RUSKIN®

AMCA LICENSED
See Page 2

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CD50L LINEAR FLOW CONTROL DAMPER

High Performance Extruded Aluminum Airfoil
Meets International Energy Conservation Code Requirements

APPLICATION

The CD50L is a Linear Flow Control Damper. The CD50L is a low leak, extruded aluminum damper with airfoil blades for higher velocity and pressure HVAC systems. It meets the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1" w.g.

Ruskin's CD50L can also assist the designer in obtaining LEED-NC EA credit 1 for optimizing energy performance.

STANDARD CONSTRUCTION

FRAME
5" x 1" x 6063T5 extruded aluminum hat channel with .125" minimum wall thickness (127 x 25 x 3.2). Low profile, 5" x 1/2" (127 x 13) top and bottom frames on dampers 12" (305) high and less. Mounting flanges on both sides of frame.

BLADES
6" (152) wide, 6063T5 heavy gage extruded aluminum, airfoil shape.

SEALS
Ruskiprene blade edge seals and flexible metal compressible jamb seals.

BEARINGS
Molded synthetic.

LINKAGE
Concealed in frame.

AXLES
1/2" (13) plated steel hex.

ACTUATOR (FACTORY FURNISHED)
Modulating 24 VAC/VDC for linear applications. **One actuator required for every 20 sq. ft. of damper.**

MAXIMUM SIZE
Single section – 48"w x 60"h (1219 x 1524).
Multiple section assembly – Unlimited size.
Multiple section maximum section size is 48"w x 60"h (1219 x 1524)

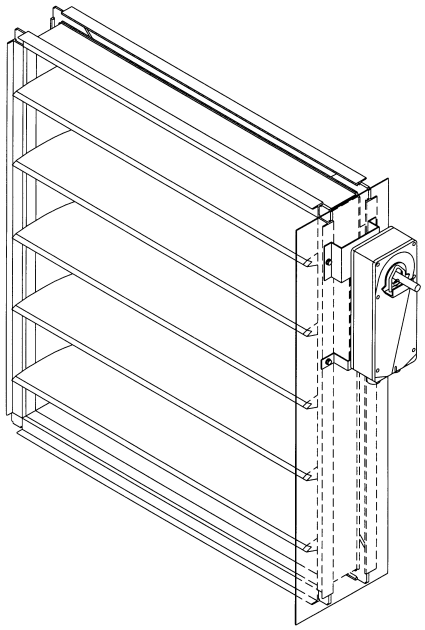
MINIMUM SIZE
Single blade – 6"w x 5"h (152 x 127).
Two blades, parallel or opposed action: 6"w x 11"h (152 x 279).

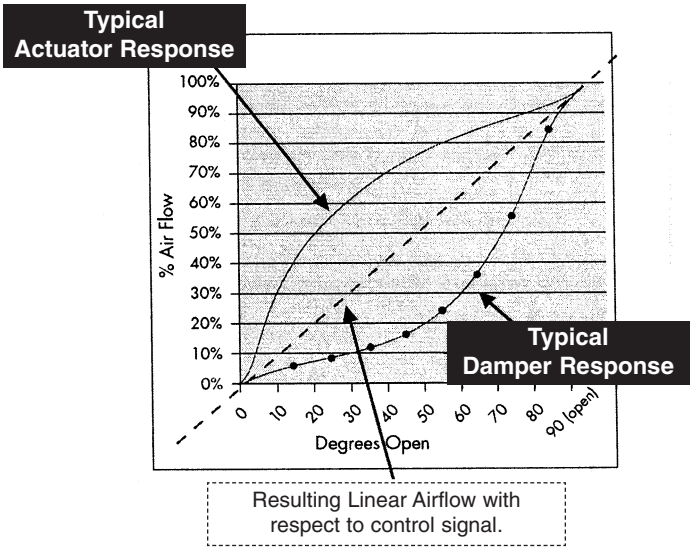
TEMPERATURE LIMITS
-22°F (-30°C) and +122°F (+50°C).

NOTES:

1. Dimensions shown in parenthesis ( ) indicate millimeters.

2. Units normally furnished approximately 1/4" (6) smaller than given opening dimensions.





Resulting Linear Airflow with respect to control signal.

FEATURES

- Airfoil blade design for low pressure drop and low noise generation.
- Factory furnished and mounted linear actuators.
- Blade edge seals mechanically lock into the blade for superior sealing.
- Factory programmed for linearity per ASHRAE RP1157.

OPTIONS

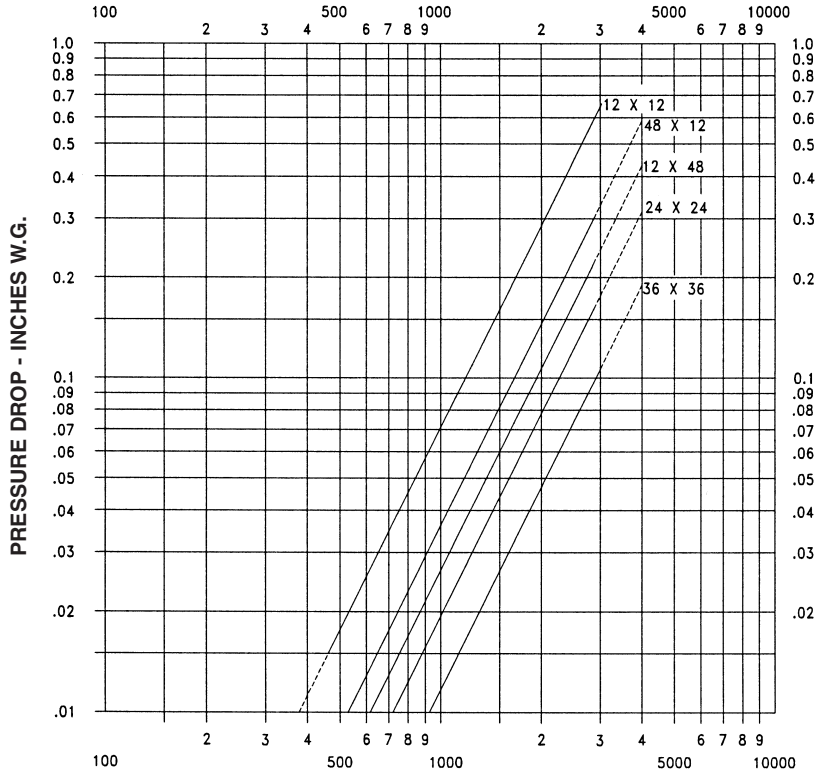
- SP100 Switch Package to remotely indicate damper blade position.
- 16 gage galvanized steel hat channel frame.
- Front, rear or double flange frame with or without bolt holes.
- Face and bypass configurations.
- Enamel and epoxy finishes.

Pressure/ Class	Leakage, CFM (l/s/m²)			
	Required Rating		Extended Ranges (Opt.)	
	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)	12" (3.0 kPa)
1A	3 (15.2)	N/A	N/A	N/A
1	4 (20.3)	8 (40.6)	11 (55.9)	14 (71.1)
2	10 (50.8)	20 (102)	28 (142)	35 (178)
3	40 (203)	80 (406)	112 (569)	140 (711)

DAMPER WIDTH (INCHES)	1 IN. W.G.	4 IN. W.G.	8 IN. W.G.
12" (305)	IA	I	II
24" (610)	IA	I	II
36" (914)	IA	I	NA
48" (1219)	IA	I	NA
60"(1524)	IA	I	NA

Leakage testing conducted in accordance with AMCA Standard 500-D-98. Torque applied holding damper closed, 5 in. lbs./sq. ft. on opposed blade dampers and 7 in. lbs./sq. ft. on parallel blade dampers. Air leakage is based on operation between 50°F to 104°F. All data corrected to represent standard air density 0.075 lbs/ft³.

VELOCITY VS. PRESSURE DROP



FACE VELOCITY - FEET/MINUTE
AMCA FIG. 5.3

CD50L sizes 12 x 12, 24 x 24, 48 x 12, 12 x 48, 36 x 36 (305 x 305, 610 x 610, 1219 x 305, 305 x 1219, 914 x 914)

All data corrected to represent standard air at a density of 0.075 lbs/ft³.

Ruskin Company certifies that the CD50L shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program.The AMCA International Certified Ratings Seal applies to Air Performance and Air Leakage.

CD50L SUGGESTED SPECIFICATION

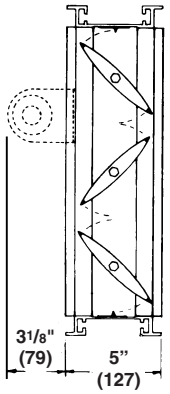
Furnish and install, at locations shown on plans, or in accordance with schedules, Ultra low leak, linear flow control dampers that meet the following minimum requirements: Frames shall be 5" x 1" x .125" (minimum thickness) (127 x 25 x 3.2) 6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity. Blades shall be airfoil type extruded aluminum (maximum 6" [152] depth) with integral structural reinforcing tube running full length of each blade. Blade edge seals shall be extruded double edge design with inflatable pocket which enables air pressure from either direction to assist in blade to blade seal off. Blades seals shall be mechanically locked in extruded blade slots, yet shall be easily replaceable in field. Adhesive or clip-on type blade seals are not acceptable. Bearings shall be non-corrosive molded synthetic. Axles shall be hexagonal (round not acceptable) to provide positive locking connection to blades and linkage. Linkage shall be concealed in frame. Engineer shall provide percent of damper authority and the AMCA test figure that closely matches the actual field conditions. Submittal must include leakage, maximum air flow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage and shall be linear flow control dampers per ASHRAE RP1157. Damper widths from 12" to 60" (305 to 1524) wide shall not leak any greater than 8 cfm sq. ft. @ 4" w.g. and a maximum of 3 CFM sq. ft. @ 1" w.g. Actuator will be Modulating 24 VAC/VDC programmed for Ruskin Control damper CD50L. Dampers shall be in all respects equivalent to Ruskin Model CD50L.

CD50L PROGRAMMING PROCESS (STEPS 1 THROUGH 4)

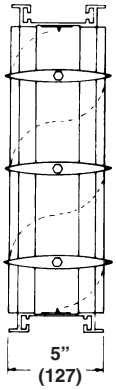
The CD50L is factory programmed to help achieve linear airflow in the air system in which it is applied. Steps 1 through 4 are required to select the appropriate factory program for linearity.

NOTE: The factory default will consist of figure 5.2 geometry and authority of 5% or 10% based on blade action.

1. BLADE ACTION OF DAMPER – OPPOSED BLADE OR PARALLEL BLADE



OPPOSED BLADE (5% Authority)



PARALLEL BLADE (10% Authority)

2. GEOMETRY OF AIR SUBSYSTEM

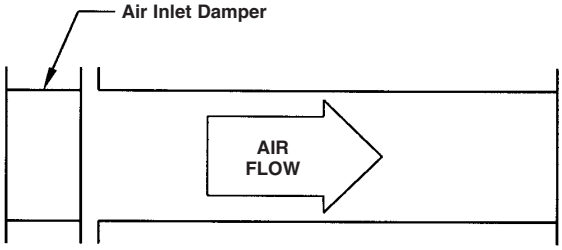


Figure 5.1

Damper is located at duct entrance. Airflow accelerates from zero velocity and must overcome entrance losses due to the blockage and entrance conditions. This subsystem is similar to AMCA Test Figure 5.1.

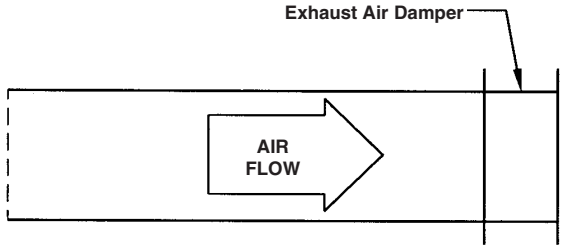


Figure 5.2

Damper is located at duct exit. Airflow dissipates in a zero velocity plenum with no chance of static regain. This subsystem is similar to AMCA Test Figure 5.2. (Linear Program Default)

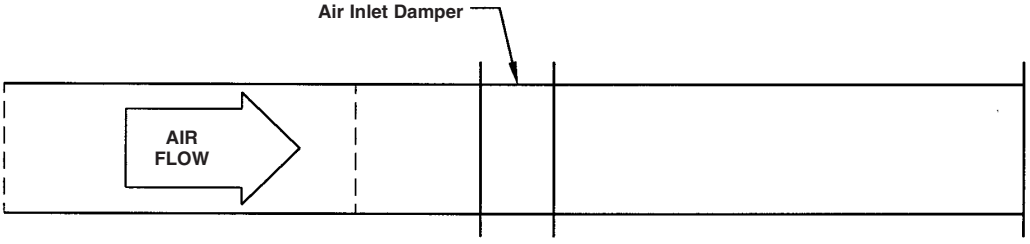


Figure 5.3

Damper is located in ideal conditions of fully developed airflow upstream and sufficient duct length downstream for static regain. This subsystem is similar to AMCA Test Figure 5.3.

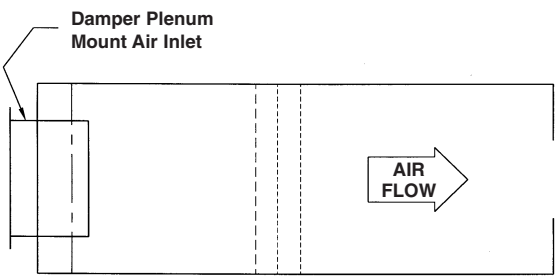


Figure 5.4

Damper is located at plenum entrance. Airflow is required to accelerate to a given velocity and overcome any entrance losses due to the blockage and entrance conditions. This subsystem is similar to AMCA Test Figure 5.4.

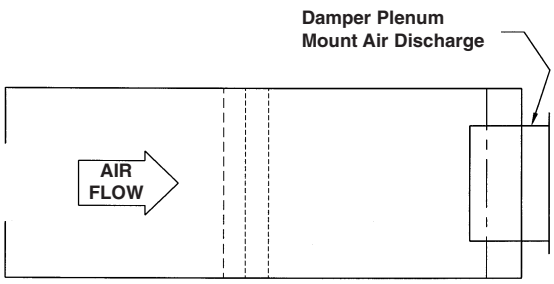


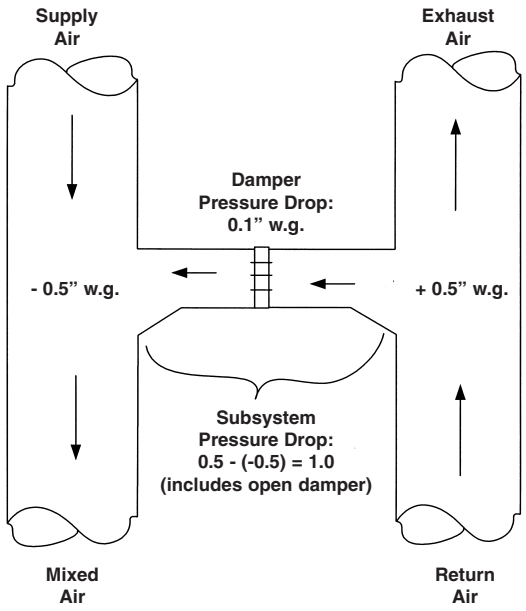
Figure 5.5

Damper is located at plenum exit. Airflow is required to accelerate to a given velocity and overcome any exit losses due to the blockage and exit conditions. This subsystem is similar to AMCA Test Figure 5.5.

CD50L PROGRAMMING PROCESS (continued)

3. DAMPER AUTHORITY

Is defined as the pressure drop across the damper in the full open position divided by the pressure drop across the system or subsystem. **The damper shown in the figure below has an authority of 10%. Most opposed blade dampers in most air subsystems will have an authority of 5% while parallel blade dampers will have an authority of 10%.**

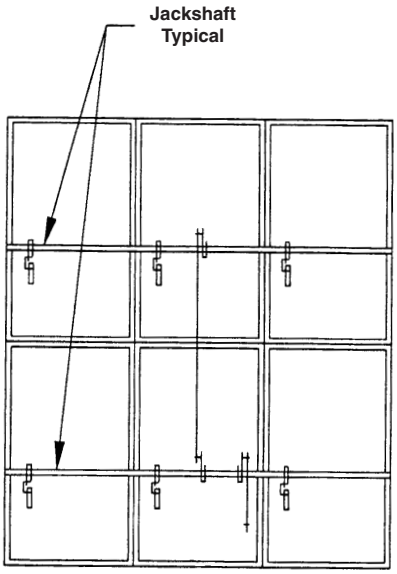


$$\text{Damper Authority} = \frac{\text{Damper Pressure Drop}}{\text{Subsystem Pressure Drop}} \times (100) = \frac{0.1}{1.0} \times (100) = 10\%$$

4. JACKSHAFT

A jackshaft is a 1/2" solid steel or 1" hollow steel tube used to connect multiple section dampers together so they work as a single unit. Jackshafts on CD50L dampers are split jackshafts (one per section) and are factory supplied when the actuator is required to be mounted in the air stream.

Any CD50L damper over 48"w or 60"h (1219 or 1524) will be assembled into smaller equal sections. The maximum section size is 48"w x 60"h (1219 x 1524) for multiple section damper assemblies.



Multiple Wide Multiple High

LINEAR AIRFLOW

Airflow in an HVAC system is interrupted by anything placed in the ductwork or the arrangement of the ductwork itself. To achieve maximum efficiency and occupant comfort through the system, a predictable method to manage and control airflow is required. The predictable method for control dampers is linear airflow. To achieve linear airflow however, one must overcome a number of non-linear system effects. For instance, as the damper blade begins to rotate from full closed to full open, a parallel blade damper will allow more airflow initially versus an opposed blade damper. Likewise, if the damper includes a jackshaft or special linkages, this can influence the airflow. Other factors also contribute to non-linearity:

Geometry: The geometry of the subsystem where the damper is located. Entry, exit, plenum, etc.

Authority: The amount of pressure loss within the damper compared to the subsystem.

Entering Flow Profile: If near an elbow, air can move through the top of the damper and even backflow through it.

Free Area Ratio: The ratio with respect to the size of the wall or duct can influence flow.

Left unattended, these non-linear affects can lead to erratic control, hunting, equipment wear, energy waste and ultimately occupant discomfort.

THE LINEAR AIRFLOW DAMPER

The linear airflow control damper allows a linear change in airflow quantity through the damper per volt of signal change. Using a complementary 24v modulating actuator and factory programming*, the CD50L will deliver 25% airflow on a call for 25% from the control signal even though the damper position may only be 15% based on the geometry, blade configuration etc.

*Each CD50L is factory programmed based on test results from ASHRAE Research Project 1157.

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