mounting:	Mounted and Wired	RPM:	1425	Wiring (Exp. Resist.):	None		

Electrical Drawing Details



Notes: All dimensions shown are in units of in

Isolator

Type: Spring Hanging

Standard Construction Features:

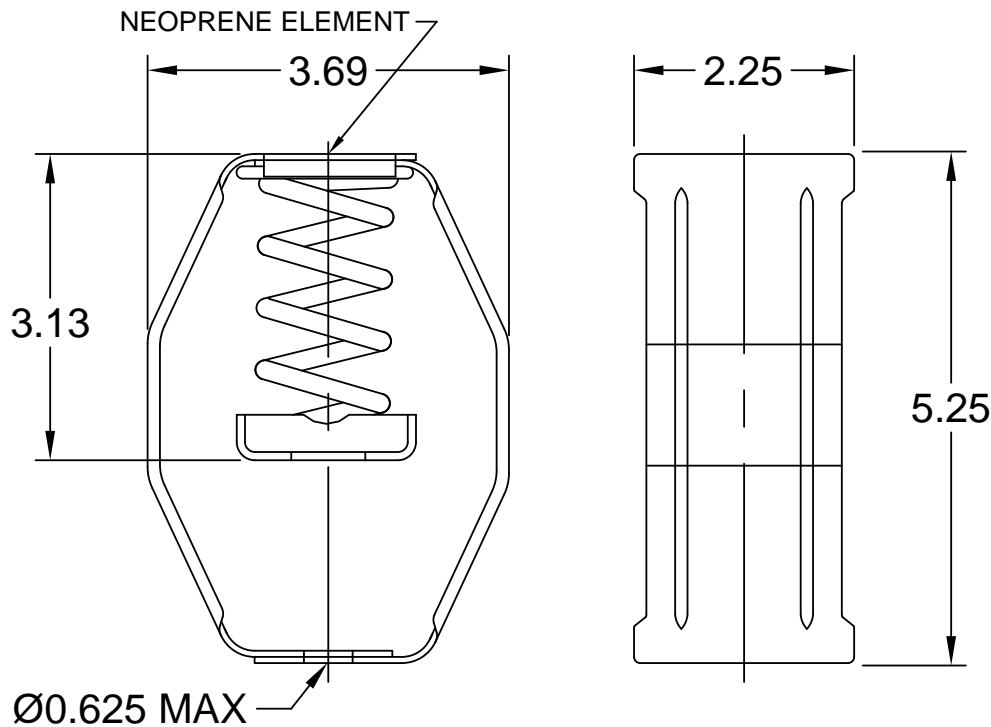
The spring hanging isolator is designed to reduce the transmission of vibration and noise produced by suspended equipment and piping. To assure stability, the spring element has a minimum lateral stiffness of 1.0 times the rated vertical stiffness. The hanger will allow a support rod misalignment through a 30 degree arc and the isolation brackets will carry a 500% overload without failure. The isolator has an epoxy powder coated bracket and spring coil which is color coded according to the load capacity and has a noise isolation pad, all which is assembled into a stamped or welded hanger bracket.

This part number includes 4 isolators.

Isolator Configuration

Description:	SH-1-125	Color:	Gray
Manufacturer:	Kinetics Noise Control	Mounting:	Hanging
Load Capacity:	125 lb	Kit Part Number:	850345
Deflection:	1.25 in		

Spring Hanging - Vibration Isolator



Notes: All dimensions shown are in units of in

Model: BSQ-160-5

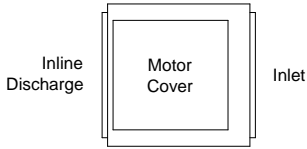
Belt Drive Centrifugal Inline Fan

Standard Construction Features:

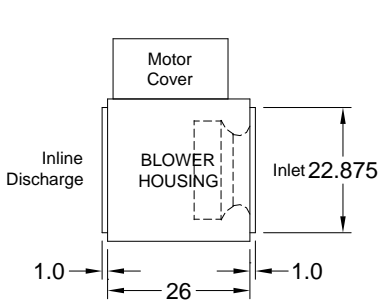
- Galvanized steel housing - Backward inclined aluminum wheel - Two bolted access panels - Integral duct connection flanges - Ball bearing motors - Adjustable motor pulley - Adjustable motor plate - Fan shaft mounted in ball bearing pillow blocks - Static free belts - Corrosion resistant fasteners

Options & Accessories:

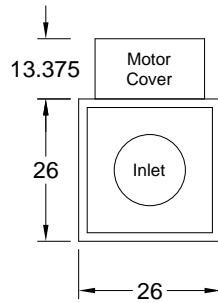
Motor with CSA Approval
Motor with Class F Insulation
UL/cUL 705 Listed - "Power Ventilators"
Switch, NEMA-1, Toggle, Junction Box Mounted & Wired
Motor Cover
Isolators & Brackets (Qty:4), Spring Hanging (PN 850345)(Shipped Loose)
Bearings with Grease Fittings, L10 life of 100,000 hrs (L50 avg. life 500,000 hrs)



PLAN VIEW



ELEVATION VIEW



END VIEW

Dimensional

Qty	Weight w/o Accessories (lb)	Weight with Accessories (lb)
2	187	218

Performance

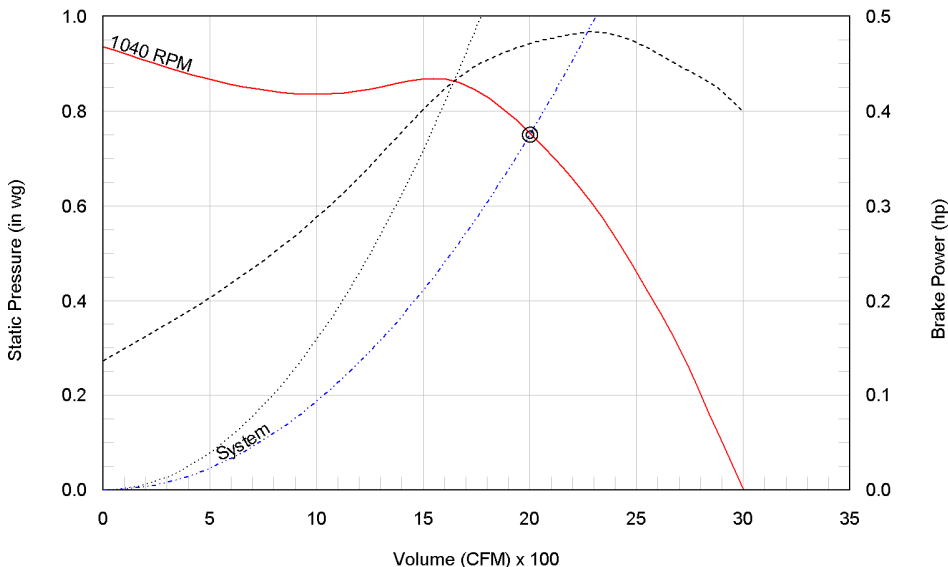
Requested Volume (CFM)	Actual Volume (CFM)	Requested SP (in wg)	Actual SP (in wg)	Fan RPM	Operating Power (hp)	Elevation (ft)	Airstream Temperature (F)	Drive Loss (%)	Tip Speed (ft/min)	SE (%)
2,000	2,000	0.75	0.75	1040	0.47	0	70	8.7	4,525	55.0

Motor

Motor Mounted	Size (hp)	V/C/P	Encl.	Motor RPM	Windings	NEC FLA* (Amps)
Yes	1/2	230/50/1	TEFC	1425	1	4.9

Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	75	76	74	71	62	61	57	54	72	60	10.3
Radiated	78	77	70	65	54	46	39	38	67	55	7.5



Notes:

All dimensions shown are in units of in.
*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighed sound pressure level, based on 11.5 dB attenuation per Octave band at 5.0 ft - dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5.0 ft

— RPM Curve
--- System Curve
--- Brake Power Curve
--- Do not select to the left of this surge curve
⊙ Desired operating point
⊙ Actual operating point

Disconnect Switch

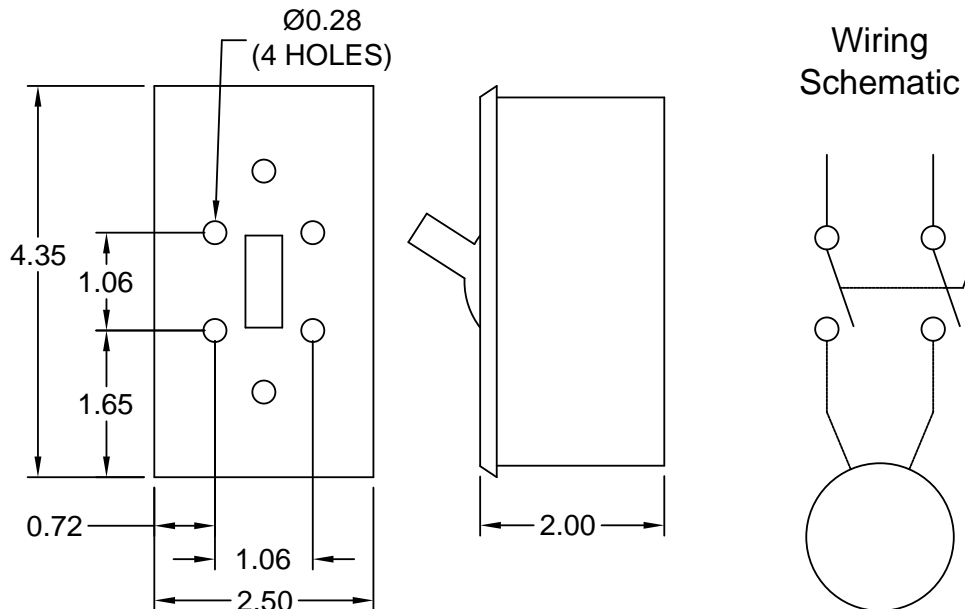
Enclosure Rating: NEMA-1 Standard Construction Features:

Enclosure constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dust. This enclosure meets the rod entry and the indoor corrosion protection design tests. The rod entry test is intended to simulate incidental contact with enclosure equipment. Enclosure is equipped with provision to lockout in the off position with customer supplied lock.

Disconnect Switch Configuration

Type:	Toggle	Motor Size:	1/2 hp	Voltage:	230	UL Listed:	Yes
Manufacturer:	Pass and Seymour	Cycle:	50	Amperage:	20	CSA Approved:	Yes
Overload Protection:	None	Phase:	1	Switch Pole(s):	2	Rating:	2 hp
Mounting:	Mounted and Wired	RPM:	1425	Wiring (Exp. Resist.):	None		

Electrical Drawing Details



Notes: All dimensions shown are in units of in

Isolator

Type: Spring Hanging

Standard Construction Features:

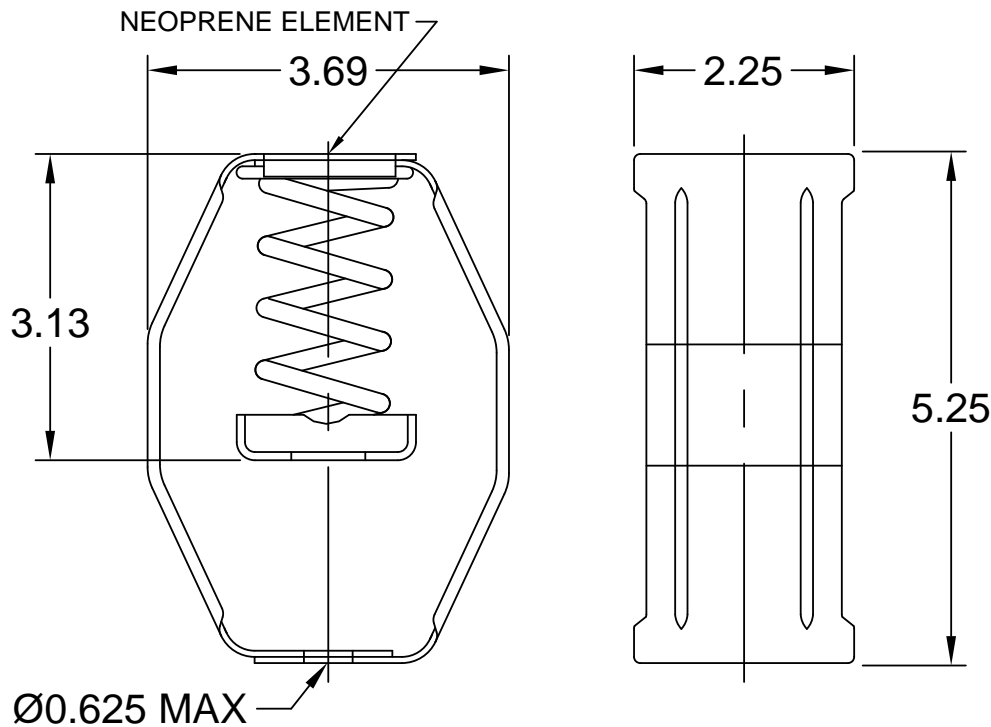
The spring hanging isolator is designed to reduce the transmission of vibration and noise produced by suspended equipment and piping. To assure stability, the spring element has a minimum lateral stiffness of 1.0 times the rated vertical stiffness. The hanger will allow a support rod misalignment through a 30 degree arc and the isolation brackets will carry a 500% overload without failure. The isolator has an epoxy powder coated bracket and spring coil which is color coded according to the load capacity and has a noise isolation pad, all which is assembled into a stamped or welded hanger bracket.

This part number includes 4 isolators.

Isolator Configuration

Description:	SH-1-125	Color:	Gray
Manufacturer:	Kinetics Noise Control	Mounting:	Hanging
Load Capacity:	125 lb	Kit Part Number:	850345
Deflection:	1.25 in		

Spring Hanging - Vibration Isolator



Notes: All dimensions shown are in units of in