

## GENERAL PRODUCT OVERVIEW

With today's stringent design criteria for energy efficient 'green' building technology and indoor air quality, individual product engineering, testing and quality of workmanship are more important than ever before. At Nailor Industries, our continuous research and development, combined with our commitment to quality in manufacturing, have resulted in premium control damper products at a reasonable cost. Our standard performance control dampers meet the requirements of the majority of low to medium velocity and pressure commercial HVAC systems and our high performance control dampers offer unsurpassed leakage that meet the International Energy Conservation Code (IECC) maximum leakage for building envelope dampers criteria of 3 cfm/ft.<sup>2</sup> @ 1" w.g. (15.2 L/s/m<sup>2</sup> @ 0.25 kPa) and offer low pressure drop characteristics suitable for use in high velocity, medium pressure commercial and industrial applications.

### MODELS 1010 & 1020

#### LOW LEAKAGE CONTROL DAMPER VEE GROOVE BLADE

Model 1010 and 1020 Low Leakage Control Dampers are Nailor's most popular choice for use in low to medium velocity and pressure commercial HVAC systems. They are low cost, high quality dampers that meet the frequently specified leakage criteria of less than 10 cfm per sq. ft. at 4" w.g. (0.5% at 2000 fpm). The design features include galvanized steel construction, a sturdy hat channel frame with die-formed corner gussets providing superior structural strength equivalent to 13 ga. (2.4) channel type frames, extruded PVC blade seals, a vee groove blade design that maximizes strength and optimizes airflow and a no-maintenance concealed linkage located out of the air stream for reduced pressure drop, air turbulence and noise. A variety of options are available to meet specific installation requirements and applications.

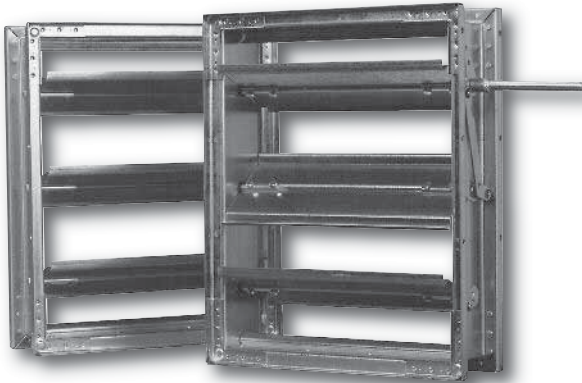


Models 1010 & 1020

### MODELS 1012 & 1022

#### STANDARD CONTROL DAMPER VEE GROOVE BLADE

Model 1012 and 1022 Standard Control Dampers are the most economical choice for use in low to medium pressure and velocity commercial HVAC systems. They are high quality, low cost dampers that meet or exceed the majority of less stringent specification requirements. The design features include galvanized steel construction, a sturdy hat channel frame with die-formed corner gussets providing superior structural strength equivalent to 13 ga. (2.4) channel type frames, an interlocking vee groove blade design that maximizes blade strength and optimizes airflow and a no-maintenance concealed linkage located out of the air stream for reduced pressure drop, air turbulence and noise.



Models 1012 & 1022

### MODEL 1090

#### LOW LEAKAGE CONTROL DAMPER ROUND DUCT

Model 1090 is an ultra-low leakage round control damper which has been designed for all types of round ductwork applications and is suitable for use in low to medium pressure and velocity commercial HVAC systems. The 1090 installs quickly and easily, saving money on installation costs. The design features a sturdy beaded casing for superior rigidity and a 14 ga. (2.0) equivalent laminated blade double bolted to the drive shaft for maximum strength. The damper can be used for two position or modulating control using electric or pneumatic actuators or can also be used as a manual balancing damper when used with the optional hand locking quadrant and positive shut-off is required.



Model 1090

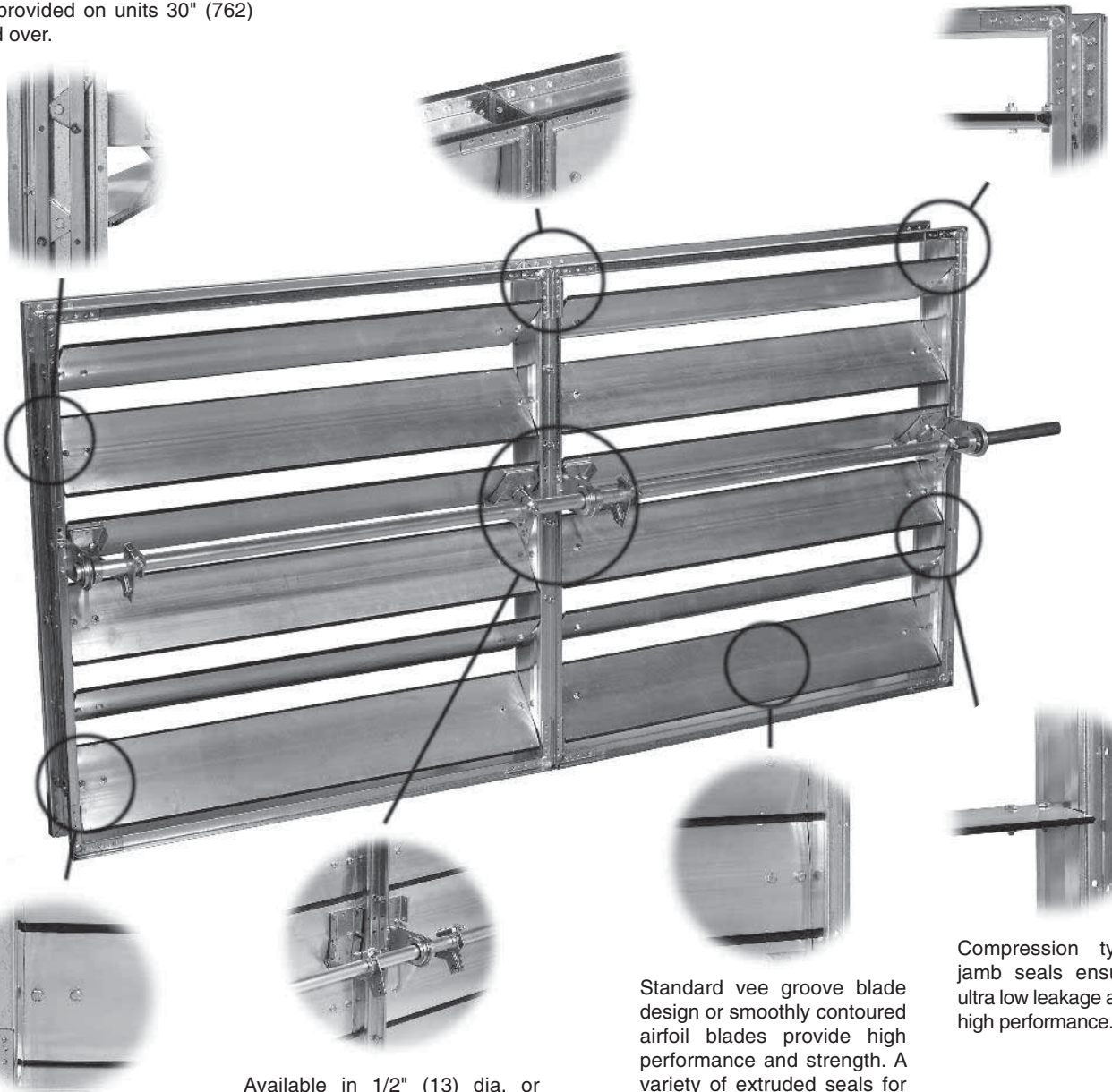
## FEATURES OF NAILOR CONTROL DAMPERS

At Nailor Industries, we take pride in putting our years of experience in manufacturing premium quality dampers to work for you with every control damper we make. We've learned a lot since producing our first damper in 1971 and have incorporated that knowledge into the latest designs and features that are offered today. With Nailor dampers you're in control! We manufacture your control dampers with the remarkable quality features shown below and with a multitude of options you can select from to meet your specific requirements. With Nailor's fast lead times, your control dampers will be on site when you need them. Premium quality, reasonable cost and versatility are just some the standard features found on all Nailor products!

Nailor's robust blade linkage provides firm, precise blade connections for smooth operation, concealed in frame, out of airstream for reduced turbulence and pressure drop. Double linkage provided on units 30" (762) wide and over.

Rugged 16 ga. (1.6) hat channel frame design provides strength equivalent to heavier gauge U-channel frames.

Corners are mitered and reinforced with die-formed gussets for superior rigidity and strength that virtually eliminates racking.



Each axle is fastened to blade end with double thru-bolts providing superior no-slip axle connections. Choice of bearings to suit application.

Available in 1/2" (13) dia. or heavy duty 1" (25) dia. shaft. A robust linkage, bearing brackets and blade connections provide optimum operation on larger dampers.

Standard vee groove blade design or smoothly contoured airfoil blades provide high performance and strength. A variety of extruded seals for various applications provide low-leakage characteristics that lead the industry.

Compression type jamb seals ensure ultra low leakage and high performance.

Quality dampers by Nailor Industries . . . Now you're in control!

## CONTROL DAMPER TESTING

All AMCA certified dampers are subject to the guidelines of the Certification Ratings Program and are tested in accordance with AMCA Standard 500-D, *Laboratory Methods of Testing Dampers for Rating*. All Nailor non-AMCA certified control, balancing and backdraft dampers are tested in an independent laboratory and testing is conducted in accordance with AMCA Standard 500-D.

There are three common test setups to test pressure drop referenced in AMCA 500-D: Fig. 5.2, Fig. 5.3 and Fig. 5.5 (see below). All Nailor control dampers are tested using the configuration shown below in Fig. 5.3, illustrating a fully ducted damper. All Nailor backdraft dampers are tested using the configuration shown in Fig. 5.5, illustrating a plenum mounted damper. Fig. 5.3 yields the lowest pressure drop of the three test configurations due to minimized entrance and exit losses of the upstream and downstream straight duct runs. Fig. 5.5 has the highest pressure drop due to extremely high entrance and exit losses due to the sudden changes of area in the system.

Pressure drop data within this section has been corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup> (1.2 kg/m<sup>3</sup>) and this data is representative of laboratory conditions. The actual pressure drop of any HVAC system is a combination of many factors. This pressure drop information along with an analysis of other system influences should be used to estimate actual pressure losses for a damper installed in a given HVAC system.

With any damper application, the amount of air leakage through the damper should be considered. If the application requires low leakage characteristics, the damper should be provided with seals. Nailor Industries offers a variety of low leakage rated dampers with blade and jamb seals suitable for most commercial and light industrial HVAC applications.

The sealing performance of a closed damper is described by the airflow leakage rate through the damper for a given pressure differential across the damper. The established sealing performance is usually expressed (or plotted) as cfm per sq. ft. (m<sup>3</sup>/s per m<sup>2</sup>) through the face area of a damper versus measured pressure differential across the damper. The published sealing performance is calculated in accordance with AMCA Standard 500-D and is a statement of the worst-case performance based on testing various damper sizes.

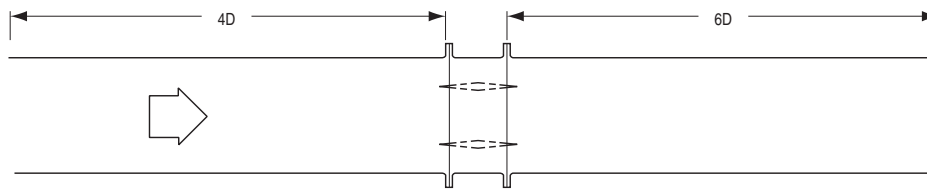


FIG. 5.3

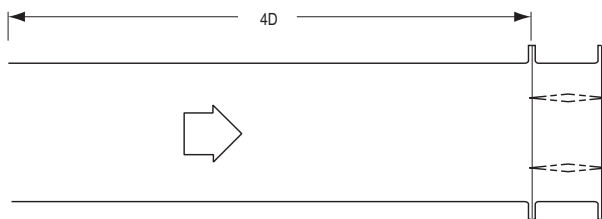


FIG. 5.2

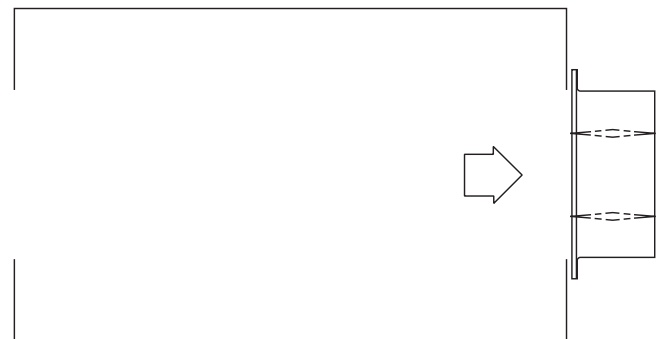


FIG. 5.5

- VEE GROOVE BLADE
- LOW LEAKAGE
- GALVANIZED STEEL

**Models:**

- 1010 Parallel Blade
- 1020 Opposed Blade



Model 1010

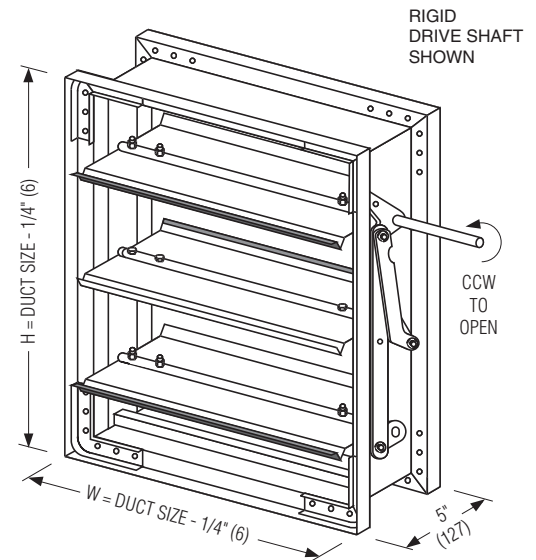
Model 1020

Model 1010 and 1020 low leakage control dampers are Nailor's most popular choice for use in low to medium velocity and pressure commercial HVAC systems. They are low cost, high quality dampers that meet the frequently specified leakage criteria of less than 10 cfm per sq. ft. at 4" w.g. (0.5% at 2000 fpm). Suitable for use in low to medium velocity and pressure commercial HVAC systems.

Design features include durable steel construction, a sturdy 16 ga. (1.6) galvanized steel hat channel frame with die-formed corner gussets providing superior structural strength equivalent to 13 ga. (2.4) channel type frames, an interlocking vee groove blade design that maximizes strength and optimizes airflow, double bolted no slip blade axle connections with corrosion resistant long life synthetic bearings, extruded PVC blade seals and compression type metallic jamb seals for low leakage requirements and a no-maintenance concealed linkage located within the side frame out of the air stream for reduced pressure drop, air turbulence and noise. A variety of electric or pneumatic actuators are available for factory or field mounting along with a comprehensive selection of options to meet specific installation requirements and applications.

**STANDARD CONSTRUCTION:**

- Frame:** 5" x 7/8" x 16 ga. (127 x 22 x 1.6) galvanized steel hat channel with die-formed corner gussets. Low profile (flat top and bottom) on dampers 10" (254) high and under.
- Blades:** 6" (152) wide on 5 1/2" (140) centers. 16 ga. (1.6) galvanized steel vee groove design. Parallel or opposed action.
- Linkage:** Concealed type totally enclosed within the frame and out of the airstream. Plated steel.
- Bearings:** 1/2" (13) dia. Celcon®.
- Axles:** 1/2" (13) dia. plated steel double bolted to blades.
- Drive Shaft:** 6" (152) long x 1/2" (13) dia. rigid shaft; or optional lock-on shaft with outboard support bracket (standard in Canada), on all single section dampers. A 1/2" (13) or 1" (25) dia. factory installed jackshaft is standard on all multiple section dampers.
- Blade Seals:** Dual durometer bulb type extruded PVC.
- Jamb Seals:** Compression type cambered metal.



**Models 1010 and 1020 Sizes (Duct W x H):**

Minimum		Maximum	
Single Section		Single Section	Multiple Section
Single Blade 6" x 4" (152 x 102)	Two Blades (parallel or opposed) 8" x 10" (203 x 254)	48" x 72" (1219 x 1829)	Unlimited

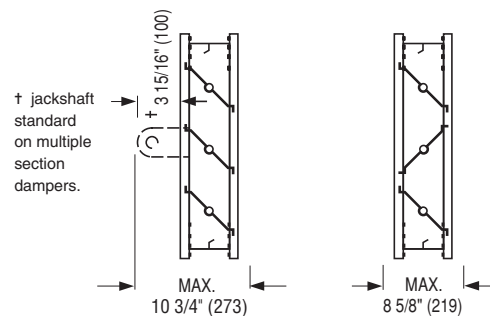
Temperature Range: -50°F to 180°F (-46°C to 82°C)

**COMMON OPTIONS:**

- Type 304 Stainless Steel construction.
- Heavier gauge frame construction.
- Front, rear or double flange frame (with or without bolt holes).
- Factory installed pneumatic and electric actuators.

**MODEL 1010**  
PARALLEL BLADE

**MODEL 1020**  
OPPOSED BLADE

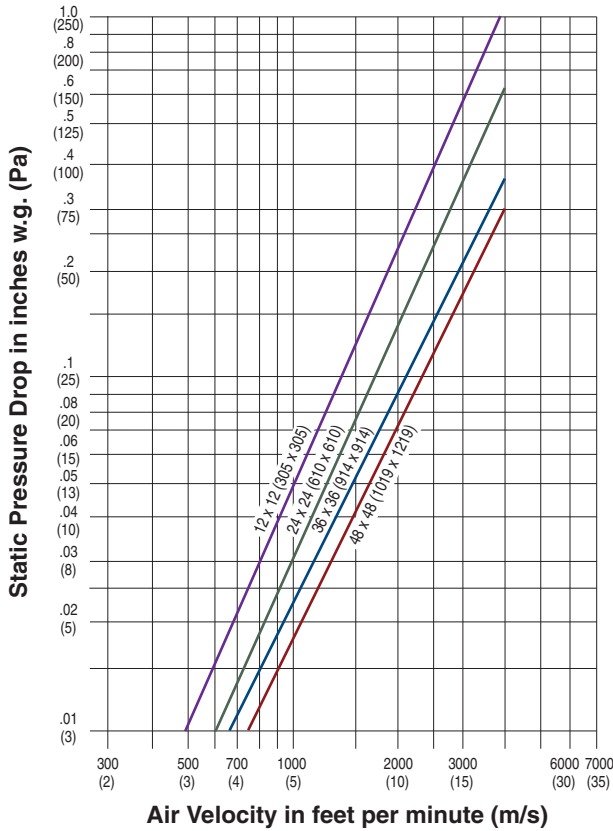




**PERFORMANCE DATA:**

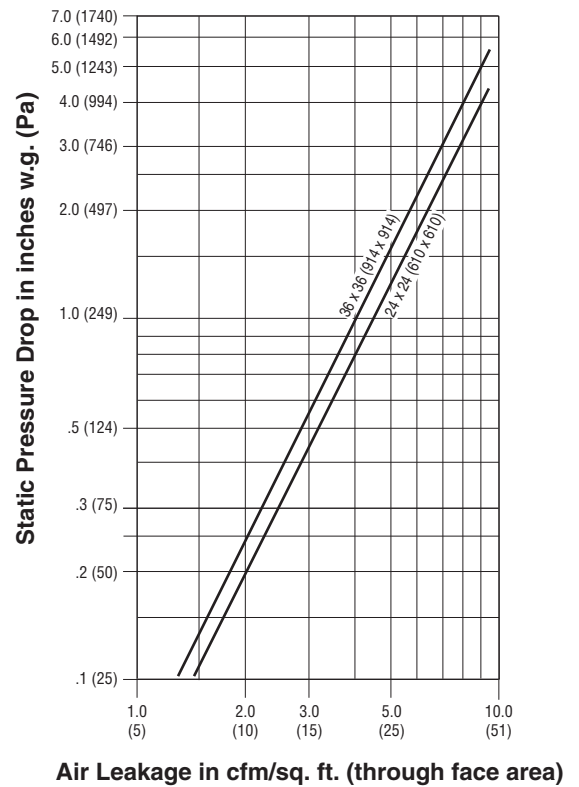
**MODELS: 1010 AND 1020**

**PRESSURE DROP (damper fully open):**



Tested per AMCA standard 500-D, Fig. 5.3.

**LEAKAGE (damper fully closed):**



Tested per AMCA standard 500-D, Fig. 5.5.

**DYNAMIC LIMITATIONS / LEAKAGE**

Damper Width	Maximum System Pressure	Maximum System Velocity	Leakage *	
			% of Max. Flow	Cfm/Sq. Ft.
48" (1219)	2.5" w.g.	2000 fpm	.18	3.5
36" (914)	3.0" w.g.	2000 fpm	.20	4.0
24" (610)	4.0" w.g.	2000 fpm	.23	4.5
12" (305)	5.0" w.g.	2000 fpm	.33	6.6

\* Leakage information is based upon a pressure differential of 1" w.g. tested per AMCA standard 500-D, Fig. 5.5.

## HOW TO SPECIFY

## MODELS: 1010 AND 1020

## LOW LEAKAGE CONTROL DAMPERS

**SUGGESTED SPECIFICATION:**

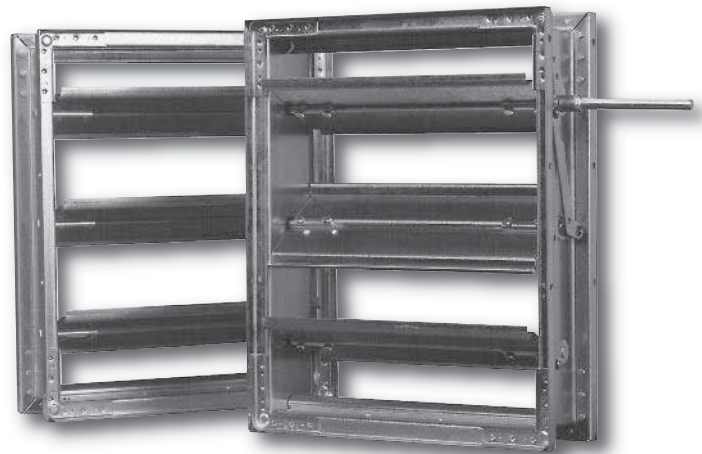
Provide and install, as shown on plans and/or schedules, low leakage control dampers as manufactured by Nailor Industries, Inc. which meet or exceed the following criteria: Frame shall be constructed of 16 ga. (1.6) galvanized steel hat channel with mitered corners and die-formed corner gussets for rigidity and structural strength equivalent to 13 ga. (2.4) channel type frames. Blades shall be of vee groove design, 16 ga. (1.6) galvanized steel, on maximum 6" (152) centers. Blade axles shall be 1/2" (13) dia. plated steel, double thru-bolted to blade at each end. Hex, square friction-fit or press-fit axles are not acceptable. Bearings shall be Celcon® molded synthetic type. Blade linkage shall be no-maintenance, out of airstream and totally concealed within the frame. Jackshafts shall be supplied on all multiple section wide assemblies in order to evenly distribute torque. Blade seals shall be dual durometer bulb type extruded PVC, and jamb seals shall be compression type cambered metal, providing positive shut-off.

All submitted performance data to be based on tests in accordance with AMCA Standard 500-D. Standard of acceptance shall be Nailor Industries (**specifier to select**) Model 1010 parallel blade **or** Model 1020 opposed blade control damper.

- VEE GROOVE BLADE
- GALVANIZED STEEL

**Models:**

- 1012 Parallel Blade
- 1022 Opposed Blade



Model 1012

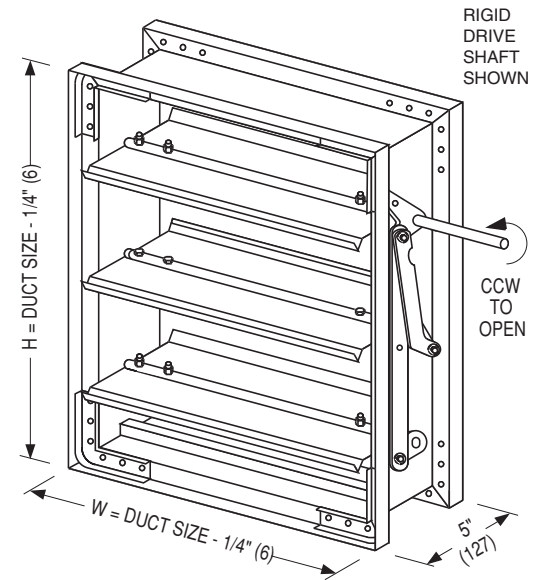
Model 1022

Model 1012 and 1022 Control Dampers are the most cost-effective choice for use in low to medium pressure and velocity commercial HVAC systems where leakage and tight shut-off are not a major concern. The standard models are unsealed. They are high quality, low cost dampers that meet or exceed the majority of less stringent specification requirements and applications.

Design features include durable steel construction, a sturdy hat channel frame with die-formed corner gussets providing superior structural strength equivalent to 13 ga. (2.4) channel type frames, a vee groove blade design that maximizes blade strength and optimizes airflow, double bolted no slip blade axle connections with long life corrosion resistant synthetic bearings and a no-maintenance concealed linkage enclosed in the side frame out of the air stream for reduced pressure drop, air turbulence and noise. A variety of options are available to meet specific installation requirements and a wide selection of electric or pneumatic actuators are available for factory or field mounting.

**STANDARD CONSTRUCTION:**

- Frame:** 5" x 7/8" x 16 ga. (127 x 22 x 1.6) galvanized steel hat channel with die-formed corner gussets. Low profile (flat top and bottom) on dampers 10" (254) high and under.
- Blades:** 6" (152) wide on 5 1/2" (140) centers. 16 ga. (1.6) galvanized steel vee groove design. Parallel or opposed action.
- Linkage:** Concealed type totally enclosed within the frame and out of the airstream. Plated steel.
- Bearings:** 1/2" (13) dia. Celcon®.
- Axles:** 1/2" (13) dia. plated steel double bolted to blades.
- Drive Shaft:** 6" (152) long x 1/2" (13) dia. rigid shaft; or optional lock-on shaft with outboard support bracket (standard in Canada), on all single section dampers. A 1/2" (13) or 1" (25) dia. factory installed jackshaft is standard on all multiple section dampers.



**Models 1012 and 1022 Sizes (Duct W x H):**

Minimum		Maximum	
Single Section		Single Section	Multiple Section
Single Blade 6" x 4" (152 x 102)	Two Blades (parallel or opposed) 8" x 10" (203 x 254)	48" x 72" (1219 x 1829)	Unlimited

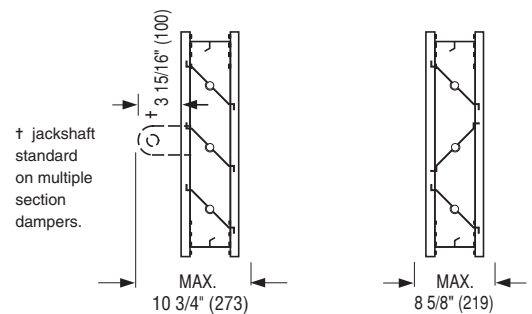
Temperature Range: -50°F to 180°F (-46°C to 82°C)

**COMMON OPTIONS:**

- Polyurethane blade seals & metallic jamb seals.
- Heavier gauge frame construction.
- Front, rear or double flange frame (with or without bolt holes).
- Factory installed pneumatic and electric actuators.

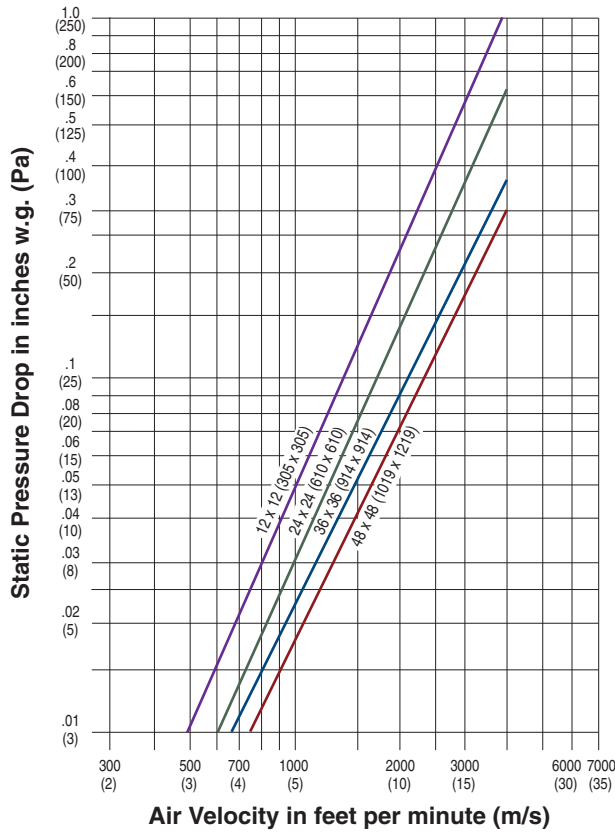
**MODEL 1012**  
PARALLEL BLADE

**MODEL 1022**  
OPPOSED BLADE



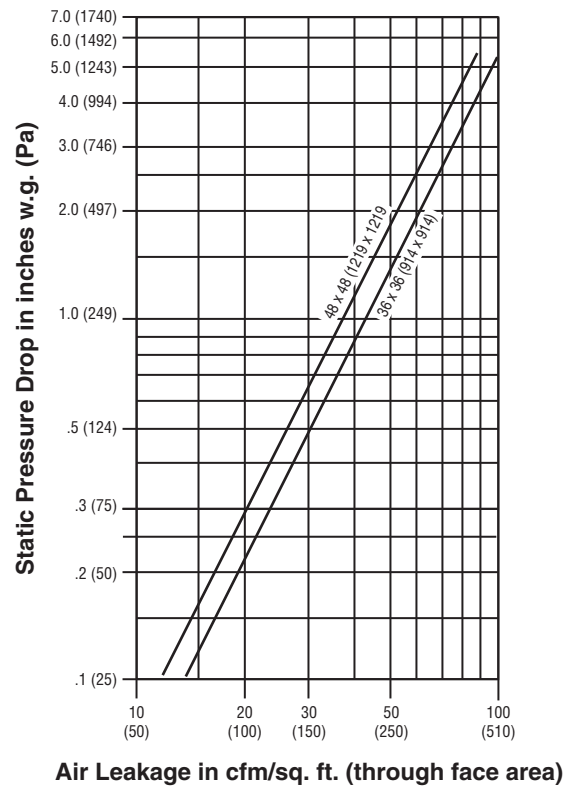
**PERFORMANCE DATA:  
MODELS: 1012 AND 1022**

**PRESSURE DROP (damper fully open):**



Tested per AMCA standard 500-D, Fig. 5.3.

**LEAKAGE (damper fully closed w/o seals):**



Tested per AMCA standard 500-D, Fig. 5.5.

**DYNAMIC LIMITATIONS/LEAKAGE**

Damper Width	Maximum System Pressure	Maximum System Velocity	Leakage *			
			W/O Seals		W/Seals	
			% of Max. Flow	Cfm/Sq. Ft.	% of Max. Flow	Cfm/Sq. Ft.
48" (1219)	2.5" w.g.	2000 fpm	1.90	38	.48	9.5
36" (914)	3.0" w.g.	2000 fpm	2.15	43	.54	10.8
24" (610)	4.0" w.g.	2000 fpm	2.35	47	.57	11.3
12" (305)	5.0" w.g.	2000 fpm	3.10	62	.80	16.0

\* Leakage information is based upon a pressure differential of 1" w.g. tested per AMCA standard 500-D, Fig. 5.5.

**B CONTROL DAMPERS**



**HOW TO SPECIFY**

**MODELS: 1012 AND 1022  
STANDARD CONTROL DAMPERS**

**SUGGESTED SPECIFICATION:**  
Provide and install, as shown on plans and/or schedules, control dampers as manufactured by Nailor Industries, Inc. which meet or exceed the following criteria: Frame shall be constructed of 16 ga. (1.6) galvanized steel hat channel with mitered corners and die-formed corner gussets for rigidity and structural strength equivalent to 13 ga. (2.4) channel type frames. Blade shall be of vee groove design, 16 ga. (1.6) galvanized steel, on maximum 6" (152) centers. Blade axles shall be 1/2" (13) dia. plated steel, double thru-bolted to blade at each end. Hex, square friction-fit or press-fit axles are not acceptable. Bearings shall be Celcon® molded synthetic type. Blade linkage shall be zero-maintenance, out of airstream and totally concealed within the frame. Jackshafts shall be supplied on all multiple section wide assemblies in order to evenly distribute torque. Standard of acceptance shall be Nailor Industries (**specifier to select**) Model 1012 parallel blade **or** Model 1022 opposed blade control damper.

**HOW TO ORDER**

**MODELS: 1010, 1020, 1012 AND 1022  
VEE BLADE CONTROL DAMPERS**

**EXAMPLE: 1020 - 24x24 - GLV - HC - 16G - LC - BC - BVP - JSS - DSR - DR - SMP - AUTO - 120 - SPR - 2POS - CL - 4X02**

- |  |  |  |
|--|--|--|
| <p><b>1. Models</b></p> <ul style="list-style-type: none"> <li>1010 Steel, Vee Blade, Parallel, Low Leakage</li> <li>1020 Steel, Vee Blade, Opposed, Low Leakage</li> <li>1012 Steel, Vee Blade, Parallel, Standard</li> <li>1022 Steel, Vee Blade, Opposed, Standard</li> </ul> <p><b>2. Duct Size</b></p> <p>Width x Height (inches [mm's])</p> <p><b>3. Construction</b></p> <ul style="list-style-type: none"> <li>GLV Galvanized Steel (default)</li> <li>304 Type 304 Stainless Steel</li> <li>ALS Aluminum with Stainless Steel Hardware</li> </ul> <p><b>4. Frame Type</b></p> <ul style="list-style-type: none"> <li>HC Hat Channel (default)</li> <li>FD Double Flange</li> <li>FDB Double Flange with Bolt Holes</li> <li>FF Flanged Front</li> <li>FFB Flanged Front with Bolt Holes</li> <li>FR Flanged Rear</li> <li>FRB Flanged Rear with Bolt Holes</li> </ul> <p><b>5. Frame Gauge</b></p> <ul style="list-style-type: none"> <li>16G 16 ga. standard (default)</li> <li>14G 14 ga.</li> <li>13G 13 ga.</li> <li>12G 12 ga.</li> </ul> <p><b>6. Blade Linkage Style</b></p> <ul style="list-style-type: none"> <li>LC Concealed Linkage (default)</li> <li>LF Face Linkage</li> </ul> <p><b>7. Bearings</b></p> <ul style="list-style-type: none"> <li>BC Celcon (default)</li> <li>BO Oilite Bronze</li> <li>BS Stainless Steel</li> </ul> | <p><b>8. Blade Seals</b></p> <ul style="list-style-type: none"> <li>BVP Extruded PVC Seals (default 1010/1020)</li> <li>- None (default 1012/1022)</li> <li>BSP Polyurethane</li> </ul> <p><b>9. Jamb Seals</b></p> <ul style="list-style-type: none"> <li>JSS Stainless Steel (default 1010/1020)</li> <li>- None (default 1012/1022)</li> <li>JSM Metal</li> </ul> <p><b>10. Factory Actuator Mounting</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>FMEN External Supplied by Nailor</li> <li>FMEO External Supplied by Others</li> <li>FMIN Internal Supplied by Nailor</li> <li>FMIO Internal Supplied by Others</li> </ul> <p><b>11. Drive Shaft Option</b></p> <ul style="list-style-type: none"> <li>DSR Rigid (default USA, International)</li> <li>DLO Lock-on Drive Shaft (default CAN)</li> <li>JK Jackshaft</li> <li>JK1 Jackshaft - 1" (25) dia.</li> <li>JK5 Jackshaft - 1/2" (13) dia.</li> </ul> <p><b>12. Drive Location</b></p> <ul style="list-style-type: none"> <li>DR Right or Left Hand (default)</li> <li>DI Internal</li> </ul> <p><b>OPTIONS &amp; ACCESSORIES:</b></p> <p><b>13. Optional Linkage</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>SSL Type 304 Stainless Steel</li> </ul> <p><b>14. Thrust Bearings for Vertical Blades</b></p> <p>(Single Section only)</p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>BT Thrust Bearings</li> </ul> <p><b>15a. Side Mounting Plate</b></p> <ul style="list-style-type: none"> <li>- None</li> <li>SMP Side Mounting Plate</li> </ul> | <p><b>15b. Sleeve Length</b></p> <p><b>SL = Specify</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>12" - 28" (305 - 711)</li> </ul> <p><b>16. Sleeve Gauge</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>20G 20 ga. standard</li> <li>18G 18 ga.</li> <li>16G 16 ga.</li> <li>14G 14 ga.</li> <li>10G 10 ga.</li> </ul> <p><b>17. Sleeve Construction</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>SGLV Galvanized Steel</li> <li>S304 Type 304 Stainless Steel</li> <li>SALU Aluminum</li> </ul> <p><b>18. Transition</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>CR Round</li> <li>CO Oval</li> </ul> <p><b>19. Hand-Locking Quadrant</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>HL2 Quadrant with 2" (51) Bracket</li> <li>HLQ Hand-Locking Quadrant</li> </ul> <p><b>20. Vertical Inter-Connect Kit</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>VCK Vertical Inter-Connect Kit</li> </ul> <p><b>21. Chain Operator</b></p> <ul style="list-style-type: none"> <li>- None (default)</li> <li>PCE External</li> <li>PCI Internal</li> </ul> <p><b>22. Chain</b></p> <ul style="list-style-type: none"> <li>CH Chain Length (specify ft.)</li> </ul> |
|--|--|--|

**B CONTROL DAMPERS**

- FOR ROUND DUCT
- LOW LEAKAGE
- GALVANIZED STEEL

**Model:**

**1090 Single Blade, Round**



Model 1090  
(shown w/ 2" (51) stand-off bracket)

Model 1090 is an ultra-low leakage steel butterfly control damper which has been designed for all types of round ductwork applications. Suitable for use in low to medium pressure and velocity commercial HVAC systems, the 1090 installs quickly and easily, saving money on installation costs.

Design features a sturdy beaded casing for superior rigidity, a 14 ga. (2.0) equivalent laminated blade double bolted to the drive shaft for maximum strength, long life corrosion resistant synthetic bearings and blade seals for low leakage requirements. The damper can be used for two position or modulating control using electric or pneumatic actuators and can also be used as a manual balancing damper or when positive shut-off is required by utilizing an optional hand locking quadrant. A variety of options are available to meet specific installation requirements and a comprehensive selection of electric or pneumatic actuators are available for factory or field mounting.

**STANDARD CONSTRUCTION:**

- Frame:** 20 ga. (1.0) corrosion-resistant steel with stiffening beads.
- Blades:** 2 x 20 ga. (1.0) corrosion-resistant steel laminated together, equivalent to 14 ga. (2.0). Open and close end stops. 90 degree rotation. CCW to open.
- Bearings:** 1/2" (13) dia. Celcon®.
- Drive Shaft/Axle:** 1/2" (13) dia. plated steel double bolted to blade. Axles extends approximately 6" (152) beyond the frame.
- Blade Seal:** Cross-linked polyethylene.

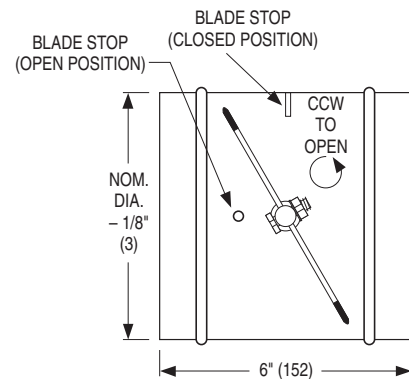
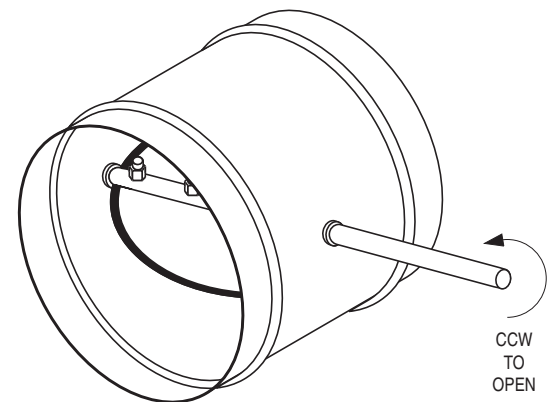
**Model 1090 Sizes (Duct W x H):**

Minimum	Maximum
Single Section	Single Section
4" (102) dia.	24" (610) dia.

Temperature Range: -50°F to 180°F (-46°C to 82°C)

**COMMON OPTIONS:**

- Type 304 Stainless Steel construction.
- Factory installed pneumatic and electric actuators.



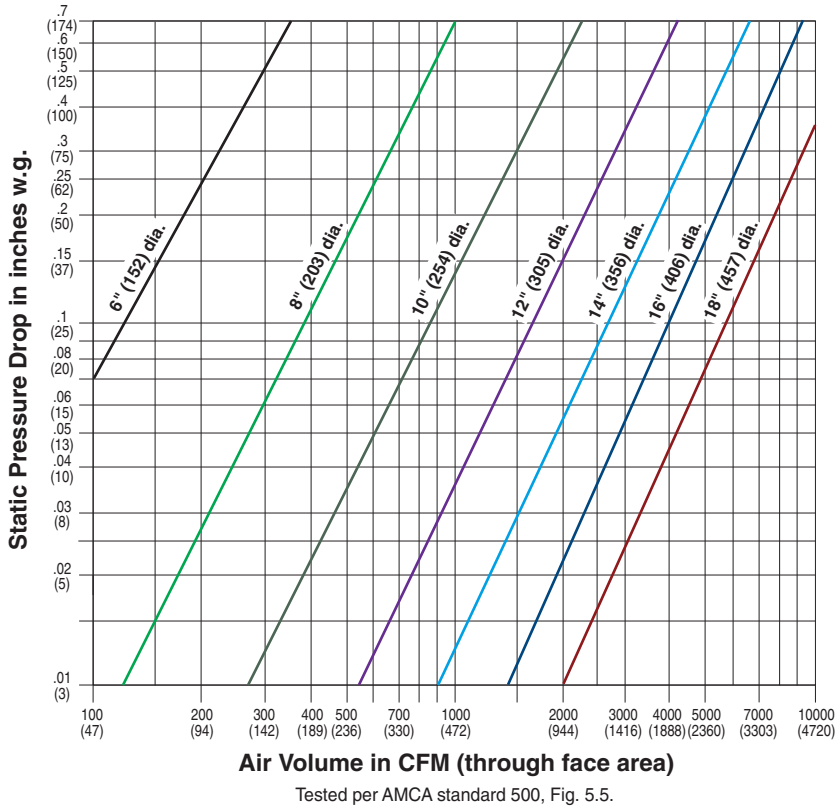
**MODEL 1090**  
SINGLE BLADE, ROUND

**PERFORMANCE DATA:**

**MODEL: 1090**

**B  
CONTROL DAMPERS**

**PRESSURE DROP (damper fully open):**

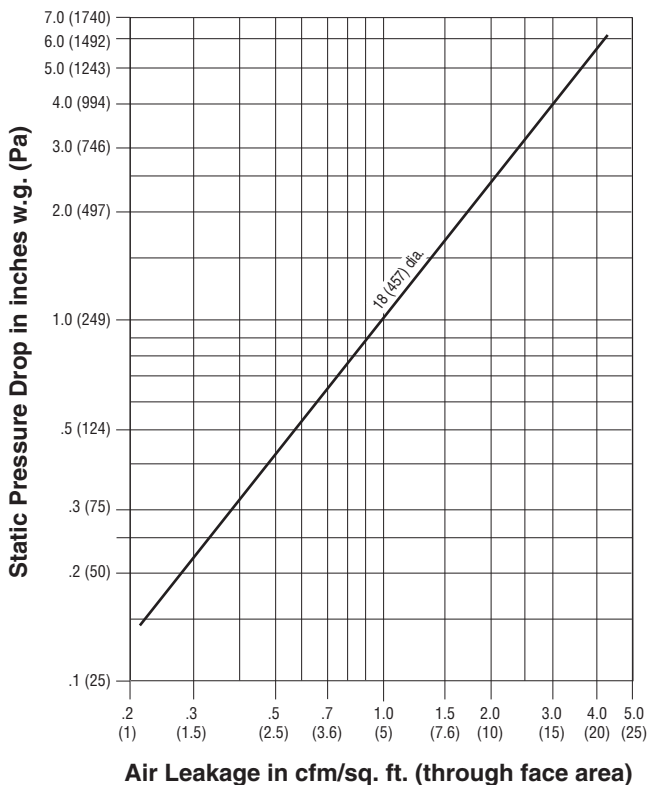


**MAXIMUM SYSTEM PRESSURE**

Maximum Damper Diameter	Maximum System Pressure
24" (610)	6" w.g. (1.5 kPa)
18" (457)	6" w.g. (1.5 kPa)
12" (305)	8" w.g. (2 kPa)
6" (152)	10" w.g. (2.5 kPa)

Note: Maximum Face Velocity = 4000 fpm (20 m/s).

**AIR LEAKAGE (damper fully closed):**



**LEAKAGE: CLASS I**

Less than 4 cfm/sq. ft. @ 1" w.g. (0.02 m<sup>3</sup>/s/m<sup>2</sup> @ 250 kPa).  
 Less than 8 cfm/sq. ft. @ 4" w.g. (0.04 m<sup>3</sup>/s/m<sup>2</sup> @ 1 kPa).

**HOW TO ORDER OR TO SPECIFY**

**MODEL: 1090**

**LOW LEAKAGE ROUND CONTROL DAMPERS**

**EXAMPLE: 1090 - 12 - GLV - BC - 411**

- |  |   |
|--|---|
| <p>1. <b>Model</b><br/>1090 Steel, Single Blade, Round</p> <p>2. <b>Duct Size</b><br/>Diameter - inches (mm's)</p> <p>3. <b>Construction</b><br/>GLV Galvanized Steel (default)<br/>304 Type 304 Stainless Steel</p> <p>4. <b>Bearings</b><br/>BC Celcon (default)<br/>BO Oilite Bronze<br/>BS Stainless Steel</p> | <p>5. <b>Actuator</b><br/>– None (default)</p> <p><b>Electric:</b><br/>411 ML4115 120 VAC<br/>811 ML8115 24 VAC</p> <p><b>Pneumatic:</b><br/>482 331-4826 25 psi</p> <p>6. <b>Hand-Locking Quadrant</b><br/>HL2 Quadrant with 2" (51) Bracket<br/>HLQ Hand-Locking Quadrant</p> |
|--|---|

**SUGGESTED SPECIFICATION:**  
Provide and install, as shown on plans and/or schedules, low leakage round dampers as manufactured by Nailor Industries, Inc. which meet or exceed the following criteria: Frame shall be constructed of 20 ga. (1.0) corrosion resistant steel with roll-formed stiffening beads up to 12" (305) dia.; 20 ga. (1.0) over 12" (305) dia.. Blade shall be 2 x 20 ga. (1.0) corrosion resistant steel laminated together, equivalent to 14 ga. (2.0). Blade seal shall be cross-linked polyethylene sandwiched in blade. Blade axle/drive shaft shall be 1/2" (13) dia. plated steel double bolted to blade. Bearings shall be Celcon® molded synthetic type. Hex, square friction-fit or press-fit axles are not acceptable. Open and closed end-stops shall provide maximum 90° rotation, counter clockwise to open. Submitted performance data shall show leakage of less than 10 cfm/sq. ft. @ 4" w.g. (0.05 m³/s/m² @ 1 kPa). Standard of acceptance shall be Nailor Industries Model 1090.

## Options and Accessories

Nailor control dampers are available with a variety of options and accessories to suit the majority of commercial and light industrial applications and installations. With short lead times and marginal effect on costs, Nailor control dampers can be custom tailored to suit virtually any requirement.

### MATERIAL OPTIONS:

**OPTION CODE 304**  
STAINLESS STEEL CONSTRUCTION

#### 1000/1100 Series

All parts of damper (except blade seals) will be constructed of 304 stainless steel. Provides higher corrosion resistance against harsh atmospheric and process elements. Consult your Nailor representative for specific application suitability.

**OPTION CODE ALS**  
ALUMINUM CONSTRUCTION WITH  
STAINLESS STEEL HARDWARE

#### 2000 Series

Damper will be constructed with aluminum frame and blades with stainless steel linkage, bearings, axles and related hardware. Suitable for use in high humidity applications such as swimming pool areas etc.

**OPTION CODE EAF**  
EXTRUDED ALUMINUM FRAME

#### 2000 Series

Rugged Type 6063-T5 extruded aluminum frame for premium performance. See Models 2010-EAF/2020-EAF for further details.

**OPTION CODE SSF**  
STAINLESS STEEL FRAME

#### 2000 Series

Damper frame will be constructed from 304 stainless steel, fully welded with corner reinforcing brackets. Provides an extra rigid frame that is more corrosion resistant than galvanized steel.

### BEARING OPTIONS:

**OPTION CODE BC**  
CELCON® BEARINGS



Synthetic type Celcon® bearings provide long life and corrosion free operation. Standard bearing for all 1000 and 1800 series dampers.

**OPTION CODE BO**  
OILITE® BRONZE BEARINGS



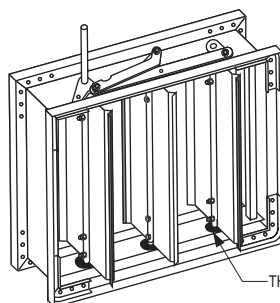
Bronze sintered (oil impregnated) self-lubricating oilite bearings provide long time lubrication making them ideal for use in applications where proper maintenance is uncertain or difficult.

**OPTION CODE BS**  
STAINLESS STEEL BEARINGS



304 grade stainless steel bearings provide corrosion resistance in a wide variety of corrosive media. In higher heat applications, provides good oxidation resistance.

**OPTION CODE BT**  
THRUST BEARINGS



For use when damper is mounted with blades running vertically. Installed against lower blade edge to reduce friction due to weight of blades. When ordering, specify which side of damper will be bottom.



## FLANGED FRAME OPTIONS:

Available as an option on Series 1000, 1100 and 2000 steel hat channel frame control dampers, the 1 1/2" (38) flanged frames allow for direct fastening to wall or unit housings as well as flanged ductwork. Damper inside dimension can be sized to match ductwork inside dimension, providing a smooth transition that produces lower pressure drop and less turbulence across the damper. Flange frames are also available with optional 9/32" (7) dia. bolt holes on 6" (152) centers for fast, convenient installation.

### OPTION CODES

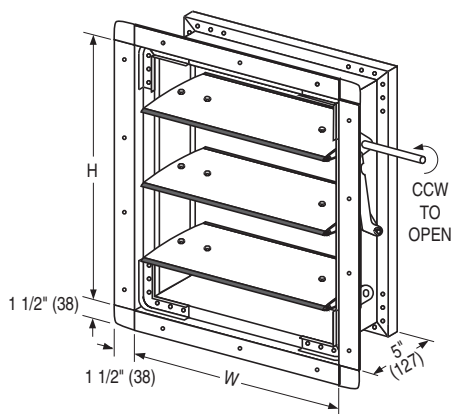
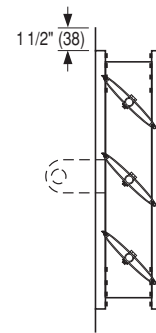
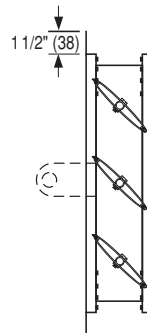
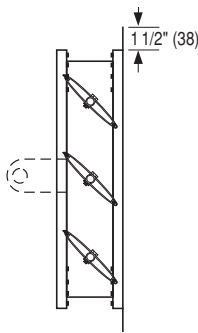
- FF** FLANGED FRONT
- FFB** FLANGED FRONT WITH BOLT HOLES

### OPTION CODES

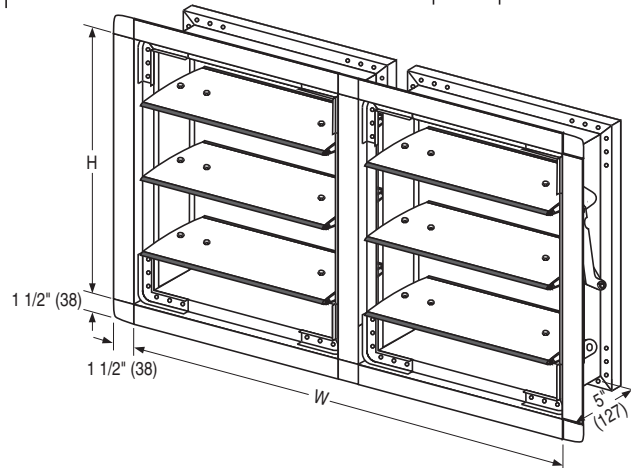
- FR** FLANGED REAR
- FRB** FLANGED REAR WITH BOLT HOLES

### OPTION CODES

- FD** DOUBLE FLANGE
- FDB** DOUBLE FLANGE WITH BOLT HOLES



SINGLE SECTION DAMPER SHOWN WITH **FRB** OPTION: FLANGED REAR FRAME WITH 9/32" (7) DIA. BOLT HOLES ON 6" (152) CENTERS.

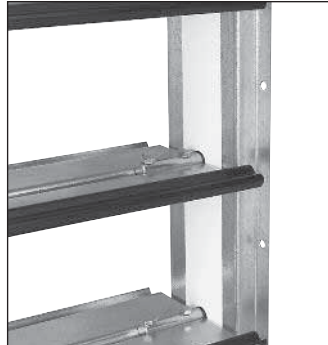


MULTIPLE SECTION DAMPER SHOWN WITH **FR** OPTION: FLANGED REAR FRAME (JACKSHAFT NOT SHOWN)

CONTROL DAMPERS

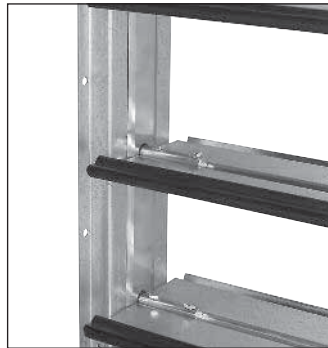
## JAMB SEAL OPTIONS:

**OPTION CODE JSM**  
METALLIC JAMB SEALS



Standard compression type metallic jamb seal used for reducing air leakage between blade ends and frame. Standard jamb seals on Models 1010 and 1020.

**OPTION CODE JSS**  
STAINLESS STEEL JAMB SEALS

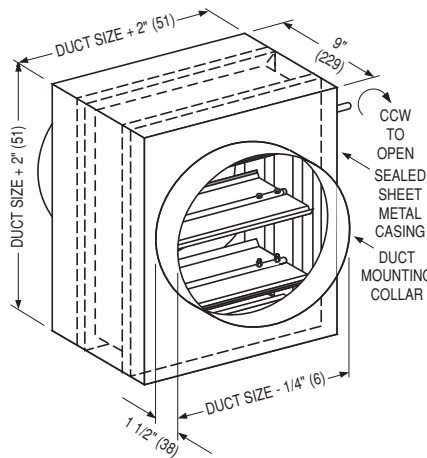


Compression type cambered stainless steel jamb seal for reducing air leakage between blade ends and frame. Provides higher resistance to corrosion and heat than our standard metallic jamb seal. Standard on Model Series 1100 and 2000 dampers.

## ROUND/OVAL TRANSITIONS:

**OPTION CODE CR**  
TRANSITION ENCLOSURE FOR ROUND DUCT.

**OPTION CODE CO**  
TRANSITION ENCLOSURE FOR OVAL DUCT



The CR transition enclosure option allows for connection of multi-blade control dampers to round ductwork. The CO transition enclosure option allows for connection of multi-blade control dampers to oval ductwork. Casing and collars are constructed from 20 ga. (1.0) galvanized steel (18 ga. (1.3) on sizes 36" x 36" (914 x 914) and up) and are tack welded and caulked against leakage.

**MAXIMUM SIZE:**

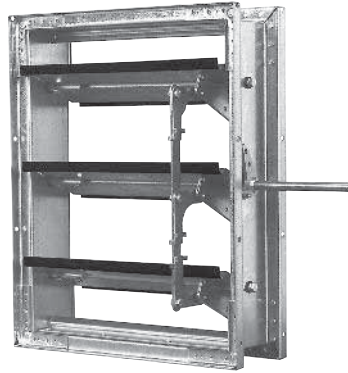
Single section: 46" (1168) dia.  
For larger sizes contact factory.

TYPE CR (FOR ROUND DUCT) SHOWN

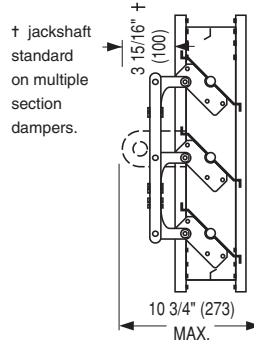
## BLADE LINKAGE OPTION:

OPTION CODE **LF**  
FACE LINKAGE

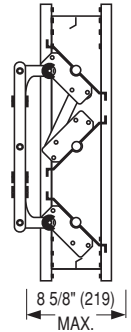
Nailor's robust plated steel linkage, uniquely installed directly to face of blades with integral heavy-duty brackets. Provides positive blade to blade connection while providing 'in the airstream' accessibility to linkage without removing damper from duct.



Model 1010 with Face Linkage (LF) option.



**Parallel Blade**  
(Model 1010 Shown)



**Opposed Blade**  
(Model 1020 Shown)

## LINKAGE MATERIAL OPTIONS:

OPTION CODE **SSL**  
STAINLESS STEEL LINKAGE

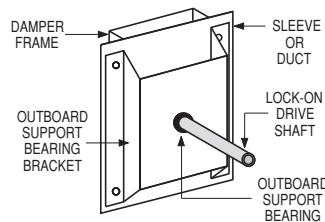
All linkage, axles and bearings will be of Type 304 Stainless Steel. Provides better resistance to corrosion and resistance to oxidation in higher heat applications.

OPTION CODE **SSA**  
STAINLESS STEEL AXLES ONLY

Blade axles only will be of Type 304 Stainless Steel. Provides better resistance to corrosion and good resistance to oxidation in higher heat applications.

## DRIVE SHAFT OPTION:

OPTION CODE **DLO**  
LOCK-ON DRIVE SHAFT



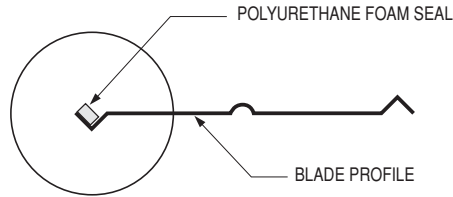
Shipped loose and can be installed before or after damper is mounted in duct. Unique spring clip locks shaft onto damper drive for firm connection. Each lock-on drive shaft is shipped complete with an outboard support bracket with bearing that can be fastened to outside of duct for extra support. Lock-on drive shafts are standard on dampers manufactured for Canada.

Note: **OPTION CODE DSR rigid drive shaft** (welded) is provided as standard on most control damper models. In Canada, **DSR** is available as an option.

## BLADE SEAL OPTION:

OPTION CODE **BSP**  
POLYURETHANE FOAM BLADE SEAL

### FOR MODELS 1012 AND 1022 ONLY

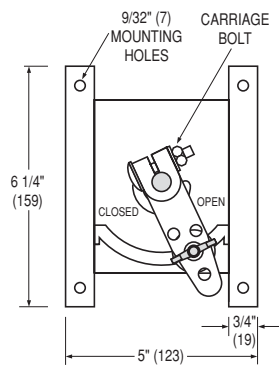


Available on Models 1012 and 1022 as an economical alternative to extruded seals, the polyurethane foam seal adheres to blade edge with self-adhesive backing. Suitable for light duty use in applications involving low static pressures and velocities.

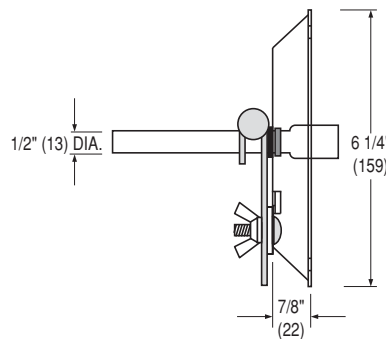
## MANUAL LOCKING QUADRANTS:

OPTION CODE **HLQ**  
HAND LOCKING QUADRANT FOR  
1/2" (13) DIA. DRIVES

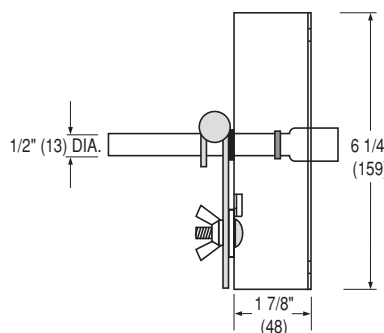
### FOR USE WITH 1/2" (13) DIA. DRIVE SHAFT



Standard hand locking quadrant designed for use with Model Series 1000, 1100, 1810/1820 and 2000 dampers. Supplied as standard with Celcon® bearing, the HLQ mounts directly over a 1/2" (13) dia. drive shaft and is secured to shaft with a carriage bolt. 16 ga. galvanized steel bracket with 1" (25) stand-off is provided for convenient installation that ensures the mounting screws do not interfere with any damper side linkage that may be hidden in damper frame. Quadrant handle and hardware are plated steel. A heavy-duty wing nut locks the quadrant in desired position.



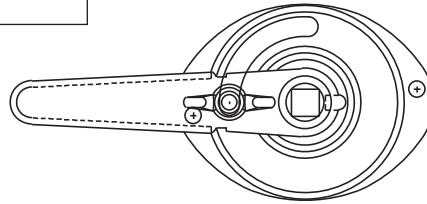
OPTION CODE **HL2**  
HAND LOCKING QUADRANT WITH  
2" (51) STAND-OFF



The HL2 hand locking quadrant is similar to the standard HLQ locking quadrant for use with 1/2" (13) dia. shafts (see above) but is supplied with a 2" (51) stand-off bracket that allows for use with externally insulated ductwork.

## MANUAL LOCKING QUADRANTS:

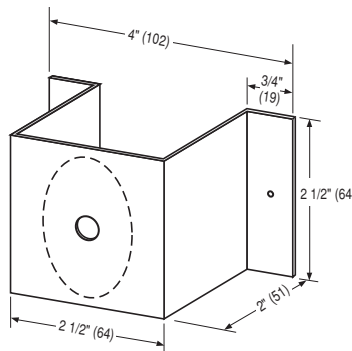
OPTION CODE **HLQ**  
HAND LOCKING QUADRANT FOR  
1/4" (6) SQUARE DRIVES



FOR USE WITH 1/4" (6) SQUARE DRIVE SHAFT

Suitable for light duty use on 1/4" (6) square drive shafts, this HLQ is supplied as standard on Models 1870 and 1890 balancing dampers. Constructed of plated steel, the quadrant slides directly over shaft and mounts easily with two mounting screws. A wing nut assembly locks the handle firmly in desired position.

OPTION CODE **SB**  
HAND LOCKING QUADRANT WITH  
2" (51) STAND-OFF BRACKET



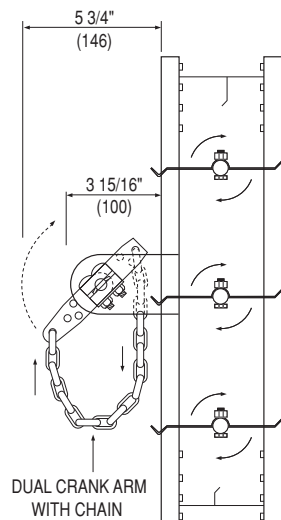
Option SB provides the above HLQ for 1/4" (6) square drive shafts with a 2" (51) stand-off bracket that allows the quadrant to be used on externally insulated ductwork.

(QUADRANT NOT SHOWN)

## MANUAL PULL-CHAIN OPERATORS:

OPTION CODE **PCE**  
EXTERNAL CHAIN OPERATOR

OPTION CODE **PCI**  
INTERNAL CHAIN OPERATOR



Nailor's manual pull-chain operator is ideal for use in applications that require remote manual operation from below a damper that is otherwise generally inaccessible. Suitable for use on Series 1000, 1100, and 2000 dampers.

**Option PCE External Pull Chain Operator** provides a dual crank arm type linkage securely fastened to a rugged jackshaft that extends past the damper frame (out of airstream). Operator can be adapted for right or left handed drive (right hand drive standard).

**Option PCI Internal Pull Chain Operator** provides the same strong linkage and jackshaft mounted within the face of the damper (in airstream). Units come complete with strong closed loop steel chain (please specify length) that loops down for convenient two-way operation and can be fastened to wall to maintain damper blade position. Both PCE and PCI options provide firm, smooth operation of dampers that are above the rest!

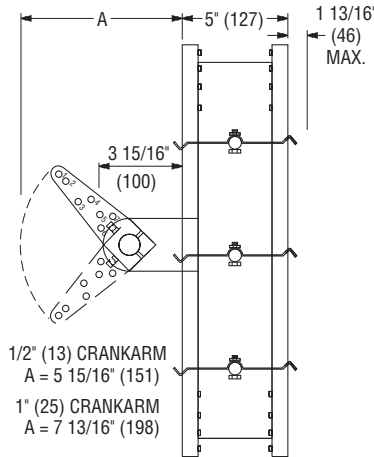


## JACKSHAFTS AND ACCESSORIES:

**OPTION CODE JK5**  
1/2" (13) DIA. JACKSHAFT

**OPTION CODE JK1**  
1" (25) DIA. JACKSHAFT

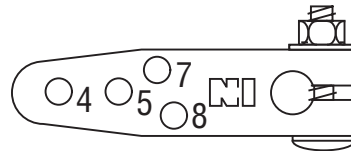
**JK5** and **JK1** jackshafting may be ordered as an option on Series 1000, 1100 and 2000 single section dampers in order to offset the mounting position of an external actuator (ie: for mounting of damper within a wall) or for internal factory mounting of an actuator (in the airstream).



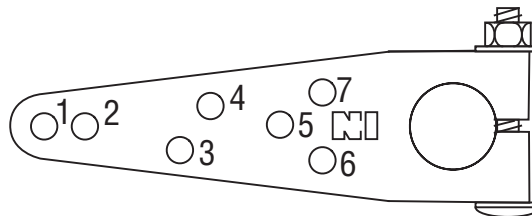
**TYPICAL JACKSHAFT**



### OPTIONAL CRANK ARM DETAILS:



**1/2" (13) DIA. CRANK ARM PART NO. CD005**



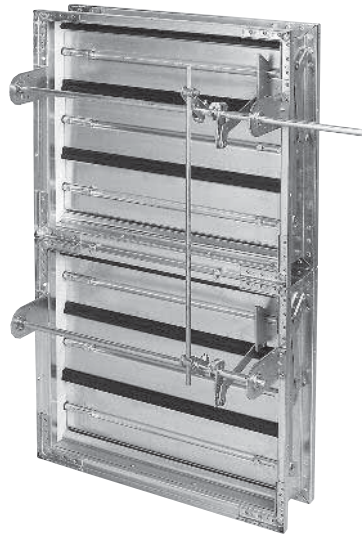
**1" (25) DIA. CRANK ARM PART NO. CD010**

Hole No.	Crank Arm Radius
8	1 3/8" (35)
7	1 9/16" (40)
6	1 9/16" (40)
5	2" (51)
4	2 13/16" (72)
3	3 3/16" (81)
2	4 1/4" (108)
1	4 3/4" (121)

Other **drive accessories** such as Swivel for 5/16" (8) dia. Rod (Part No. CD006) and 1" to 3/4" (25 to 19) Jackshaft Reducer (Part No. CD075) are available. Contact your Nailor representative for assistance.

## VERTICAL INTERCONNECTION OF DAMPER SECTIONS:

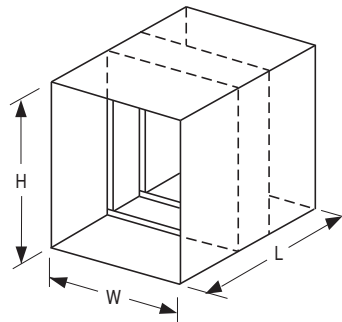
OPTION CODE **VCK**  
VERTICAL INTERCONNECTION KIT



Nailor 1000, 1100 and 2000 Series control dampers that are two sections in height (single section wide) can be connected together for operation by a single actuator by utilizing **Option VCK Vertical Inter-Connection Kit**. Standard kit consists of factory mounted 1/2" (13) diameter jackshafts on each section, with crankarms, swivels and 5/16" (8) diameter connecting rod for smooth, positive operation. Specify drive location when ordering.

## SLEEVE OPTIONS:

OPTION CODE **SL**  
SLEEVE



TYPE 'A'  
BLADES AND FRAME IN AIRSTREAM

Nailor control dampers are available in factory furnished sleeves in lengths up to 36" (914). Sleeves are constructed out of 20 ga. through 10 ga. (1.0 through 3.5) galvanized steel. When dampers are installed in factory sleeves, the "L" dimension specifies the location of damper within the sleeve. Factory furnished sleeves ensure proper fit and allow for direct shipment of dampers to jobsite eliminating the need for costly shop handling and provide for convenient, fast installation. Standard sleeve length is 12" (305) and standard "L" dimension is 4" (102).

## FACE & BYPASS MIXING DAMPERS:

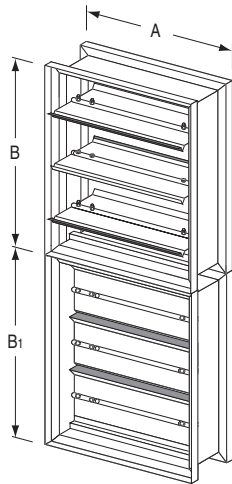
OPTION CODE **FBV**  
VERTICAL

OPTION CODE **FBH**  
HORIZONTAL

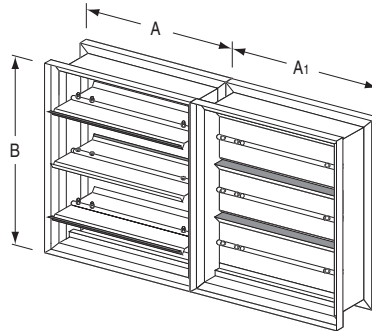
OPTION CODE **FBR**  
RIGHT ANGLE

Face and bypass dampers are standard control dampers assembled either (FBV) one over the other, (FBH) beside each other or (FBR) at right angle from each other. The units are interconnected for simultaneous blade action, typically causing one damper to open while the other closes. The Nailor FBR option utilizes an inter-connected linkage that eliminates ball joints, crank arms and connecting rods with no adjustment required. The top section is fully open when the bottom section is fully closed.

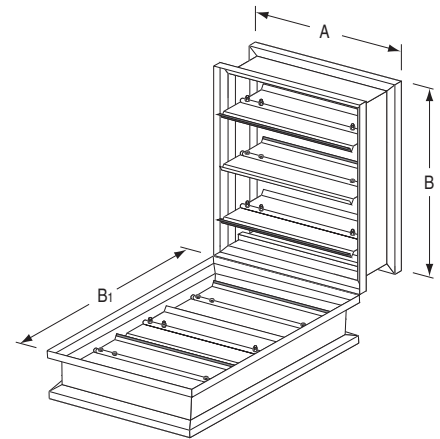
Dampers larger than maximum single section sizes are assembled of equal single section dampers (refer to the damper submittal document for maximum section sizes) and may be coupled for operation in a variety of ways. Large multiple section damper assemblies require an engineering analysis of how the dampers are to be operated (type, quantity and location of actuators) before the best method of coupling sections can be determined. Special assembly drawings are normally prepared and forwarded for customer approval on large damper assemblies.



**FBV**  
VERTICAL



**FBH**  
HORIZONTAL



**FBR**  
RIGHT ANGLE

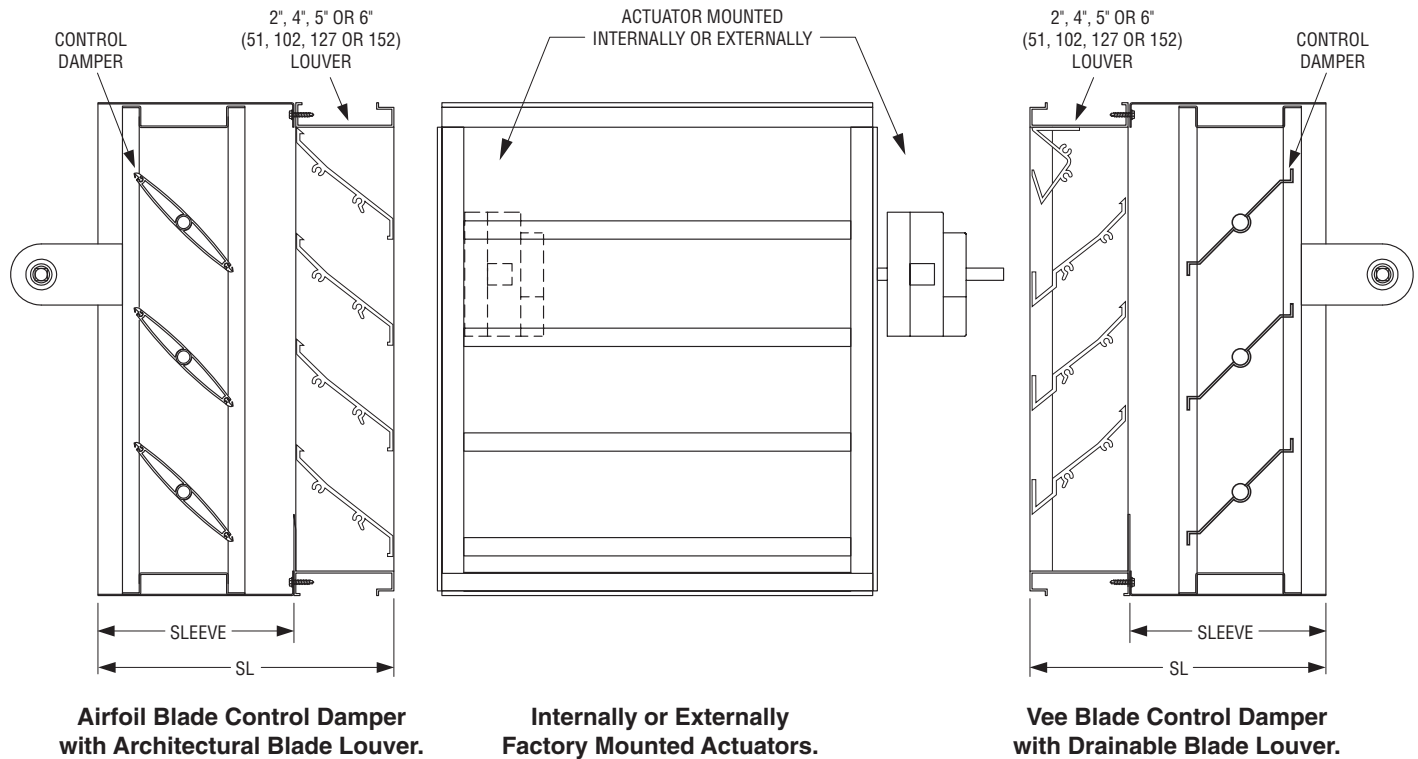
**TAKE CONTROL OF PERFORMANCE:**

## LOUVER/DAMPER COMBINATIONS IN A COMMON SLEEVE

Since 1971, Nailor Industries has been a global leader in the engineering and manufacturing of Air Control products. Our Control Damper product line features some of the industry's best performing products, with a reputation for reliability and affordability. Our Louver product line features a growing number of aesthetically pleasing and mechanically enduring models, proven to perform under the most demanding conditions.

Our capabilities as a world class manufacturer allow for an endless possibility of Control Damper and Louver combinations, suitable for just about any application or installation requirement. Using the skilled craftsmanship of Nailor's Sheet Metal Workers International Association (S.M.W.I.A) manufacturing personnel, we can construct and ship, a wide variety of Control Damper and Louver combinations, mounted in a common sleeve, ready for a fast and easy field installation. This option reduces field labor costs, materials costs, and shipping & handling costs, and offers an out of the box solution from our factory to your job site! In addition, factory mounted actuators assures proper installation and actuator selection, further reducing installation and handling costs.

**B CONTROL DAMPERS**



**Consult Nailor for specific applications and performance requirements for a custom solution today!**

## STANDARD MULTIPLE SECTION CONTROL DAMPER DRIVE ARRANGEMENTS:

Maximum single section size is 48" wide x 72" high (1219 x 1829) for all models except 2000 series which is 60" wide x 72" high (1524 x 1829). Dampers larger than the maximum single section size are fabricated in multiple section assemblies. These assemblies consist of sections of equal size which are coupled together with a jackshaft. The jackshaft runs parallel to the "W" dimension. Maximum Section Size for all Multiple Section Dampers is 48" wide x 72" high (1219 x 1829).

**A. 1/2" (13) Diameter Jackshaft:**

- Used on two sections wide with a maximum of 32 sq. ft. with blade and jamb seals; or a maximum of 40 sq. ft. without seals.

**B. 1" (25) Diameter Jackshaft:**

- Used on two sections wide over 32 sq. ft. with blade and jamb seals; or over 40 sq. ft. without seals.

- Used on assemblies of more than two sections wide, regardless of area.

Use the details on page B50 and B51 to determine how multiple section dampers with standard construction and sizes up to 240" wide x 144" high (6086 x 3658) will be manufactured. Details do not apply if the control damper has any of the following non-standard features such as unequal section sizes or Face and Bypass arrangement. For sizes larger than 240" x 144" (6096 x 3658), consult factory.

### HOW TO DETERMINE YOUR DAMPER CONFIGURATION

1. Calculate the damper area in square feet:

$$\text{Area} = \frac{(\text{W in. wide} \times \text{H in. high})}{144} = \text{_____ sq. ft.}$$

2. Based on the W and H dimensions and the area of your damper, determine the appropriate assembly detail using the chart on page B50.

Example: Model 1020, 96" wide x 96" high.

$$\text{Area} = \frac{(96 \times 96)}{144} = 64 \text{ sq. ft.}$$

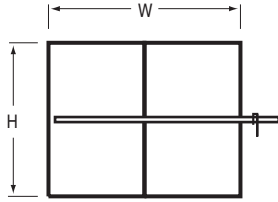
From chart and drawings, damper configuration is per detail 22Q. Your damper will be built this way.

Multiple section assemblies require bracing to support the weight of the assembly and to hold against system pressure. Appropriate bracing must support the damper horizontally at least once for every 8 ft. (2438) of damper width. Vertical assemblies and higher system pressures require more bracing.

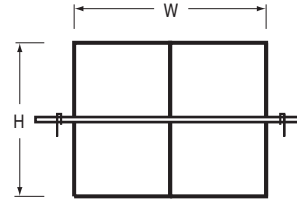
The maximum shipping size is 96" x 72" (2438 x 1829) or two sections wide. Larger units are shipped in sections for field assembly. Refer to the Control Damper Installation Instructions on pages B50 and B51 for joining multiple sections.



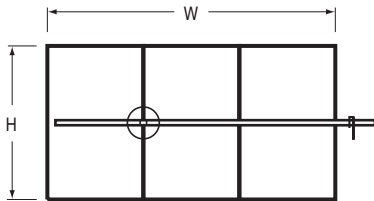
Dimension W Width in inches (mm)							
Dimension "H" Height in inches (mm) ↓	All Model Series	1000 and 1100 Series Only	2000 Series Only		All Model Series		
	48" (1219) and under	Over 48" (1219) Thru 96" (2438)	Over 48" (1219) Thru 60" (1524)	Over 60" (1524) Thru 96" (2438)	Over 96" (2438) Thru 144" (3658)	Over 144" (3658) Thru 192" (4877)	Over 192" (4877) Thru 240" (6069)
72" (1829) and under	-	Detail 21 S or D	-	Detail 21 S or D	Detail 31 S or D	Detail 41 S or D	Detail 51 S or D
Over 72" (1829) Thru 144" (3658)	Detail 12 S or D	Detail 22 S, D or Q	Detail 22 S, D or Q		Detail 32 D or Q	Detail 42 D or Q	Detail 52 S or D



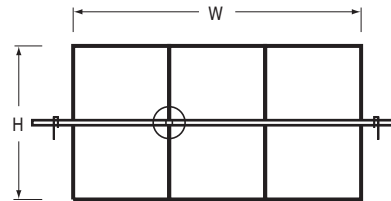
**DETAIL 21S**  
25 SQ. FT. (2.3 SQ. M) AND UNDER WITH SEALS  
48 SQ. FT. (4.5 SQ. M) AND UNDER NO SEALS



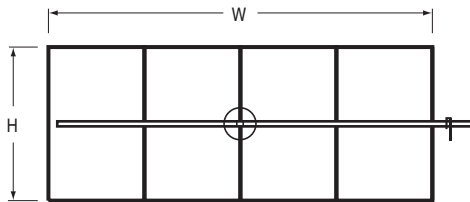
**DETAIL 21D**  
OVER 25 THRU 48 SQ. FT. (OVER 2.3 THRU 4.5 SQ. M) WITH SEALS



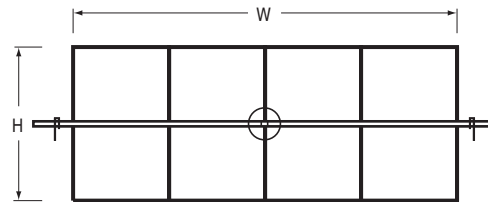
**DETAIL 31S**  
25 SQ. FT. (2.3 SQ. M) AND UNDER WITH SEALS  
50 SQ. FT. (4.6 SQ. M) AND UNDER NO SEALS



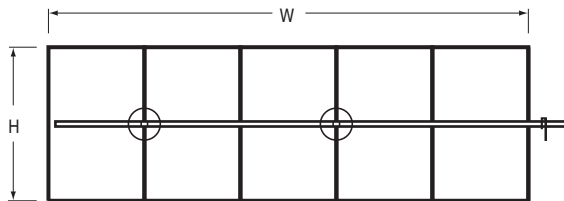
**DETAIL 31D**  
OVER 25 THRU 50 SQ. FT. (OVER 2.3 THRU 4.6 SQ. M) WITH SEALS  
OVER 50 THRU 72 SQ. FT. (OVER 4.6 THRU 6.7 SQ. M) NO SEALS



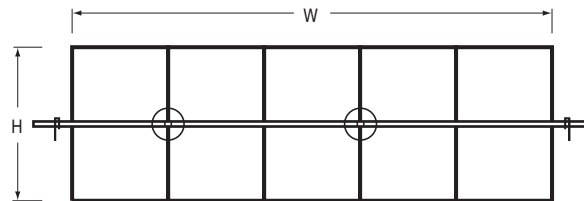
**DETAIL 41S**  
25 SQ. FT. (2.3 SQ. M) AND UNDER WITH SEALS  
50 SQ. FT. (4.6 SQ. M) AND UNDER NO SEALS



**DETAIL 41D**  
OVER 25 THRU 96 SQ. FT. (OVER 2.3 THRU 8.9 SQ. M) WITH SEALS  
OVER 50 THRU 96 SQ. FT. (OVER 4.6 THRU 8.9 SQ. M) NO SEALS

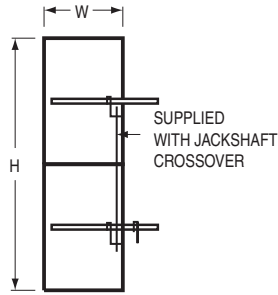


**DETAIL 51S**  
25 SQ. FT. (2.3 SQ. M) AND UNDER WITH SEALS  
50 SQ. FT. (4.6 SQ. M) AND UNDER NO SEALS

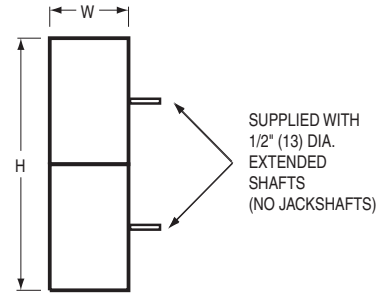


**DETAIL 51D**  
OVER 25 THRU 120 SQ. FT. (OVER 2.3 THRU 11.1 SQ. M) WITH SEALS  
OVER 50 THRU 120 SQ. FT. (OVER 4.6 THRU 11.1 SQ. M) NO SEALS

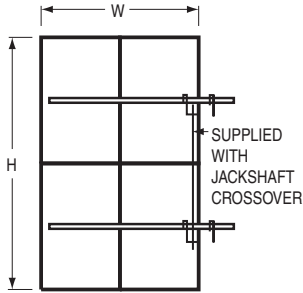
**NOTE:** INDICATES LOCATION OF JACKSHAFT COUPLING.



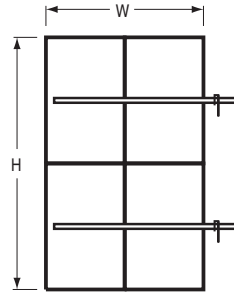
**DETAIL 12S**  
25 SQ. FT. (2.3 SQ. M) AND UNDER WITH SEALS  
48 SQ. FT. (4.5 SQ. M) AND UNDER NO SEALS



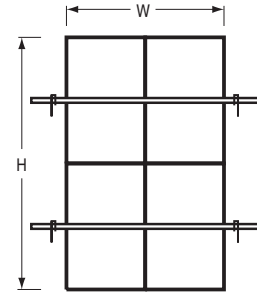
**DETAIL 12D**  
OVER 25 THRU 48 SQ. FT. (OVER 2.3 THRU 4.5 SQ. M) WITH SEALS



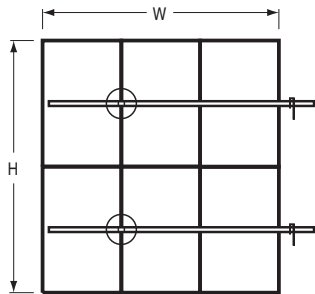
**DETAIL 22S**  
OVER 24 THRU 25 SQ. FT. (OVER 2.2 THRU 2.3 SQ. M) WITH SEALS  
OVER 24 THRU 50 SQ. FT. (OVER 2.2 THRU 4.6 SQ. M) NO SEALS



**DETAIL 22D**  
OVER 25 THRU 50 SQ. FT. (OVER 2.3 THRU 4.6 SQ. M) WITH SEALS  
OVER 50 THRU 96 SQ. FT. (OVER 4.6 THRU 8.9 SQ. M) NO SEALS

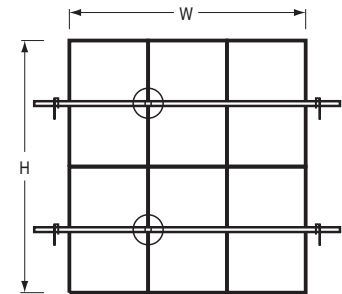


**DETAIL 22Q**  
OVER 50 THRU 96 SQ. FT. (OVER 4.6 THRU 8.9 SQ. M) WITH SEALS

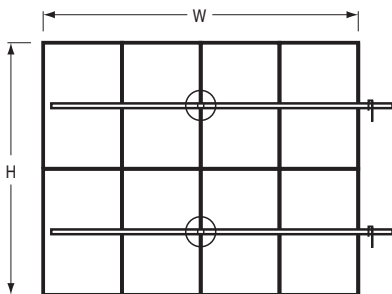


**DETAIL 32D**  
OVER 48 THRU 50 SQ. FT. (OVER 4.5 THRU 4.6 SQ. M) WITH SEALS  
OVER 48 THRU 100 SQ. FT. (OVER 4.5 THRU 9.3 SQ. M) NO SEALS

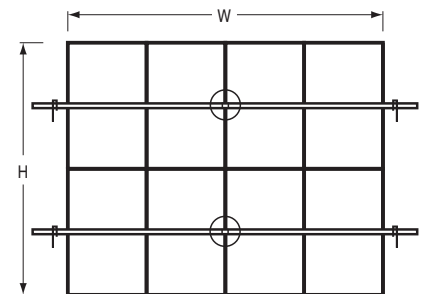
**NOTE:** INDICATES LOCATION OF JACKSHAFT COUPLING.



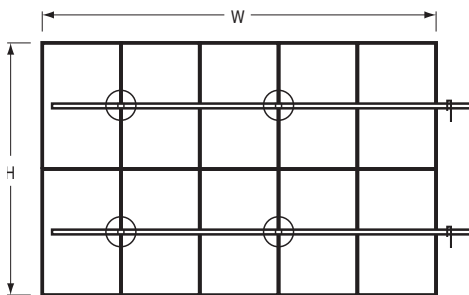
**DETAIL 32Q**  
OVER 50 THRU 144 SQ. FT. (OVER 4.6 THRU 13.4 SQ. M) WITH SEALS  
OVER 100 THRU 144 SQ. FT. (OVER 9.3 THRU 13.4 SQ. M) NO SEALS



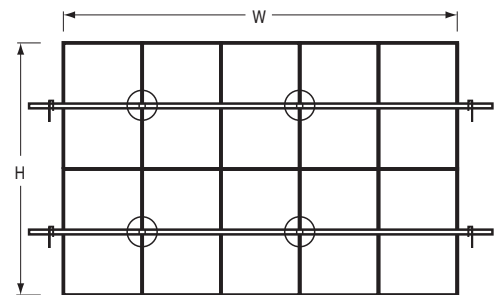
**DETAIL 42D**  
OVER 72 THRU 100 SQ. FT. (OVER 6.7 THRU 9.3 SQ. M) NO SEALS



**DETAIL 42Q**  
OVER 72 THRU 192 SQ. FT. (OVER 6.7 THRU 17.8 SQ. M) WITH SEALS  
OVER 100 THRU 192 SQ. FT. (OVER 9.3 THRU 17.8 SQ. M) NO SEALS



**DETAIL 52D**  
OVER 96 THRU 100 SQ. FT. (OVER 8.9 THRU 9.3 SQ. M) NO SEALS



**DETAIL 52Q**  
OVER 96 THRU 240 SQ. FT. (OVER 8.9 THRU 22.3 SQ. M) WITH SEALS  
OVER 100 THRU 240 SQ. FT. (OVER 9.3 THRU 22.3 SQ. M) NO SEALS