Thermal Efficiency Volume Control Dampers

Product Bulletin

VD-1251Tx

Code No. LIT-12011907
Issued January 2017

Since 1885, Johnson Controls has provided the highest quality control dampers that fit your application and size requirements.

- VD-1251TE insulated aluminum blade with thermal break and aluminum frame
- VD-1251TB insulated aluminum blade with thermal break and insulated aluminum frame with thermal break

Figure 1: VD-1251Tx Damper

Table 1: Features and Benefits

Features	Benefits
3-Year Warranty on Materials and Workmanship	Provides the confidence of Johnson Controls standing behind the product.
15-Working-Day Standard Shipping after Order Entry	Results in fast response for short lead time projects.
345% Thermal Efficiency Ratio	Results in less cold penetration.
Self-Compensating Side Seals	Minimize leakage between the blades and the damper frame.
Twin Blade Seals with Neutral Zone Thermal Break	Improve thermal efficiency and isolate skins for less migration.
Dual-Action Injection Molded Bearing and Bearing Surface Frame Insert	Reduce friction for lower torque, requiring fewer and smaller actuators.

Application

VD-1251Tx dampers offer sturdy construction of both frame and airfoil blades of aluminum, and are designed to meet various application and environmental requirements. These applications include, but are not limited to:

- VD-1251TE: Insulated aluminum blade with thermal break and aluminum frame. For low-temperature applications.
- VD-1251TB: Insulated aluminum blade with thermal break and insulated aluminum frame with thermal break. For low-temperature applications that also require isolation breaks filled with polyurethane and are debridged.

Dampers are tested using instrumentation and procedures at an AMCA Certified Laboratory in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, and Shutters.

Energy Efficiency Performance Data

VD-1251TE and VD-1251TB are tested as Thermal Efficiency Volume Control Dampers, which have an AMCA certified thermal efficiency ratio of 345%.

Thermal efficiency ratio (E) is a comparison of a tested damper's thermal performance against a known reference damper. A tested damper is compared to the thermal performance of a v-groove blade reference damper. A damper with the same thermal efficiency as the reference damper has an E value of 0%, while a damper that is four times as efficient has an E value of 200%.

Torque, seal material, blade action, and flow direction influence thermal efficiency. Consult Johnson Controls for additional test data for a specific application.

See *Factory Options* for optional features and combinations of features that add versatility to applications. For example, Option C is used in corrosive environments. Options C and S are used in extreme environments. The VD-1251BF with polycarbonate bearings and silicone seals is used in extreme cold conditions to reduce or eliminate condensation or freeze-up.

Torque

Johnson Controls® VD-1251Tx data are based on a closing torque of 7 lb·in/ft^2 (0.8 N·m/m^2).

Test Setup Information

In accordance with AMCA 500-D Figure 5.10, Thermal Efficiency Test, a 36 x 36 in. (914 x 914 mm) test sample is placed on the test fixture. Johnson Controls' published torque is applied to hold the damper closed.

Submittal Specifications

Furnish and install, where shown on plans or as indicated in schedules, thermal efficiency control dampers meeting the following minimum specifications.

Damper shall be Johnson Controls VD-1251Tx.

Frame: Damper frame shall be constructed of 6063T6 high-yield extruded aluminum with a minimum wall thickness of 0.125 in. (3 mm) and a yield stress of no less than 30,000 psi.

Blades: Low-pressure-drop aerodynamically shaped blades shall be constructed of 6063T6 high-yield extruded aluminum with a minimum wall thickness of 0.125 in. (3 mm) and a yield stress of no less than 30,000 psi. Blades shall be filled with Polyurethane structural foam with a minimum density of 15 pcf. Insulated blades shall include a thermal break positioned between two blade seals to completely eliminate a thermal path from one side of the damper to the other. Thermal breaks on the blade edges shall not be visible when the damper is in the closed position.

Design: Damper assembly shall have a symmetrical design to ensure the resistance to airflow is identical from either direction.

Axles: Axles shall be 1/2 in. (13 mm) hexagonal plated steel material. Stainless steel axles shall be utilized when noted on the plans. Polycarbonate bearings shall be formed to the shape of the axle to reduce leakage through the frame.

Bearings: Bearings shall rotate inside an acetyl copolymer outer bearing surface to reduce torque and promote a smooth operation throughout the stroke of the damper.

Linkage: Zero-tolerance Swedgelock™ linkage arms shall be permanently and mechanically secured to each axle, eliminating future need for field adjustment of the linkage assembly. Linkage assembly shall be set to predetermined parameters ensuring leakage performance for the life of the product. Linkage shall be completely concealed within the damper frame, out of the airstream. Stainless steel linkage of the same design shall be used when specified on the plans.

Seals: Blade edge seals shall be extruded bulb silicone and shall be mechanically fastened to the blades. Santoprene seals are standard. Silicone seals shall be utilized when specified on the plans. Jamb seals shall be low-profile, light-prohibiting, extruded silicone secured in extruded pockets of the damper frame. Santoprene jamb seals are standard. Silicone seals shall be used when specified on the plans. Stainless steel jamb seals creating a thermal path from one side of the blade to the other are not permitted.

Pressure: Damper shall be suitable for pressures up to 8 in. water gage (2 kPa), velocities up to 4,000 fpm (20.3 m/s), standard air leakage of less than 8 cfm/ft^2 at 4 in. water gage (2.44 cmm/m^2 at 1 kPa), temperature range of -45 to 200°F (-43 to 93°C), and a thermal efficiency ratio no less than 345% on opposed blade dampers.

All performance data shall be submitted to engineer of record for approval. Damper leakage, performance, and thermal efficiency shall be developed in accordance with the latest edition of AMCA 500-D.

Table 2: VD Series Dampers Thermal Efficiency

Product Code	Description	Thermal Efficiency (% of Reference Damper)
VD-1241	Two 4 in. (5.8 cm) frames	195
VD-1250	No insulation	200
VD-1251	Thermally broken/insulated blades	239
VD-1630	No insulation	196

Construction

Each frame is made of extruded aluminum and has corner braces for additional strength.

Note: Units are furnished approximately 1/4 in. (6 mm) smaller than given opening dimensions.

Table 3: Materials (Part 1 of 2)

Part	Materials
Frame	5 x 1 x 0.125 in. (127 x 25 x 3 mm) thick 6063T6 high-yield aluminum 6 x 1 x 0.125 in. (152 x 25 x 3 mm) thick 6063T6 high-yield aluminum frame with optional quick-connect T flange frame and optional thermal break for the frame
Blades	5/64 in. (2 mm) 6063T6 high-yield aluminum opposed (standard) or parallel action with thermal break
Axles	1/2 in. (13 mm) nominal hexagonal plated steel

Table 3: Materials (Part 2 of 2)

Part	Materials
Bearings	Dual-action polycarbonate internal hex rotating inside an acetyl copolymer outer sleeve
Blade Seals	Mechanically fastened extruded bulb Santoprene (standard) or silicone (optional)
Jamb Seals	Combination compression/ribbed extruded silicone
Linkage	Swedgelock assembly plated steel concealed out of airstream
Output Shaft	1/2 in. (13 mm) diameter x 6 in. (152 mm) plated steel shaft single-section units. Pin included with all single-section dampers. 1/2 in. (13 mm) diameter jackshaft on multi-section assemblies up to 12-1/2 ft^2 (3.8 m^2) 1 in. (25 mm) diameter jackshaft multi-section assemblies over 12-1/2 ft^2 (3.8 m^2)

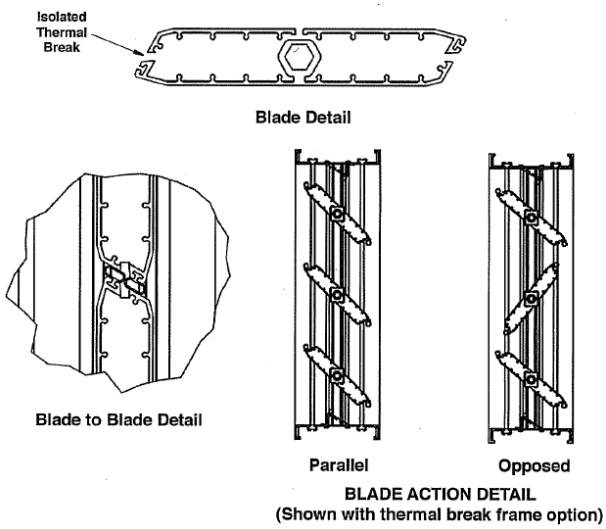

Figure 2: Blade Details

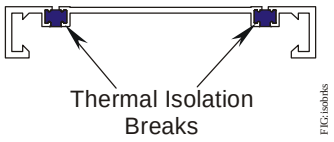

Figure 3: Frame Thermal Components

Dimensions

The frames of the VD-1251Tx are 5 x 1 x 0.125 in. (127 x 25 x 3.2 mm) minimum wall thickness.

All Johnson Controls height and width dimensions are from the outside edges of the frame. The damper is exact size only with the T frame or thermal break option. In all other cases, actual damper size is 1/4 in. (6 mm) less than nominal.

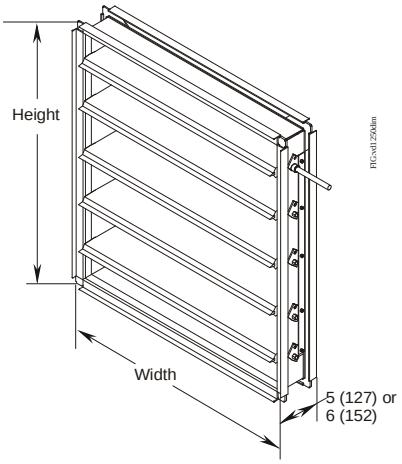

Figure 4: Mounting Dimensions, in. (mm)

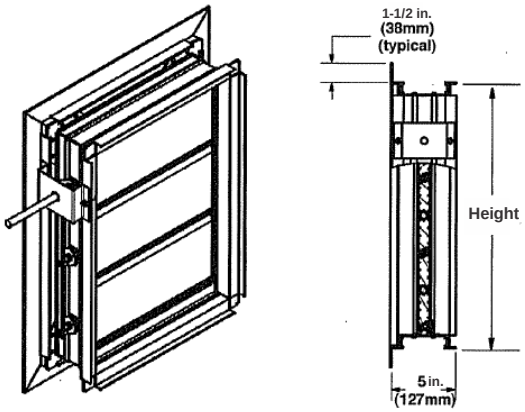

Figure 5: Flange Frame Detail
(Width and Height are O.D. Frame)

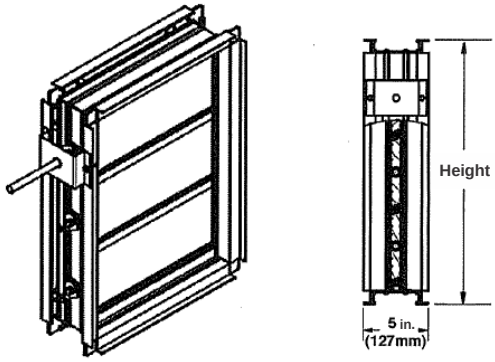

Figure 6: Channel Frame Detail
(Width and Height are O.D. Frame)

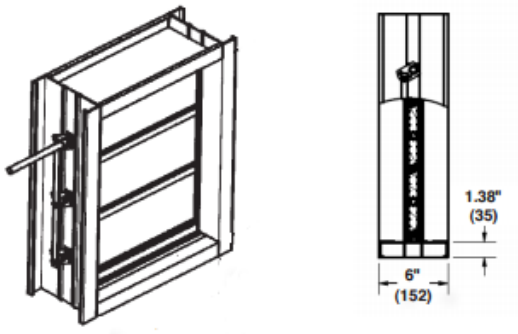

Figure 7: Quick-Connect T Frame Detail
(VD-1251TB Only)
(Width and Height are O.D. Frame)

Note: To provide maximum free area and lowest pressure drop, Johnson Controls model VD-1251Tx utilizes varying blade widths. In some cases, the blade extends beyond the frame a maximum of 3.06 in. (78 mm).

Table 4: Single-Panel Size Limits

Dimension	Limits
Width	Minimum 6 in. (152 mm) Maximum Single Panel 60 in. (1,524 mm) Maximum Multiple Panel 48 in. (1,219 mm)
Height	Minimum Parallel 6 in. (152 mm) Minimum Opposed 12 in. (305 mm) Maximum 60 in. (1,524 mm)
Size Increment	1 in. increments

Selection Information

Use the following to select the product:

1. Determine the required size from the drawings.
2. Use the *Damper Selector* in Table 5 to select the features that match the operation and performance required.
3. Enter the width and height of damper.

Note: The damper is exact size only with the T frame or thermal break option. In all other cases, actual damper size is 1/4 in. (6 mm) less than nominal.

4. Enter the options required.

Example: VPISN-020x020 is an all aluminum damper that has insulated and thermally broken airfoil blades with thermally broken frames, parallel blade operation, Santoprene blade seals, dual-action polycarbonate internal hex rotating inside an acetyl copolymer outer sleeve, and combination compression/ribbed extruded silicone jamb seals. It is shipped 19-3/4 x 19-3/4 in. actual size.

Volume Control damper ordering size limits are 999 in. wide and 999 in. high. All VD-1251Tx dampers are shipped factory coupled.

Factory-mounted actuators are standard outside air stream on a side plate. Actuators are selected by the factory for best performance at 7 lb/sq ft (3.2 kg/sq m).

Multiple section dampers are shipped from the factory, assembled up to three panels wide, and include jackshafts.

Table 5: Damper Selector[1]

	Ordering Code Number	V					-	w	w	w	x	h	h	h		
Application	V = Volume Control															
Blade Operation	O = Opposed (greater than 12 in. high) P = Parallel															
Blade/Frame	C = Insulated, Thermally Broken Blade/Standard Frame (VD-1251TE) I = Insulated, Thermally Broken Blade/Thermally Broken Frame (VD-1251TB)															
Bearing/Seal	E = Extended (Polycarbonate/Silicone) S = Standard (Polycarbonate/Santoprene)															
Actuator[2]	A = M9208-AGC or M9220-AGC (24 V Floating, Spring Return) B = M9208-GGC or M9220-GGC (24 V Modulating, Spring Return) C = M9208-BAC or M9220-BAC (120 V Two-Position, Spring Return) D = M9208-BGC or M9220-BGC (24 V Two-Position, Spring Return) F = M9106-AGC or M9116-AGC (24 V Floating, Non-Spring Return) G = M9106-GGC or M9116-HGC (24 V Modulating, Non-Spring Return) N = No Actuators P = D-3062-3 or D-1353-2 (Pneumatic, 8-13# Spring Range)															
Width	006 to 999 inches, 1 in. increments															
Height	Opposed: 012 to 999 inches, 1 in. increments Parallel: 006 to 999 inches, 1 in. increments															
Options (limit two)	See *Factory Options* for descriptions and combinations.															

1. Not all combinations are available; check selector tool for valid combinations.
2. Actuators restrict minimum sizes (see *Factory Options*) and may restrict maximum sizes; check selector tool for valid sizes.

Factory Options

C Clear anodized finish

E Exact whole inch size, no undercut

F 1-1/2 in. L flange air entering side (cannot be used with option G) (VD-1251TE only)

G 1-1/2 in. L flange air leaving side (cannot be used with option F) (VD-1251TE only)

H Double flange for flange to duct applications (VD-1251TE only.) VD-1251TB models have a double-sided T Flange as standard. For flange to duct applications, on VD-1251TB models, add 2 in. to height and width dimensions.

I Indicator switch

J Single-panel jackshaft (multiple section broken down for field assembly)

M Single panel only, factory assembled

Q Internal mount actuator (electric minimum size 014 x 021, pneumatic minimum size 018 x 024)

S Stainless steel linkage and axles (VD-1251TB only)

X Ships unassembled

Note: Not all options are available with all features or other option combinations. Contact the nearest Johnson Controls representative for availability.

Air Performance Data

VD-1251Tx pressure-drop testing was conducted in accordance with AMCA Standard 500-D figures 5.2, 5.3, and 5.5 as illustrated. All data have been corrected to standard air density of 0.075 lb/ft^3 (1.201 kg/m^3).

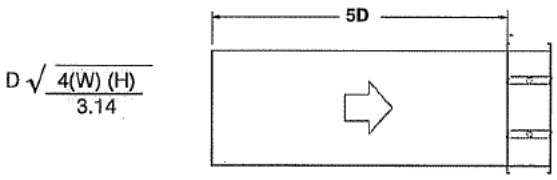

Figure 8: AMCA Figure 5.2 Ducted Damper Exhausting into an Open Area

In the arrangement shown in Figure 8, a straight-duct run upstream of the damper minimizes entrance losses.

Table 6: AMCA Figure 5.2 Ducted Damper Exhausting into an Open Area

12 x 12 in. (305 x 305 mm)		24 x 24 in. (610 x 610 mm)		36 x 36 in. (914 x 914 mm)		12 x 48 in. (305 x 1,219 mm)		48 x 12 in. (1,219 x 305 mm)	
Velocity (fpm)	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**
500	0.09	500	0.03	500	0.02	500	0.03	500	0.05
1,000	0.38	1,000	0.11	1,000	0.08	1,000	0.13	1,000	0.21
1,500	0.85	1,500	0.25	1,500	0.18	1,500	0.30	1,500	0.47
2,000	1.50	2,000	0.44	2,000	0.33	2,000	0.52	2,000	0.83
2,500	2.35	2,500	0.69	2,500	0.51	2,500	0.82	2,500	1.30

Table 6: AMCA Figure 5.2 Ducted Damper Exhausting into an Open Area

12 x 12 in. (305 x 305 mm)		24 x 24 in. (610 x 610 mm)		36 x 36 in. (914 x 914 mm)		12 x 48 in. (305 x 1,219 mm)		48 x 12 in. (1,219 x 305 mm)	
Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)
3,000	3.41	3,000	1.00	3,000	0.74	3,000	1.18	3,000	1.87
3,500	4.64	3,500	1.36	3,500	1.02	3,500	1.60	3,500	2.51
4,000	6.06	4,000	1.78	4,000	1.33	4,000	2.09	4,000	3.28

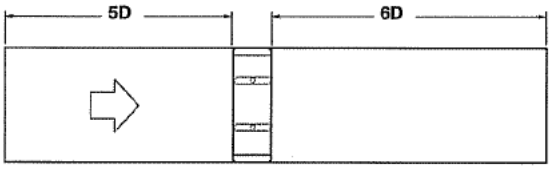

Figure 9: AMCA Figure 5.3 Fully Ducted Damper with Straight Duct Upstream and Downstream

The straight-duct arrangement shown in Figure 9 minimizes entrance and exit losses, providing the lowest pressure drop of all three arrangements.

Table 7: AMCA Figure 5.3 Fully Ducted Damper with Straight Duct Upstream and Downstream

12 x 12 in. (305 x 305 mm)		24 x 24 in. (610 x 610 mm)		36 x 36 in. (914 x 914 mm)		12 x 48 in. (305 x 1,219 mm)		48 x 12 in. (1,219 x 305 mm)	
Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)	Velocity (fpm)	Pressure Drop (in.wg)
500	0.06	500	0.01	500	0.01	500	0.02	500	0.03
1,000	0.24	1,000	0.06	1,000	0.03	1,000	0.08	1,000	0.10
1,500	0.54	1,500	0.13	1,500	0.08	1,500	0.16	1,500	0.24
2,000	0.97	2,000	0.22	2,000	0.13	2,000	0.28	2,000	0.41
2,500	1.51	2,500	0.34	2,500	0.20	2,500	0.44	2,500	0.54
3,000	2.18	3,000	0.49	3,000	0.29	3,000	0.62	3,000	0.93
3,500	2.96	3,500	0.65	3,500	0.39	3,500	0.84	3,500	1.27
4,000	3.86	4,000	0.86	4,000	0.51	4,000	1.07	4,000	1.65

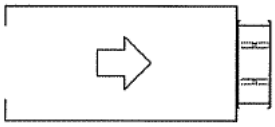

Figure 10: AMCA Figure 5.5 Damper Installed on a Plenum Wall

In the arrangement shown in Figure 10, sudden area changes entering and exiting the damper create extreme losses, providing the highest pressure drop of all three arrangements.

Table 8: AMCA Figure 5.5 Damper Installed on a Plenum Wall

12 x 12 in. (305 x 305 mm)		24 x 24 in. (610 x 610 mm)		36 x 36 in. (914 x 914 mm)		12 x 48 in. (305 x 1,219 mm)		48 x 12 in. (1,219 x 305 mm)	
Velocity (fpm)	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**	**Velocity (fpm)**	**Pressure Drop (in.wg)**
500	0.11	500	0.05	500	0.05	500	0.05	500	0.07
1,000	0.45	1,000	0.19	1,000	0.19	1,000	0.20	1,000	0.28
1,500	0.95	1,500	0.42	1,500	0.42	1,500	0.45	1,500	0.62
2,000	1.68	2,000	0.77	2,000	0.74	2,000	0.79	2,000	1.09
2,500	2.66	2,500	1.17	2,500	1.16	2,500	1.24	2,500	1.71
3,000	3.84	3,000	1.67	3,000	1.66	3,000	1.78	3,000	2.46
3,500	5.22	3,500	2.29	3,500	2.26	3,500	2.42	3,500	3.35
4,000	6.82	4,000	2.96	4,000	2.95	4,000	3.16	4,000	4.37

Leakage Data

Leakage testing is performed in accordance with ANSI/AMCA Standard 500-D figure 5.5.

Air performance testing is performed in accordance with ANSI/AMCA Standard 500-D figures 5.2, 5.3, and 5.5.

Data are based on a closing torque of 7 lb·in/ft^2 (0.79 N·m/m^2).

Table 9: Leakage Data

VD-1251Tx	Leakage Class[1]			
Maximum Damper Width	1 in. water gage (0.25 kPa)	4 in. water gage (1 kPa)	8 in. water gage (2 kPa)	10 in. water gage (2.5 kPa)
60 in. (1,524 mm)	1A	1	1	1

1. See the following *Leakage Class Definitions* section.

Leakage Class Definitions

As defined by AMCA, the maximum allowable leakage is as follows:

Leakage Class 1A (defined only at 1 in. water gage)

- 3 cfm/ft^2 (0.92 cmm/m^2) at 1 in. water gage (0.25 kPa)

Leakage Class 1

- 4 cfm/ft^2 (1.22 cmm/m^2) at 1 in. water gage (0.25 kPa)
- 8 cfm/ft^2 (2.44 cmm/m^2) at 4 in. water gage (1 kPa)
- 11 cfm/ft^2 (3.35 cmm/m^2) at 8 in. water gage (2 kPa)

Multiple Section Stacking Details

The maximum panel size for VD-1251Tx dampers is 48 in. wide x 72 in. high (1,219 mm wide x 1,829 mm high). See Table 4 for panel size limits.

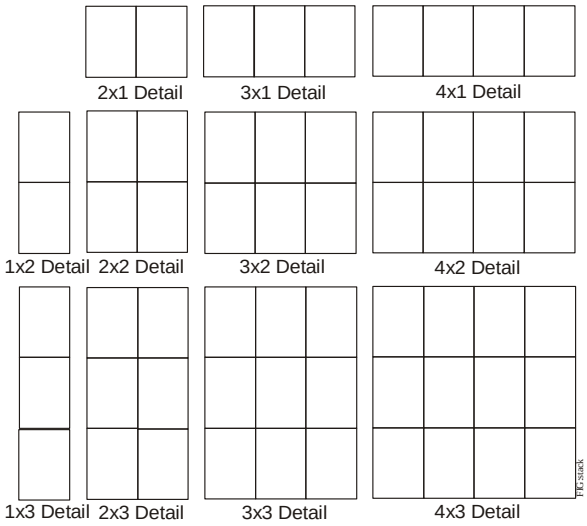

Figure 11: Multiple Section Stacking Options

Maintenance

Johnson Controls VD-1251Tx dampers have no components that require routine scheduled maintenance.

During normal duct maintenance, damper blades should be wiped clean if necessary and opened or closed to verify complete rotation and sealing.

Repair Information

All Johnson Controls dampers are built to order and cannot be returned due to ordering errors. All dampers are backed by a 3-year warranty, which covers defects in materials or workmanship. Refer to terms and conditions of sale for specifics.

Table 10: Accessories

Code Number	Description
DMPR-KC011	Extended shaft only, hex pin
DMPR-KC012	Extended shaft with bracket, hex pin
DMPR-KC013	Position switch kit, short link, for sizes over 20 in.
DMPR-KC014	Position switch kit, long link, for sizes under 20 in.
DMPR-KC016	External field mount position switch 1 in. coupling
DMPR-KC017	External field mount position switch square pin coupling
DMPR-KC018	External field mount position switch hex pin coupling
DMPR-KC210	Jackshaft, 1 in. diameter, 1 panel

Table 11: Repair Parts

Code Number	Description
DMPR-RC070	Santoprene blade seal
DMPR-RC071	Silicone blade seal/stop
DMPR-RC072	Santoprene blade stop

Technical Specifications

VD-1251Tx Volume Control Dampers[1]

Leakage	Class 1A at 1 in. water gage (0.25 kPa) Class 1 at 4 in. water gage (1 kPa)				
Operating Torque	1 in. static pressure, 1,000 fpm fully open approach velocity				7 lb·in/sq ft
Pressure Drop (in. water gage) - Fully Open	**Size (in.)**	**Approach Velocity (fpm) Based on AMCA Standard 500-D Figure 5.3**			
		1,000	**2,000**	**3,000**	**4,000**
	24 x 24	0.06	0.22	0.49	0.86
	36 x 36	0.03	0.13	0.29	0.51
Pressure	Up to 8.0 in. water gage (2 kPa) pressure				
Velocity	Up to 4,000 fpm (20.3 m/s)				
Temperature Rating	**Standard and Extended Operating Conditions**	-50 to 200°F (-46 to 93°C)			
	Actuator	-4 to 122°F (-20 to 50°C)			
Temperature Range	-70 to 200°F (-57 to 93°C) with optional silicone seals -45°F to 185°F (-43 to 85°C) with standard Santoprene seals				
Approximate Weight	10 lb/sq ft (4.6 kg/sq m)				
	Actuator	2.9 lb (1.6 kg) per actuator			

1. All performance data are determined using instrumentation and procedures at an AMCA Certified Laboratory in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, and Shutters.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products. Refer to the M9208-xxx-x Series Electric Spring-Return Actuators Product Bulletin (LIT-12011480), M9220-xxx-3 Electric Spring-Return Actuators Product Bulletin (LIT-12011057), and M9108, M9116, M9124, and M9132 Series Electric Non-Spring-Return Actuators Product Bulletin (LIT-2681058) for necessary information on operating and performance specifications for the actuator.

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