



# Dampers and Actuators Catalog



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## Johnson Controls delivers products, services and solutions that increase energy efficiency and lower operating costs in buildings for more than one million customers.

Operating from 500 branch offices in 148 countries, we are a leading provider of equipment, controls and services for heating, ventilating, air-conditioning, refrigeration and security systems. We have been involved in more than 500 renewable energy projects including solar, wind and geothermal technologies. Our solutions have reduced carbon dioxide emissions by 13.6 million metric tons and generated savings of \$7.5 billion since 2000. Many of the world's largest companies rely on us to manage 1.8 billion square feet of their commercial real estate.

### HVAC Dampers, Louvers and Air Control Products

Since 1905, Johnson Controls has manufactured industry-leading temperature control dampers. Today, we offer a complete line of HVAC dampers and air control products including volume control, balancing, round, zone, fire, smoke and combined models.

Johnson Controls is committed to customer satisfaction, and that's why we custom-build each of our HVAC dampers to suit your specific size and model requirements. Some dampers can even be manufactured one day and shipped the next day.

Actuators and accessories can be ordered with the damper and factory-installed or shipped separately depending on your needs.



# Introduction to Dampers

## The Selection Process

Selecting the right damper is important to assure good operating characteristics in any airflow system, helping you maximize energy efficiency and minimize installation costs.

In any system, the damper dimensions must be appropriate for the designed airflow volume. The consulting engineer who designs a system's duct work typically calculates damper sizes as part of the overall air distribution system. For modulating control, the engineer must choose sizes that create enough velocity (and therefore enough pressure drop) to allow stable control. For isolation purposes or two-position control, the engineer sizes dampers for economy, considering both the initial cost and the ongoing energy effects the pressure drop and open damper creates.

## About Damper Sizes

The building's mechanical plans provide a summary of required dampers. Damper sizes may be indicated in the floor plans or control drawings. Selecting the control dampers involves checking the specifications and following the requirements, including size, flanges, blade and jamb seals, blade design, bearings, leakage requirements, opposed or parallel operation, linkages, jackshafts, and construction material.

Damper sizes are generally called out using height by width on plans or schedules. Damper manufacturers by convention use width by height when placing orders. Control dampers are usually installed with the blades horizontal, so the width is the dimension in line with the blades. If the blades are vertically mounted, then thrust washers are necessary. When the blades are vertical, their weight forces the blades toward the bottom part of the frame. Thrust washers provide a low-friction surface between the blades and frame to prevent binding and damage to jamb seals. When blades are horizontal, thrust bearings are not required.

## Parallel vs Opposed Blade Operation

Parallel blades rotate so they are always parallel to each other; therefore, at any partially open position, they tend to redirect airflow and increase turbulence and mixing within the downstream duct work or plenum. This characteristic makes them good candidates for return and outside air intake into a mixing chamber. The two dampers are often linked together (one opens and one closes) to coordinate control.

Opposed blades rotate opposite each other in adjacent pairs. Air discharge through this type of damper is straighter and a bit quieter under partial-flow conditions. Opposed blade dampers are often specified where air direction control is important relative to other factors, such as within final volume control devices. The flow characteristics of parallel and opposed dampers are different; an opposed blade damper must be opened further (creating a higher modulating pressure drop) to provide the same percentage of total air volume as a parallel damper (creating a lower modulating pressure drop). When they are wide open, the pressure drop is the same for both types.

## Blades

Damper blade design varies among manufacturers. There are flat blades, triple V-groove blades, single or double layer blades, and airfoil blades. The most costly is the airfoil blade which reduces noise, has the least flow resistance, and the tightest leakage. The most common is the V-groove, which offers economy and moderate flow resistance.

In northern climates, multi-layered blades with insulating cores are often used for outside air control to keep the inside surfaces from icing up. Other specialty blade types are available to cope with various conditions.

It is critical to consider damper leakage when selecting dampers for cost, efficiency, and control, and to protect the duct work from environmental conditions. Low leakage or ultra-low leakage dampers incorporate a seal along the edge and the side of the blade to minimize leakage when the dampers are fully closed.



## Frames

Seal materials and designs vary among manufacturers; some are cellular foam or silicone rubber, some snap on, some are spring steel, and others inflate. Seals add torque to the operation of the damper, and most seals are replaceable. Leakage specifications are listed as CFM/sq ft of damper area at a given static pressure or as a class (Class I, II, III). Class I has the lowest leakage. Underwriters Laboratories® (UL) 555S defines these classes. The lower the leakage, the higher the cost of the damper.

## Bearings

Damper bearings are important components of the damper construction and are available in different materials. Be sure to check the temperature rating requirements of the dampers on your job. Bronze bearings have higher temperature ratings and typically last longer than synthetic bearings.

Damper frames and flanges on major manufacturers' dampers are heavy duty to assure reliable blade rotation and operation. However, if the frame of the damper is bent during shipment or installation, the damper may bind and add torque or may not tightly close. Typical frame designs are without flanges (for internal duct mounting) or with single or double flanges (for wall or duct butt mounting). The job plans or specifications should make it clear which frame connection is needed, but it is always good to coordinate with the duct work contractor for the needed frame connection.

Multi-section dampers are typically required when the damper size exceeds 48 inches wide or 60 inches high. Single dampers are not usually made larger than 48 x 76 or 60 x 72 inches for ease in shipping and handling and for construction rigidity. Coupling kits, pin extensions, jack shafts, and other linkage components are used to link the single damper sections to form the multi-section damper. When ordering or planning a multi-section damper, double-check that these accessories, and any other hardware you will need, are included in your damper purchase order.

# Damper Applications

## Balancing

Designed for balancing airflow in duct work systems. They are typically intended for manual operation with a locking handle and do not provide tight shutoff.



## Gravity, Backdraft, or Barometric

Commonly found in exhaust fan duct work and boiler flue exhaust. They open when airflow (differential pressure) is present and closes when there is no differential.



## Face/Bypass

A pair of side-by-side, top-bottom modulating dampers that operate opposite each other in a single duct to direct airflow either through the face of a coil or to bypass around the coil.

## Fire

Two-position dampers that are typically found where air ducts penetrate walls or floors. They are designed to restrict the spread of fire.



## Smoke

Two-position or modulating dampers specifically designed to restrict the flow of smoke in a building.



## Fire/Smoke

Two-position or modulating dampers designed to meet the combined requirements of fire and smoke dampers. They are equipped with a thermal link and are factory-assembled with an actuator.



## Mixing

Sets of modulating control dampers that operate opposite each other to mix outside air and return air in maintaining a specified mixed-air temperature.

## Multizone

Pairs of modulating control dampers located at the air handling unit (AHU) that operate opposite each other to mix hot and cold supply air in order to maintain a specified space temperature to an individually ducted zone.

## Round

Typically available in balancing or control damper types. They are commonly specified in higher static pressure or high flow velocity applications and are installed in spiral wound duct work.

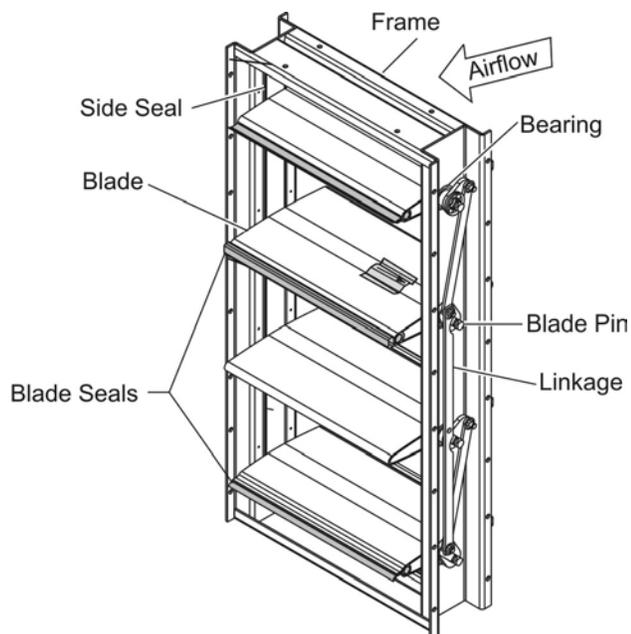


## VAV Box

Small modulating zone dampers that control the air velocity or volume entering an individual (thermostat) temperature controlled zone.

# Damper Components and Construction

## Rectangular Damper Components



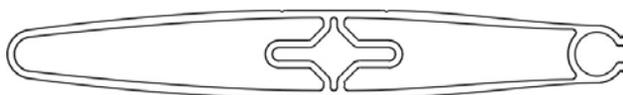
## Typical Blade Profiles



Single-Piece Profile



Two-Piece Blade Profile



Airfoil Blade Profile

## Blade Variety

Damper blades are available in various styles. Single-piece blades are fabricated from a single thickness of 16-gauge galvanized steel, with multiple grooves running the full length for structural strength. Two-piece blades are manufactured with the same longitudinal grooves and are locked together for additional strength and better airflow characteristics. Airfoil-shaped blades are available in heavy gauge aluminum or galvanized steel. Insulated blades are airfoil-shaped with foam insulation injected.

The **VD-1310** series damper has a formed blade for applications as a control or balancing damper in low pressure and low velocity, under circumstances where low leakage is not required (Class III). The VD-1310 is not designed for outdoor air.

The **VD-1320** is a formed two-piece blade for applications as a low leakage control damper (Class I).

The **VD-1330** is an airfoil-shaped blade for applications as a very low leakage control damper in higher velocities (Class IA).

The **VD-1620** is a triple V-blade damper for low leakage and standard velocities applications (Class II).

The **VD-1630** is galvanized airfoil blade damper for very low leakage and high velocities applications (Class I).

The **VD-1240** and **VD-1250** are aluminum airfoil blade and frame dampers for extreme conditions requiring very low leakage and high velocities applications (Class IA).

The **VD-1251** is an insulated airfoil blade with an aluminum frame for conditions requiring resistance to thermal penetration.

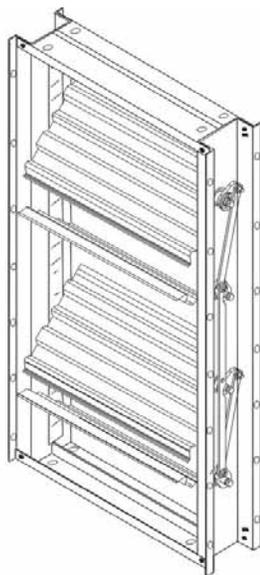
The **VD-1252** is an insulated airfoil blade with a thermal break frame for additional thermal penetration resistance.

# Damper Components and Construction

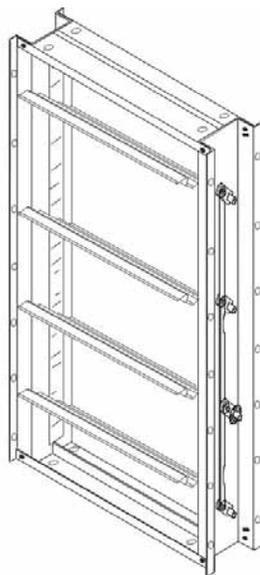
**Parallel blade operation** is preferred when the damper accounts for a significant portion of the total system pressure loss. Parallel blades are used when greater control is required near the top end of the volume operating range or for systems requiring two position operation. Because of uneven airflow, do not use parallel blades upstream of critical components.

**Opposed blade operation** offers the best control over the entire operating range when the damper does not account for a significant portion of the total system pressure loss. Use opposed operation when it is necessary to maintain an even distribution of air downstream from the damper.

## Opposed



## Parallel



## Frames

The **VD-1300** series damper uses a 3-½ inch wide 13-gauge toggled frame with hat channel sides and a flat top and bottom. This method provides more structural rigidity than traditional welded frames with reinforced corners.

The **VD-1300** frame is a 3-½ inch x 1 inch x 13-gauge galvanized steel side channel with a flat top and bottom for a low profile and easy stacking. The frames use Tog-L-Loc construction to provide rigid and square corners.

The **VD-1600** frame is a 5 inch x 1 inch x 16-gauge galvanized hat channel frame.

The **VD-1240** frame is a 4 inch x 1 inch x 12-gauge aluminum hat channel frame.

The **VD-1250** frame is a 5 inch x 1 inch x 12-gauge aluminum hat channel frame.

The **VD-1600** series damper uses a 5 inch wide 16-gauge welded hat channel frame with reinforced corners. Front, rear, or double-frame flanging is optional on all models.

## Axles

The **VD-1300** uses square-plated steel axles positively locked to the blades, eliminating slippage and eventual rounding of the axle due to extreme torques or stress. All other models use a hex-plated steel axle positively locked to the blades.

## Bearings

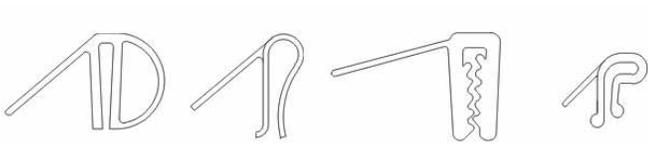
Molded synthetic bearings rotate within punched holes in the damper frame. The bearings have low friction, which reduces the torque required to turn the blades. Bronze or stainless steel bearings are optional, depending on the model.

## Linkage

Linkage concealed within the frame is engineered to control every blade without requiring adjustment or maintenance. Plated steel construction helps ensure a long, corrosion-free life.

## Seals

Flexible metal jamb seals (between the blade ends and the side frame) reduce leakage and help prevent dirt buildup by the concealed linkages. Blade seals are available in several types of material, depending on the model. Each model may have santoprene or silicone seals on the blades. Flexible stainless-steel seals are standard on all models.



## Blade Pin

The VD-1300 has standard 7 inch long square 1/2 inch plated steel. All other models are 7 inch long hex 1/2 inch plated steel. Optional lengths are available.



## Sizing

Each Johnson Controls® volume damper is manufactured to order. Frames are undercut by 1/4 inch, as is standard. Optionally, frames may be manufactured to the exact whole inch.

Damper size and rigid or breakaway duct-to-sleeve connections determine the thickness of sleeve required. There are no requirements for sleeves heavier than 14-gauge (1.9 mm), and with breakaway connections, the sleeve can be the same gauge as the connecting duct work.

Each damper model has a maximum size for single panels. This varies from 36 inches wide to 60 inches wide and from 70 inches high to 76 inches high. Multiple section dampers are made up of equal size sections.

Sections are shipped in different configurations as selected.

The **VD-1300** dampers are normally shipped loose with mounting hardware packaged. Standard assembly includes internal pin-to-pin couplers. Optional field-installed jackshaft or crossover linkage is available. When this option is selected, the dampers are shipped assembled up to three sections wide with the jackshaft.

**All other control dampers** are automatically shipped assembled up to three panels wide with a jackshaft. When this option is selected, the damper sections are shipped loose with the jackshaft assembly. Mounting holes are pre-drilled for easy field assembly.

# Damper Components and Construction

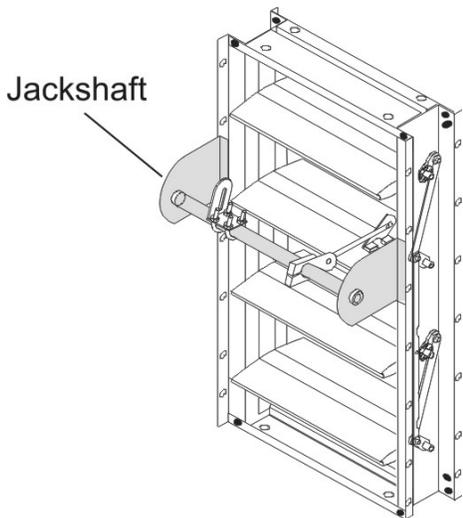
## Flanging

The standard hat channels have small flanges for attaching the dampers to ducts. Additional flanging is available to ease installation onto the face of buildings and air handlers. Options include air entering side, air leaving side, and both sides for between flanged ducts.



## Jackshafts

Jackshafts are used when the damper is mounted inside a wall and there is no axle access to mount an actuator and when multiple panels are required to complete an assembly.



## Pressure Drop (Loss)

To calculate the pressure drop across a given damper, select the AMCA test figure that most closely resembles how the damper appears in the system. Use the formula:

$\Delta p = C_o \cdot (V/4005)^2$  where  $\Delta p$  = pressure loss measured in inches wg,  $C_o$  = Pressure Loss coefficient (model specific), and  $V$  = face velocity in fpm.

Substitute the face velocity and the appropriate value of  $C_o$  for the damper model and the AMCA test figure. For example, calculate the pressure loss of a 24 x 24 model VD-1330 in the fully ducted configuration that sees a face velocity of 1,500 fpm. The  $C_o$  value obtained from the manufacturer is 0.65, thus substituting the values in the formula provided:

$$\Delta p = 0.65 \cdot (1,500/4005)^2 \quad \Delta p = 0.091 \text{ inch wg}$$

## Leakage Resistance Classes

Class	Static pressure (in Water)			
	1	4	8	12
I	4	8	11	14
II	10	20	28	35
III	40	80	112	140

Leakage testing is conducted in accordance with AMCA Standard 500D and is expressed as cfm/sq ft of damper face area. All data is corrected to represent standard air at a density of 0.075 lb/ft<sup>3</sup>.

# Life Safety Dampers

## Fire

A fire damper automatically interrupts airflow through part of an air system to restrict the passage of flame. There are two basic types of fire dampers: curtain (also called guillotine) and multi-blade. Typically, the basic curtain type without spring assist is static rated only. All curtain types with spring assist are dynamic rated and available for horizontal mounting. Multi-blade fire dampers are dynamic rated and have a tension spring that closes the dampers when a fuse link separates.

All fire dampers are held in the open position by a fuse link. This link separates at a specified temperature, releasing the blades to close, either by gravity or spring assist. If the temperature in the system climbs above 165°F (74°C), the fusible link melts, allowing the high torque spring to close and lock the damper blades. A 212°F (100°C) fusible link is optional.



Fire dampers are required to pass tests for vertical and horizontal mounting.

All fire dampers require sleeves for installation. The damper and sleeve are part of the wall. The duct work terminates at each end of the damper sleeve.

When selecting a fire damper, three basic decisions affect the final model selection: fire resistance rating, temperature, and operation range.

Resistance rating is based on the amount of time a damper will withstand the heat associated with a fire. One-and-one-half-hour fire dampers appropriately protect walls, partitions, and barriers with fire resistance ratings of less than three hours. Three-hour fire dampers are required if a barrier's fire resistance rating is three hours or more.

There are two major ratings available for fire dampers, static or dynamic closure and 1-½ or three-hour integrity. Static fire dampers can only be used in HVAC systems that shut down during a fire. Temperature relates to the point where a fuse link or other device will release the damper from open to closed position. Dynamic fire dampers are rated to close while the HVAC system remains running during a fire event. The dynamic rating carries both a pressure differential (inch wg.) and velocity (fpm) rating.

Operation refers to the type of system a damper has been tested for. Dynamic fire dampers can be applied in all HVAC systems.

All building codes require maintaining the fire resistance rating of walls, partitions, and floors when they are penetrated by air ducts or other ventilation openings. To minimize damage and protect occupants, building codes require designs that divide the building using fire rated materials. Any penetration of ducts would break the barrier and allow fire to move from one location to another. Installed in a fire-rated wall or floor, a fire damper closes automatically during a fire in order to maintain the integrity of the fire-rated separation.

Codes require fire dampers in most applications where the barrier being penetrated is required to have a fire resistance rating of two hours or more. Code requirements vary. Always follow the requirements of the applicable building code.

UL classifies fire dampers which are tested to UL Standard 555, "Fire Dampers." Each rated damper is supplied with the appropriate UL label.

## Smoke

A smoke damper is intended to:

- Restrict the spread of smoke in HVAC systems that are designed to be automatically shut down during a fire
- Control the movement of smoke within a building when the HVAC system is operational in engineered smoke control systems
- Be used as a two position control only

# Life Safety Dampers

## Smoke Continued

Smoke dampers have two general applications. They may be applied in a passive smoke control system, where they simply close and prevent the circulation of air and smoke through a duct or a ventilation opening in a smoke barrier. Or they may be applied as part of an engineered smoke control system, designed to control the spread of smoke using walls and floors as barriers and using the buildings HVAC system and/or dedicated fans to create pressure differences. Higher pressures surround the fire area and prevent the spread of smoke from the fire zone into other areas of the building. Smoke dampers are motorized with electric or pneumatic actuators. They may be controlled by a smoke or heat detector signal, a fire alarm, or in other ways by the building control system to accomplish the intent of the design.



Smoke dampers do not always require a sleeve for proper installation. External installation of the actuator can be provided using a sideplate (usually the full height of the damper). These dampers are installed in a slotted duct section with the sideplate covering the slot in the side of the duct. However, full-height sideplates may not be practical on large smoke damper (particularly multi-section assemblies).

Smoke dampers are required where a duct penetrates a smoke partition or barrier within a building and when any damper performs a function in an engineered smoke control system.

UL classified smoke dampers are tested to UL Standard 555S, "Smoke Dampers," and are always supplied with an appropriate UL label. It is necessary to determine which of the following ratings are required when applying a UL listed smoke damper.

- Leakage – Class I (lowest) or Class II (highest). The 2006 International Building Code (IBC), section 716.3.1, requires a minimum of leakage class II. Leakage class I is recommended to provide the safest level of protection.

- Elevated temperature – 250 or 350°F (121 or 177°C); 350°F (177°C) is most often selected for the highest level of safety.
- Velocity and Pressure – UL555S requires each smoke damper, with its installed actuator, to be rated for operation to open against a specific pressure differential (in wg) and to close against a specific velocity or airflow (fpm). Dampers should be selected to operate at the pressures and velocities they will see in their application, with a minimum of 4 inch wg (1 kPa) and 2000 fpm (10.2 m/s).

The SD-1320 and SD-1330 smoke dampers are UL/cUL leakage rated dampers listed under the latest UL 555S standard.

Electric and pneumatic actuators that have been UL tested and approved with the damper as a matched set are factory assembled.

SD-1620 smoke dampers meet UL Class II. Leakage is less than 20cfm/sq ft at 4 inch WC at 350°F (177°C).

SD-1630 smoke dampers meet UL Class I. Leakage is less than 8 cfm/sq ft at 4 inch WC at 350°F (177°C).

## Smoke and Control

A smoke and control damper is intended to:

- Restrict the spread of smoke in HVAC systems that are designed to be automatically shut down during a fire
- Control the movement of smoke within a building when the HVAC system is operational in engineered smoke control systems
- Be suitable for proportional temperature and pressure control applications

Sideplate external actuator mounting is available on smoke dampers.

The SD-1320 and SD-1330 smoke and control dampers are designed to restrict the flow of smoke in the duct work and operate as volume control dampers. These UL/cUL leakage rated dampers are listed under the UL-555S standard dated May 1995 and are California State Fire Marshall listed.

# Life Safety Dampers

SD-1600 series smoke and control dampers are also suitable for volume control. Pneumatic actuators that have been UL tested and approved for 100,000 cycles with the damper as a matched set are factory assembled.

## Fire and Smoke

A combination fire and smoke damper performs the functions of both a fire damper and a smoke damper. Building layouts and designs often combine fire and smoke rated partitions and barriers, requiring the installation of both a fire damper and a smoke damper at the same location. Combination fire and smoke dampers must be qualified under UL standard 555 as fire dampers and under UL Standard 555S as smoke dampers. The considerations listed above for these damper types apply to the selection and application of combination fire and smoke dampers.



Sideplate external actuator mounting is available on combination fire and smoke dampers.

When selecting a combination fire and smoke damper, four basic decisions affect the final model selection: fire resistance rating, leakage rating, temperature, and operational ratings.

The most practical way to supply combination fire and smoke dampers is with a factory-furnished sleeve with the actuator mounted externally.

All combination fire and smoke dampers require sleeves for installation.

FS-1600 combination fire and smoke dampers carry both the UL-555 1-½ hour fire rating and the UL-555S Class II leakage rating.

Fire and combination fire and smoke damper applications include walls, floors, or partitions required by the applicable building code to have fire resistance ratings of less than three hours. Select a fire damper or combination fire and smoke damper with a 1-½ hour rating for these applications.

If the wall, floor, or partition has a fire resistance rating of 3 hours or more, the damper must have a rating of 3 hours. If the barrier is not required in this application to have a fire resistance rating, then no fire rating is required of the damper, and a smoke damper may be selected.

UL Standard 555S identifies the three leakage classes given in the following table.

## Leakage Resistance Classes

Class	Static pressure (in Water)			
	1	4	8	12
I	4	8	11	14
II	10	20	28	35
III	40	80	112	140

Designers are generally advised to select the lowest leakage class. Although the 2006 edition of the *International Building Code* requires a minimum leakage class II, in some applications a lower leakage is better applied.

Actuators must be factory mounted on all smoke and fire and smoke dampers. Factory mounting options include external (on a damper sleeve or sideplate) or internal. Internal actuator mounting (where the actuator is mounted inside a duct) should be avoided whenever possible, as it increases the difficulty of actuator inspection, testing, and servicing.

All fire and smoke dampers require a sleeve for proper installation. In the most practical option, the damper is furnished by the factory with a sleeve and the actuator is installed on the outside of the sleeve. This is the standard and recommended actuator mounting option for combination fire and smoke dampers.

Most actuators can be mounted internally (in the air stream) to accommodate installations where space constraints prevent external installation. There are limitations on small sizes, and some dampers sizes with options that occupy much of the available internal space.

# Actuation

## Actuators

Actuators are furnished for dampers in several ways:

- Factory installed by the damper manufacturer and ready to operate
- Shipped loose by the damper manufacturer for field installation
- Supplied to the job site for field installation by a third party



Dampers are supplied with extended shafts shipped loose for field mounting. It is best to drive the dampers from the factory identified driving blade, but in some situations, the preferred blade is not available for driving and another blade is required.

Parallel operation is recommended as all blades are connected by a common linkage. Opposed operations have crossover linkages that can reduce the amount of torque transferred by the actuator to the blades if the incorrect blade is used.

Manual locking quadrants are used when the damper blade is in a fixed position or requires changing only occasionally.

Actuators are electric or pneumatic and can be either two position control or modulating control.

An actuator's damper size rating is dependent on the airflow velocity and pressure difference for the damper.

The use of pneumatic actuators has declined over the years as the cost of maintaining compressors and associated piping has increased and the cost of electric actuators has decreased. The primary use of pneumatic actuators is in retrofit jobs where all of the pneumatic lines are already present. Controls for pneumatic actuators are more widely available, which makes switching to electric actuators more expensive. Most pneumatic actuators are made of aluminum, which is conducive to outdoor applications without special enclosures required for electric actuators.

Electric actuators provide easier connectivity to digital controllers. Electric actuators must have the voltage source selected. Typical voltages for electric actuators are 24 VDC, 24 or 120 VAC in North America, and 208 or 240 VAC elsewhere.



Spring return actuators are also known as fail-safe actuators because they return the damper to an open or closed position that is safe for the environment where the damper is located.

## Damper Control

Typical damper controls include balancing, two-position, and modulating.

Balancing dampers generally do not have seals, as they are not used for tight closure. In a typical balancing application, the damper is held in position for seasonal applications by a manual locking quadrant. In an actuated balancing application, changes in pressure require regulation of the air movement, but not tight closure. In a two-position damper control, the damper may be either open or closed to prevent airflow.

Modulating signals position the damper via a device or controller within an HVAC system. Actuators must be compatible with the signal generated by the controller. Typical signals include:

- 0 – 10 VDC (typical)
- 4 – 20 mA
- 135 ohm (older systems)

Closed dampers are selected according to leakage, and open dampers are selected according to pressure loss.

Pressure loss depends on where and how the damper is installed within the HVAC system. AMCA Standard 500D defines several configurations used for testing damper pressure drop. Ratings are determined by testing in the fully ducted configuration (duct upstream and downstream). Static pressure and conversion velocities are corrected to 0.075 lb/cu ft air density.

# Frequently Asked Questions

## Where would I use Class I leakage rated dampers?

In applications requiring very tight closure, providing high resistance to undesired air entering the system.

## Where would I use Class II leakage rated dampers?

In applications where a tight closure is not required, but the application has a high pressure differential and flow rate.

## Where would I use Class III leakage rated dampers?

In applications where air penetration from one side of the damper is not critical to maintaining temperature in the downstream side.

## Where would I use stainless steel dampers?

In areas that require clean air applications, such as hospitals, kitchen areas, and clean rooms.

## Where would I use aluminum dampers?

In areas where chemicals or salt could pit steel dampers and speed up the deterioration of the metal. Aluminum dampers can be coated with air-dried epoxy or dry powder coating for additional protection in extreme conditions.

## Why would I use parallel blades?

Parallel blades provide a more linear inherent flow characteristic which allows for quick change of flows and static pressure. They are also used in face/bypass applications to direct the flow of air in a specific direction for mixing or stratification.

## Where would I use opposed blades?

Opposed blades provide a gradual curve for the inherent flow characteristic. This provides more controllability within the middle of the stroke which is where most systems operate.

## What is percent leakage?

Percent leakage is based on the difference between tested values and system performance. Percentage is based on test data to determine the actual leakage at a given static pressure. The anticipated system volume at full flow is then compared to the actual readings, providing a percent difference. In equation form:  $\% = \frac{\text{leakage @ static pressure}}{\text{volume @ full flow}} \times 100$   
leakage @ static pressure = total leakage - leakage @ tested static pressure  
Volume = cfm = area x velocity

## What is leakage resistance class?

Leakage resistance class is based on the standards set by UL for leakage rated dampers. Maximum leakage levels are set for different static pressures. Standardized test procedures are used on multiple sizes, and the leakage level is obtained. If any size tested exceeds the maximum level for a classification, the entire line is classified at the higher leakage.

## Is one rating better than the other?

Classifying a damper product line according to the leakage resistance helps assure that any size ordered for a job performs at the expected level. A maximum leakage resistance rating that covers all of the sizes within a product line reduces the calculations required and provides an anticipated leakage for each damper.

## Damper manufacturers rate their dampers using different sets of numbers. How can I make a healthy comparison of products?

The application determines how tight the sealing has to be. Very low or low leakage dampers are required for outdoor air applications and wherever tight shut off is desired. Indoor applications can utilize Class III or balancing type dampers. Major manufacturers have moved to using the Class rating system for damper leakage. Class I leakage is the highest rating for tight sealing. In the past, this would equate to units of 1/2 percent and very low claims. Class II is the next level. This would equate to one percent and low leakage claims. As the numbers go higher, the amount of leakage increases

## What about thermal ratings?

Prior to this release of AMCA 500D in 2012, there was no industry recognized method of testing a damper for thermal efficiency, and therefore no baseline to measure against. Some manufacturers did the best they could by providing a calculated R-value of the product assembly, but this method does not provide a complete picture. When calculating heat loss, it is important to consider damper leakage and conductance in the overall equation. When selecting product for the building penetration, the engineer should always give preference to manufacturers that use third-party test agencies to authenticate performance claims.

# Frequently Asked Questions

## How can I compare bearings?

Bearings made of synthetic material, such as nylon reinforced plastic, are used for standard applications below 200°F (93°C). Oilite bronze or stainless steel bearings are used for higher temperatures or applications where particulates could damage plastic bearings. Bearings support the weight of the blades and provide a rotational area for the blades to move on the axles. During testing and operation, the bearings have been proven to keep their shape and not crack or break under stress. We have life tested all of the bearings for over 100,000 cycles of operation. We have products which were installed over 25 years ago still operating on the original synthetic, bronze, and stainless steel bearings.

## How can I compare blade seals?

Blade seals are made of extruded silicone or high performance elastomers that combine the best attributes of vulcanized rubber. Manufacturers provide these items under different names to differentiate themselves. The seals should be mechanically locked to the blades to prevent velocity and temperature related failures. During operation, the moving air can get between the blade and clipped seals blowing the seals off of the blade. Blade seals which are fastened to the blades using adhesive may fall off because the adhesive will become brittle over time and loosen from the blade or seal.

## Can I replace a failed actuator in the field (Life Safety)?

UL allows for replacing like-for-like actuators on smoke and fire/smoke dampers. If the original actuator has been discontinued, check with the original damper manufacturer for the actuator that has been tested to replace the original.

## Can I move an actuator installed at the factory externally to internal (Life Safety)? Vice versa?

With the approval of local authorities and proper mounting kits from the damper manufacturer, actuators can be relocated in the field.

## Can I change from pneumatic to electric or vice versa in the field (Life Safety)?

No, that has to be done at the factory.

## Can I change actuators from one voltage to another (Life Safety)?

No, that has to be done at the factory.

## With all of the different agencies involved, how can I be sure I am specifying the correct product?

Here is a quick guide to the agencies controlling life safety in a building. Within each agency's guidelines, there is a reference to using UL listed products. This makes the UL listing the overriding guide for use of life safety dampers.

- UL provides the criteria to be met during testing, records the test results, and maintains the approved suppliers list.
- National Fire Protection Association (NFPA) provides guidelines for engineers designing a building to provide all of the safety damper locations.
- Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) provides the guidelines to properly install the dampers within a building.
- Air Movement and Control Association (AMCA) provides standards on how the tests for dampers are to be performed.

## Which product is better, static or dynamic rated?

Which type of rating safety dampers is determined by the type of fire system employed within each building. If in the event of fire or smoke, the building automation system shuts down all fans moving air throughout the building that is a static rated system and can use either static or dynamic rated products. A building which continues to have air moved during an event to enable a fire marshal the ability to control where smoke is evacuated to, based on occupancy, is a dynamic system.

## Which product requires no periodic maintenance?

UL validation requires a minimum of 20,000 full stroke cycles for two position operation and 100,000 full stroke cycles for modulating operation to start testing. Damper and actuator combinations have been through additional dithering, holding, and full stroke testing to verify that they will operate longer than minimal requirements. While periodic maintenance is not specified by manufacturers, all safety dampers require periodic testing per national or local codes.

# Warranty

Johnson Controls warrants dampers to be free from defects in material and workmanship for a period of three years from the purchase date. Johnson Controls will not be liable for damages resulting from misapplication or misuse of its products. Johnson Controls will not be responsible for any installation or removal costs or for any service work or backcharges without prior authorization.

## Note

All dampers are made to order and cannot be returned because of incorrectly ordered sizes.

# Shipping

Product Family	Model	Standard Lead Time	Fast Track
<b>Control Dampers</b>	BD-1300	3 Working Days	1 Working Day
	VD-1310	3 Working Days	1 Working Day
	VD-1320	3 Working Days	1 Working Day
	VD-1330	3 Working Days	1 Working Day
	ZD-1300	3 Working Days	1 Working Day
	VD-1240	15 Working Days	5 Working Days
	VD-1241	15 Working Days	5 Working Days
	VD-1250	15 Working Days	5 Working Days
	VD-1251	15 Working Days	5 Working Days
	VD-1252	15 Working Days	5 Working Days
	VD-1250S	15 Working Days	5 Working Days
	VD-1640	15 Working Days	5 Working Days
	VD-1630	15 Working Days	5 Working Days
	VD-1620	15 Working Days	5 Working Days
<b>Air Measuring</b>	AD-1250	20 Working Days	10 Working Days
	AD-1251	20 Working Days	10 Working Days
	AD-1252	15 Working Days	10 Working Days
	AD-1253	15 Working Days	10 Working Days
	AL-350	15 Working Days	10 Working Days
	AL-3	15 Working Days	10 Working Days
	AL-6	15 Working Days	10 Working Days
<b>Backdraft</b>	PD-1250	15 Working Days	10 Working Days
	CB-1250	15 Working Days	10 Working Days
	CB-1250	15 Working Days	10 Working Days
	CB-1250	15 Working Days	10 Working Days
<b>Life Safety</b>	FD-1600	20 Working Days	10 Working Days
	FC-2000	20 Working Days	10 Working Days
	SD-1630	20 Working Days	10 Working Days
	SD-1620	20 Working Days	10 Working Days
	SD-1250	20 Working Days	10 Working Days
	FS-1630	20 Working Days	10 Working Days
	FS-1620	20 Working Days	10 Working Days
<b>Industrial Dampers</b>	ID-1210	20 Working Days	N/A
	ID-1230	20 Working Days	N/A
	ID-1410	20 Working Days	N/A
	ID-1430	20 Working Days	N/A
<b>Louvers</b>	LV-1800	20 Working Days	15 Working Days
	LV-1250	20 Working Days	15 Working Days
	LS-1250	20 Working Days	15 Working Days
	LT-1250	20 Working Days	15 Working Days
	LV-1251	20 Working Days	15 Working Days
	LH-1250	20 Working Days	15 Working Days
	LM-1250	20 Working Days	15 Working Days
	LC-1250	20 Working Days	15 Working Days



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Note: Page numbers in *italics* denote pages where the product code number appears, but not as the main part.





# AD-1250 Airflow Measuring Station

## Description

The AD-1250 Airflow Measuring Stations are accurate, economical solutions for measuring, reporting, and controlling airflow from 300 to 5,000 Feet Per Minute (FPM) (91 to 1,524 Meters per Minute [MPM]) within  $\pm 5\%$  accuracy.

The factory-assembled AD-1250 Airflow Measuring Station incorporates the following items in one 15 inch (38 mm) deep assembly:

- an ultra-low-leak, high-performance, aluminum airfoil blade/aluminum frame control damper
- an aluminum air straightener
- multiple AD-1251 Airflow Sensing Probes
- a DMPR-RA001 Differential Pressure Transducer (DPT)
- galvanized steel sleeve
- M9220-GGC-3 Electric Spring Return Actuators (optional)

Refer to the *M9220-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011057)* for necessary information on operating and performance specifications for the actuator.

## Features

- Air Movement and Control Association International, Inc. (AMCA) Class IA Damper
- Flanged or Slip Fit Mounting Available
- Vertical Anodized Aluminum Sensing Blades
- Factory-Piped DPT with Display
- Factory-Installed Actuator

## Repair Information

If the AD-1250 Airflow Measuring Station fails to operate within its specifications, replace the unit. For a replacement AD-1250 Airflow Measuring Station, contact the nearest Johnson Controls® representative.

All AD-1250 Airflow Measuring Stations are built to order and cannot be returned due to ordering errors. Airflow measuring stations are backed by a 1-year warranty, which covers defects in materials or workmanship. Refer to terms and conditions of sale for specifics.



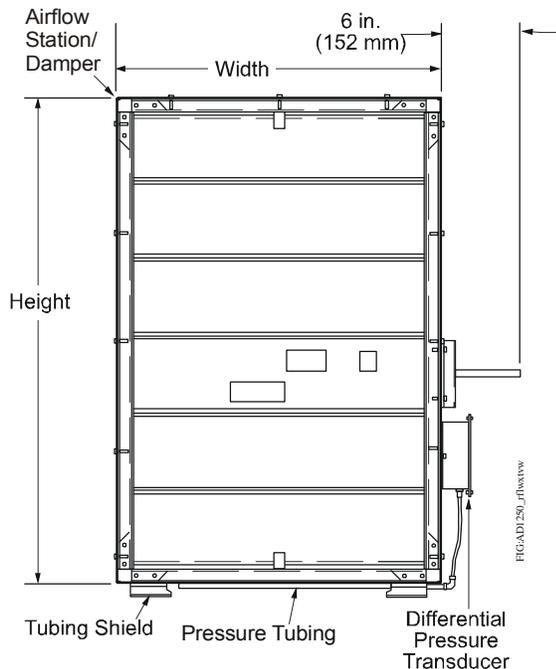
AD-1250 Airflow Measuring Station

## Selection Charts

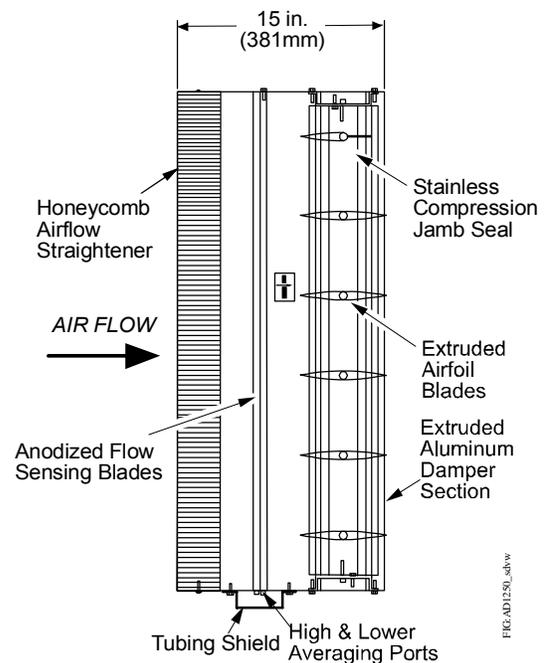
### Dimensions of Single and Multiple Panel Versions

Size Limits	Width x Height, in. (mm)
Minimum Single Panel	10 x 10 (254 x 254)
Maximum Single Panel	18 sq. ft (1.672 sq. m)
Maximum Multiple Panel with Air Straightener	640 x 300 (16,256 x 7,620)

Note: Actual size is 1/4 in. (6 mm) less than nominal.



AD-1250 Airflow Measuring Station (Airflow Exit View)



AD-1250 Airflow Measuring Station (Airflow Side View)

### AD-1250 Airflow Measuring Station (Continued)

Use the following steps to select the appropriate product:

1. Determine required size from drawings.
2. Select the part number required.
3. Enter width and height of duct.

www = width of duct (in inches)

hhh = height of duct (in inches)

**Note:** Actual probe size is 1/4 inch less than nominal.

4. Enter options required.

E = Exact whole inch size, no undercut

H = Double flange

**Example:** APESN-020x020 is an airflow measuring system with dimensions of 20 inches wide x 20 inches high, and enclosed in a 15-inch long sleeve without flanges for a slip fit.

#### Valid Part Numbers

Code Number	Description
APESN-wwwxhhh	AD-1250 Airflow Measuring Station (No Actuator)
APESW-wwwxhhh	AD-1250 Airflow Measuring Station with Optional M9208 or M9220 Modulating Actuator(s) <sup>1</sup>

1. The number of factory-mounted actuators is based on published torque rating of 7 lb-in/sq ft at 1-inch static pressure. Refer to the *M9220-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011057)* and *M9208-xxx-x Electric Spring Return Actuators Product Bulletin (LIT-12011480)* for specifications.

### Technical Specifications

AD-1250 Airflow Measuring Station <sup>1</sup>					
<b>Leakage Resistance - Fully Closed</b>	4 CFM/sq ft maximum at 2.5 in. static pressure				
<b>Operating Torque</b>	1 in. static pressure and 1,000 FPM (305 MPM) fully open approach velocity 7 lb-in/sq. ft				
<b>Pressure Drop (inches WG) - Fully Open</b>		1,000 FPM (305 MPM)	2,000 FPM (610 MPM)	3,000 FPM (914 MPM)	4,000 FPM (1,219 MPM)
	24 x 24 in. (609 x 609 mm) 36 x 36 in. (914 x 914 mm)	0.039 0.04	0.11 0.11	0.26 0.22	0.49 0.37
<b>Velocity Requirements</b>	Minimum 300 FPM (91 MPM) Maximum 5,000 FPM (1,524 MPM)				
<b>Temperature Rating</b>	Standard Operating Conditions: -22 to 140°F (-30 to 60°C) Actuator: -4 to 122°F (-20 to 50°C)				
<b>Approximate Weight</b>	Damper: 8 lb/sq. ft (3.69 kg/sq. ft) Actuator: 2.9 lb (1.32 kg) per actuator Sensor: 1 lb (0.45 kg)				

1. Measuring stations are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Airflow Station Performance.

# AD-1251 Probe with Differential Pressure Transducer

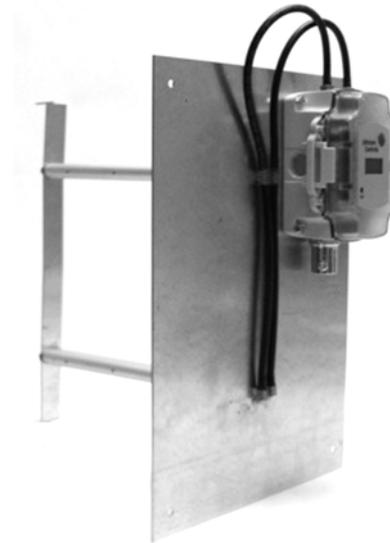
## Description

The AD-1251 Probe with Differential Pressure Transducer (DPT) is designed to provide accurate and economical flow monitoring at all times. The probe is a differential pressure air measuring device that is designed to measure flow in duct applications. The device is intended for retrofit projects. You may install the AD-1251 in a straight duct or one duct diameter upstream from an unvaned elbow, or five duct diameters downstream from an unvaned elbow. The probes are tested per Air Movement and Control Association (AMCA) 610.93 setup.

This probe measures and reports differential pressure, effectively monitoring airflow from 400 to 5,000 Feet Per Minute (fpm) (122 to 1,524 Meters per Minute [mpm]) within ±5% accuracy. When used with the Pressure Across Measuring System (PAMS) chart accompanying the probe (or in the product literature), precise airflow is easy to determine.

The probe can be used in either a horizontal or vertical application. When ordered with an air straightener, the probe is automatically positioned in a vertical application. The 9 inch (229 mm) deep probe with air straightener allows for installation in tight space requirements where dampers are already installed, or where dampers are also required.

Refer to the *AD-1251 Probe with Differential Pressure Transducer Product Bulletin (LIT-12011473)* for important product information.



AD-1251 Probe with Differential Pressure Transducer

## Features

- Slip Fit Mounting
- Horizontal or Vertical Anodized Aluminum Sensing Probes
- Factory-Piped DPT with Display

## Repair Information

If the AD-1251 Probe with Differential Pressure Transducer fails to operate within its specifications, replace the unit. For a replacement AD-1251 Probe with Differential Pressure Transducer, contact the nearest Johnson Controls® representative.

All Johnson Controls AD-1251 Probes with Differential Pressure Transducers are built to order and cannot be returned due to ordering errors. All AD-1251 Probes with Differential Pressure Transducers are backed by a 3-year warranty, which covers defects in materials or workmanship. Refer to terms and conditions of sale for specifics.

## Selection Charts.

### Dimensions

Single and Multiple Panel Dimensions <sup>1</sup>	Width x Height, in. (mm)
Minimum Single Probe	6 x 6 (152 x 152)
Maximum Three Probes	60 x 42 (1,524 x 1,069)
Maximum (with Air Straightener)	Unlimited

1. Actual size is 1/4 inch less than nominal

Use the following to select the product:

1. Determine required size from drawings.
  2. Select the part number required.
  3. Enter width and height of duct.
- www = width of duct (in inches)

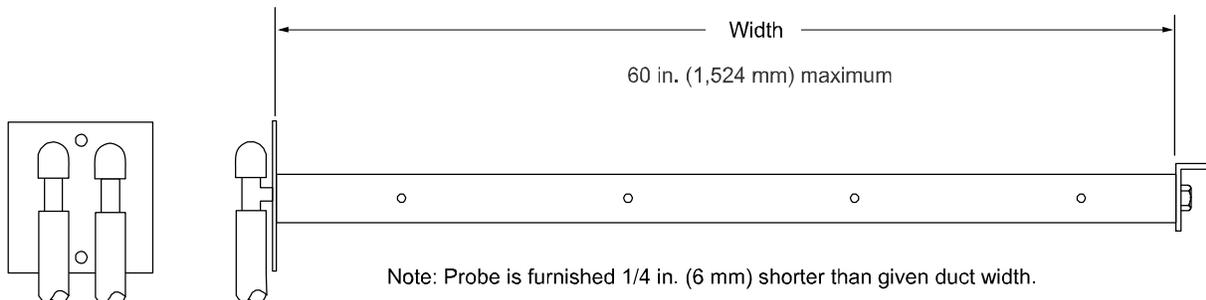
hhh = height of duct (in inches)

**Note:** Actual probe size is 1/4 inch (6 mm) less than nominal.

Example: ASENN-020x020W is an airflow measuring probe comprised of an aluminum air straightener, flow pickup station and DPT. Its dimensions are 20 inches (51 mm) wide x 20 inches (51 mm) high, and enclosed in a 9 inch (229 mm) long sleeve without flanges for a slip fit.

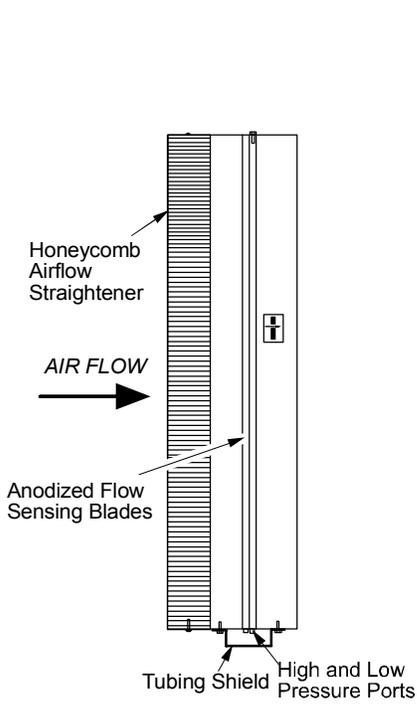
### Ordering Information

Code Number	Description
ASENN-wwwxhhh	Airflow Measuring Probe with DMPR-RA001 Transducer
ASENN-wwwxhhh	Airflow Measuring Probe with DMPR-RA001 Transducer and Air Straightener

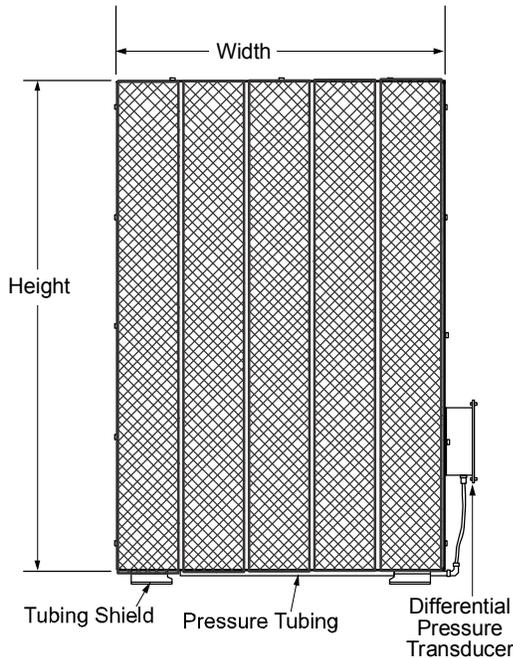


AD-1251 Probe Details

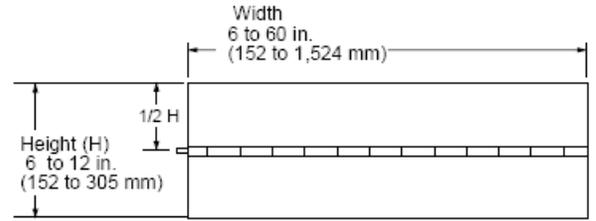
**AD-1251 Probe with Differential Pressure Transducer (Continued)**



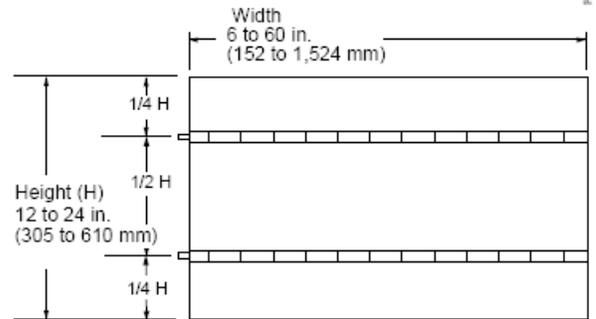
**AD-1251 Probe with Air Straightener, Side View**



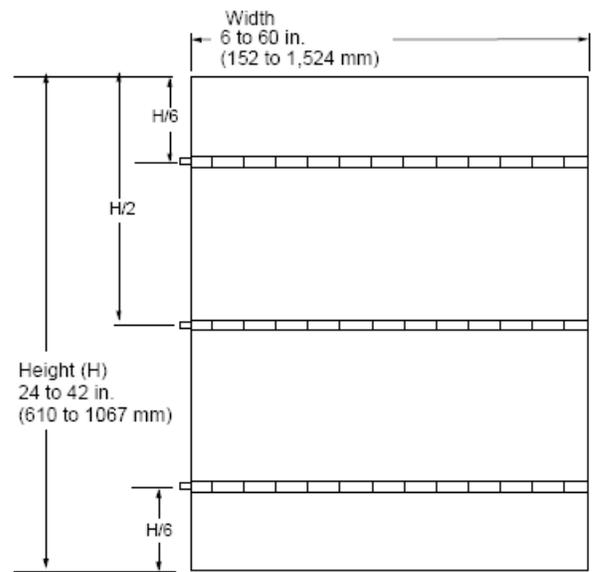
**AD-1251 Probe with Air Straightener, Front View**



**One Probe Application**



**Two Probe Application**



**Three Probe Application**

**One, Two, and Three Probe Applications**

**AD-1251 Probe with Differential Pressure Transducer (Continued)**

**Technical Specifications**

AD-1251 Probe with Differential Pressure Transducer <sup>1</sup>		
<b>Velocity Requirements</b>	Airflow Measuring Probe with DMPR-RA001 Transducer	Minimum 400 fpm (122 mpm) Maximum 5,000 fpm (1,524 mpm)
	Airflow Measuring Probe with DMPR-RA001 Transducer and Air Straightener	Minimum 300 fpm (91.44 mpm) Maximum 5,000 fpm (1,524 mpm)
<b>Temperature Rating</b>	Standard Operating Conditions: -22 to 140°F (-30 to 60°C) Actuator: -4 to 122°F (-20 to 50°C)	
<b>Approximate Weight</b>	Sensor with DPT and Side Plate: 8 lb (3.6 kg) for 60 in. (1,524 mm) long probe Sensor only: 1 lb (0.45 kg)	

1. Measuring stations are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Airflow Station Performance.

# AD-1252 Thermal Dispersion Probe Airflow Measuring System

## Description

AD-1252 Thermal Dispersion Probe Airflow Measuring System averages velocity and temperature from up to four probes and sixteen sensing points in a duct or plenum, providing accurate, dependable airflow measurement from 40 to 4,000 Feet Per Minute (FPM) (12 to 1,219 Meters Per Minute [MPM]) within  $\pm 2\%$  accuracy.

At each sensing point, a microprocessor calculates flow and temperature, sending this information to an Integral Multiplexing Unit (IMU). The IMU collects data from each sensor circuit and sends a digital output to the control transmitter. The control transmitter provides air temperature and velocity information on a Liquid Crystal Display (LCD) screen and to a Building Automation System (BAS) through analog outputs (2 to 10 VDC or 4 to 20 mA).

The factory-assembled AD-1252 Thermal Dispersion Probe Airflow Measuring System incorporates up to four thermal dispersion probes, a shielded CAT5e communications cable, and a DMPR-RA002 Electronic Controller.

Refer to the *AD-1252 Thermal Dispersion Probe Airflow Measuring System Product Bulletin (LIT-12011535)* for important product information.

## Features

- Airfoil-Shaped Aluminum Probes
- Digital Controller Display
- CAT5e Cable with RJ-45 Connectors
- Multiple Microprocessor-Based Circuits
- LCD Screen
- 4 to 20 mA or 2 to 10 VDC Analog Outputs
- Wind Gust Filter

## Repair Information

If the AD-1252 Thermal Dispersion Probe Airflow Measuring System fails to operate within its specifications, replace the unit. For a replacement AD-1252 System, contact the nearest Johnson Controls® representative.

All Johnson Controls AD-1252 Thermal Dispersion Probe Airflow Measuring Systems are built to order, just in time, and cannot be returned due to customer ordering errors. All AD-1252 System products are backed by a 3-year warranty, which covers defects in materials or workmanship.



AD-1252 Thermal Dispersion Probe Airflow Measuring System

## Selection Charts

Use the following to select the product.

1. Determine the required number of probes according to the duct size from system drawings.
2. Select the product code number required.

### AD-1252 Product Code Numbers

Code Number	Description
ASTNN-wwwxhhh	Thermal Dispersion Airflow Measuring System
ARTNN-wwwxhhh	Replacement Probes only - use if the original order size is changed or incorrect

3. Enter width and height of duct, where:  
 www = width of duct (width of probe)  
 hhh = height of duct (height of probe)

**Note:** Actual probe size is 1/4 in. (6 mm) less than nominal.

4. Enter options required (maximum 2).

### Factory Options

Letter	Option
C	Clear/Anodized Finish
I	Aluminum Internal Duct Mounting Brackets
J	SS Internal Duct Mounting Brackets
M	Aluminum Damper Stand-off Mounting Bracket
N	NEMA 4 Electronic Controller Enclosure
O	Shielded CAT5e communications cable, 25 ft (7.6 m)
P	Shielded CAT5e communications cable, 30 ft (9.1 m)
Q	Shielded CAT5e communications cable, 40 ft (12.2 m)
R	Shielded CAT5e communications cable, 50 ft (15.2 m)
S	SS Damper Stand-off Mounting Bracket
V	Round or Oval Duct (provides additional closed cell foam material to form a seal around the duct)

## Accessories

Code Number	Description
DMPR-KA001	Aluminum Damper Stand-off Mounting Brackets (2)
DMPR-KA002	SS Damper Stand-off Mounting Brackets (2)
DMPR-RA021	Shielded CAT5e communications cable, 10 ft (1.5 m)
DMPR-RA022	Shielded CAT5e communications cable, 20 ft (3.1 m)
DMPR-RA023	Shielded CAT5e communications cable, 30 ft (9.1 m)
DMPR-RA024	Shielded CAT5e communications cable, 40 ft (12.2 m)
DMPR-RA025	Shielded CAT5e communications cable, 50 ft (15.2 m)
DMPR-RA026	Shielded CAT5e communications cable, 15 ft (4.6 m)
DMPR-RA027	Shielded CAT5e communications cable, 25 ft (7.6 m)

## Repair Parts

Code Number	Description
DMPR-RA00-www	Single Replacement Probe Under Warranty
DMPR-RA002	AD-1252 Replacement Controller (Not for use on a RA-1250 product)

## Round Duct Applications - Number of Probes/Sensors per Probe<sup>1</sup>

Duct Diameter, in.	No. of Probes/No. of Sensors per Probe
12	1/2
18	2/2
24	2/2
36	2/4
42	2/4
48	3/4
60	4/4
72	4/4
96	3/4
120	4/4

1. The minimum diameter size is 8 inches. Round duct applications smaller than 12 inches use the same number of probes and sensors as the 12 inch size.

## AD-1252 Thermal Dispersion Probe Airflow Measuring System (Continued)

### Rectangular Duct Applications - Number of Probes/Sensors per Probe<sup>1</sup>

Duct Height, In.	Duct Width, in.									
	12	18	24	36	42	48	60	72	96	120
12	1/2	2/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
16	2/2	2/2	2/2	2/3	2/3	2/3	2/3	2/4	2/4	2/4
24	2/2	2/2	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/4
36	2/2	3/2	3/2	2/4	2/4	2/4	2/4	2/4	2/4	2/4
42	2/2	3/2	3/2	4/2	3/4	3/4	4/4	4/4	4/4	4/4
48	3/2	3/2	4/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4
60	3/2	3/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4
72	3/2	4/2	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
96	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
120	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4

1. 8 x 8 inches is the minimum size for rectangular duct applications. Sizes less than 12 x 12 inches use the same number of probes and sensors as the 12 x 12 inches.

Selection Example 1: ASTNN-020x020 is a thermal dispersion probe airflow measuring system with two standard (insertion-mounted) probes, shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.

Selection Example 2: ASTNN-020x020V is a thermal dispersion probe airflow measuring system with additional closed cell foam material to form a seal around the duct, two probes fitted with shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.

Selection Example 3: ASTNN-020x020I is a thermal dispersion probe airflow measuring system with two probes fitted with mounting hardware for inside-duct mounting, shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.

Selection Example 4: ASTNN-020x020N is a thermal dispersion probe airflow measuring system with two standard (insertion-mounted) probes with NEMA 4 enclosures on the multiplexer ends, shielded CAT5e communications cable (10 foot length), and one DMPR-RA002 controller.

### Technical Specifications

AD-1252 Thermal Dispersion Probe Airflow Measuring System	
Probe	Airfoil shaped 2 x 3/4 in. 6063T5 aluminum
Thermistor	Bead-in-glass type
Size Range	8 x 8 to 120 x 120 in.
Standard Insertion Brackets	0.080 in. (2.0 mm) aluminum on multiplexer side and 22 gauge galvanized steel on non-multiplexer side
Installed Airflow Accuracy	±2% of reading
Repeatability	±0.25%
Measurement Units	Inch-Pound (I.P.) or International System (S.I.)
Sensor Distribution	Equal Area
Calibrated Range	40 to 4,000 FPM (12 to 1,219 MPM)
Temperature Sensor Accuracy	±0.10° F
Sensor Temperature Range	-25 to 140°F (-32 to 60°C)
Humidity Range	0 to 99% RH, noncondensing
Maximum Number Sensors	16
Power Requirement	Dedicated 24 VAC transformer of appropriate VA rating is required.
Power Consumption	4 probes with 4 sensors: 65 VA; 3 probes with 4 sensors: 48 VA; 2 probes with 4 sensors: 35 VA; 1 probe with 4 sensors: 17 VA
Transmitter Chassis	0.080 Aluminum
Output Signals	4 to 20 mA standard, 2 to 10 VDC requires 499 ohm resistor across output terminals.
Output Signal Adjustments	Field adjustable offset/gain
Display	16 x 2 character LCD (airflow, temperature and diagnostics)
Velocity Requirements	Minimum 40 FPM (12 MPM) Maximum 4,000 FPM (1,219 MPM)
Pressure Drop	Four 48 in. (122 cm) long probes in 48 x 48 in. (122 x 122 cm) duct: 0.1 in. w.g.
Approximate Weight	Controller: 2.9 lb (1.32 kg) Sensor: 1 lb (0.45 kg)

Measuring stations are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Air flow Station Performance.

# DMPR-RA001 Differential Pressure Transducer

## Description

The DMPR-RA001 Differential Pressure Transducer is an accurate and economical solution for measuring and reporting differential pressure when used in conjunction with the AD-1250 Air Measuring Station or AD-1251 Probe with Differential Pressure Transducer.

The heart of the unit is a micro-machined single-crystal silicon piezoresistive pressure sensor. The sensor receives a five-point error correction over the compensated temperature range for excellent accuracy, repeatability, and stability. The unit comes standard in an IP66-rated enclosure with short circuit resistant outputs and reverse polarity resistant inputs to perform under real-world conditions.

The unit installs quickly by connecting standard 1/8 inch Inside Diameter (I.D.) tubing to the two pressure ports. The various output ranges and pressure ranges are all field-selectable with Dual Inline Package (DIP) switches, and the auto-zeroing process is microprocessor-controlled for simplicity.

Refer to the *DMPR-RA001 Differential Pressure Transducer Product Bulletin (LIT-12011536)* for important product information.

## Features

- 4.5 character Liquid Crystal Display (LCD) screen
- Field-selectable ranges
- Field-selectable outputs

## Applications

Furnish and install, at locations shown on plans or as in accordance with schedules, an air measuring station pressure transducer, with integral LCD screen indicating actual differential pressure.

The transducer shall be housed in a polycarbonate enclosure that bears an IP66 rating.

The enclosure shall have a hinged cover for access to all DIP switches for field adjustment.

DIP switches allow for field selection of 0 to 5 VDC, 0 to 10 VDC or 4 to 20 mA output signal.

Additionally, DIP switch settings shall accommodate field selection of a minimum of five pressure ranges from 0–2.5 inches Water Column (W.C.).

The transducer shall have an auto-zero function that is microprocessor controlled.

The transducer assembly shall contain a micro-machined, single-crystal silicon, piezoresistive pressure sensor with strain gauges to change resistance as a function of applied pressure.

Sensor shall be paired with an application-specific integrated circuit to digitally compensate for thermal sensitivity.

Accuracy of the transducer shall be  $\pm 0.5\%$  on the 0 to 0.1 and 0 to 0.25 inches Water Column (W.C.) pressure ranges. Accuracy of the transducer shall be  $\pm 0.25\%$  on all other ranges (0 to 0.5 inches W.C., 0 to 1.0 inches W.C., and 0 to 2.5 inches W.C.). Stability shall be  $\pm 2\%$  (of span selected) per year.



**DMPR-RA001 Differential Pressure Transducer**

## Repair Information

If the DMPR-RA001 Differential Pressure Transducer fails to operate within its specifications, replace the unit. For a replacement transducer, contact the nearest Johnson Controls® representative.

## Technical Specifications

DMPR-RA001 Differential Pressure Transducer	
<b>Housing</b>	Hinged, 4 x 5 x 2-1/2 in. IP-66 rated
<b>Pressure Port Fittings</b>	Barbed brass, accepts 1/8 in. or 5/32 in. I.D. tubing
<b>Sensor</b>	Micro-machined, single-crystal silicon, piezoresistive
<b>LCD Screen</b>	4.5 character, displays actual differential pressure
<b>Field-Selectable Output Ranges</b>	4 to 20 mA, 0 to 5 VDC, or 0 to 10 VDC
<b>Power Requirements</b>	7 to 45 VDC (4 to 20 mA output) 7 to 45 VDC or 7 to 32 VAC (0 to 5 VDC output) 13 to 45 VDC or 13 to 32 VAC (0 to 10 VDC output)
<b>Power Consumption</b>	4.9 mA maximum DC at 0 to 5 VDC or 0 to 10 VDC output 0.12 VA maximum AC at 0 to 5 VDC or 0 to 10 VDC output 20 mA maximum, DC only at 4 to 20 mA output
<b>Field-Selectable Ranges, in. W.C.</b>	Unidirectional: 0 to 0.1, 0 to 0.25, 0 to 0.50, 0 to 1.0, 0 to 2.5
<b>Bi-Directional</b>	Special order only
<b>Accuracy</b>	$\pm 0.5\%$ on 0 to 0.1 and 0 to 0.25 in. W.C. range $\pm 0.25\%$ on all other ranges
<b>Auto-Zero Function</b>	Microprocessor-controlled
<b>Temperature Limits</b>	Storage: -40 to 203°F (-40 to 95°C) Operational: 32 to 140°F (-0 to 60°C) Compensated: 50 to 104°F (10 to 40°C)
<b>Temperature Error</b>	$\pm 2\%$ of Span max ( $\pm 1.0$ in W.C. at 50 to 104°F)
<b>Operating RH Range</b>	0 to 95% RH, noncondensing
<b>Overpressure</b>	Proof 27.68 in W.C. (1 PSI), Burst 41.52 in W.C. (1.5 PSI)
<b>Wiring</b>	4 to 20 mA two wire (Current loop) or three wire (AC or DC powered, voltage out)

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

# AD-1253 Aluminum Electronic Airflow Measuring System

## Description

The AD-1253 Electronic Airflow Measuring System provides aluminum blade damper and thermal dispersion probes in one package. Thermal dispersion probes average velocity and temperature from up to four probes and sixteen sensing points in a duct or plenum, providing accurate, dependable airflow measurement from 4 to 4,000 fpm (12 to 1,219 mpm) tested within ±2% accuracy.

At each sensing point, a microprocessor calculates velocity and temperature, sending this information to an Integral Multiplexing Unit (IMU). The IMU collects data from each sensor circuit and sends a digital output to the control transmitter. The control transmitter provides air temperature and velocity information on a Liquid Crystal Display (LCD) screen and to a Building Automation System (BAS) through two isolated analog outputs. Outputs are 4 to 20 mA and can be easily converted to 1 to 5 VDC or 2 to 10 VDC by adding the appropriately sized resistor, 250 ohm or 500 ohm respectively.

The factory-assembled AD-1253 Aluminum Electronic Airflow Measuring System incorporates up to four thermal dispersion probes, a CAT5e shielded communications cable, and a DMPR-RA002 Electronic Controller.

Refer to the *AD-1253 Aluminum Electronic Airflow Measuring System Product Bulletin (LIT-12011718)* for important product information.

## Features

- Air Movement and Control Association International, Inc. (AMCA) Class 1A Damper
- Available Flanged or Slip Fit
- Aluminum Airfoil Probes
- LCD Display
- Factory-Installed Actuator

## Repair Information

If the AD-1253 Thermal Dispersion Probe Airflow Measuring System fails to operate within its specifications, replace the unit. For a replacement AD-1253 Thermal Dispersion Probe Airflow Measuring System, contact the nearest Johnson Controls® representative.



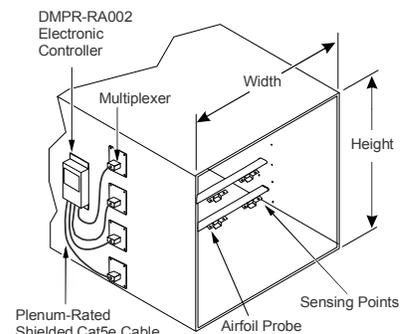
Complete Assembly

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

## Dimensions

Size Limits	Width x Height, in. (mm)
Minimum Single Panel	12 x 12 (305 x 305)
Maximum Single Panel	48 x 72 (1,219 x 1,829)
Maximum Multiple Panel (with Air Straightener)	120 x 72 (3,048 x 1,829)

Note: Actual size is 1/4 in. (6 mm) less than nominal.



Assembly Components (Front View)

## Rectangular Duct Applications – Number of Probes/Sensors per Probe<sup>1</sup>

Duct Height, in. (mm)	Duct Width, in. (mm)									
	12 (305)	18 (457)	24 (609)	36 (914)	42 (1,067)	48 (1,219)	60 (1,524)	72 (1,829)	96 (2,438)	120 (3,048)
12 (305)	1/2	2/2	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
16 (406)	2/2	2/2	2/2	2/3	2/3	2/3	2/3	2/4	2/4	2/4
24 (609)	2/2	2/2	2/3	2/3	2/3	2/4	2/4	2/4	2/4	2/4
36 (914)	2/2	3/2	3/2	2/4	2/4	2/4	2/4	2/4	2/4	2/4
42 (1,067)	2/2	3/2	3/2	4/2	3/4	3/4	4/4	4/4	4/4	4/4
48 (1,219)	3/2	3/2	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4
60 (1,524)	3/2	3/2	4/3	4/3	4/4	4/4	4/4	4/4	4/4	4/4
72 (1,829)	3/2	4/2	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
96 (2,438)	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
120 (3,048)	4/2	4/3	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4

1.8 x 8 in. (203 x 203 mm) is the minimum size for rectangular duct applications. Sizes less than 12 x 12 in. (305 x 305 mm) use the same number of probes.

## AD-1253 Aluminum Electronic Airflow Measuring System (Continued)

### Factory Options

Letter	Description
E	Exact whole inch size, no undercut
F	1.5 in.(38 mm) long flange air entering side (cannot use with option G or H)
G	1.5 in.(38 mm) long flange air leaving side (cannot use with option F or H)
H	Offset flange (cannot use with option F or G)
I	Indicator Switch (DMPR-KC014)
Q	Internal Mount Actuator

### Replacement Parts

Code Number	Description
DMPR-RA002	Controller
DMPR-RA021	10 ft (3 m) shielded CAT5e cable
DMPR-RA022	20 ft (6.1 m) shielded CAT5e cable
DMPR-RA023	30 ft (9.1 m) shielded CAT5e cable
DMPR-RA024	40 ft (12.2 m) shielded CAT5e cable
DMPR-RA025	50 ft (15.2 m) shielded CAT5e cable

### Technical Specifications<sup>1</sup>

AD-1253 Aluminum Electronic Airflow Measuring System	
Leakage Resistance - Fully Closed	4 cfm/sq. ft maximum at 1 in. static pressure
Operating Torque	1 in. static pressure and 1,000 fpm fully open approach velocity
Pressure Drop (inches WG) - Fully Open	7 lb-in/sq. ft at 2.5 in. WG
Velocity Requirements	Minimum 40 fpm (12 mpm) Maximum 4,000 fpm (1,219 mpm)
Thermal Dispersion Probe	Refer to <i>AD-1252 Thermal Dispersion Probe Airflow Measuring System Product Bulletin (LIT-12011535)</i>
Damper	Refer to <i>VD-1250 Volume Control Dampers Product Bulletin (LIT-1201740)</i>
Temperature Rating	Standard Operating Conditions: -22 to 140°F (-30 to 60°C) Actuator: -4 to 122°F (-20 to 50°C)
Approximate Weight	Damper: 8 lb/sq. ft (3.69 kg/sq. m) Actuator: 2.9 lb (1.32 kg) Sensor: 1 lb (0.45 kg)

1. Measuring stations are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Airflow Station Performance

Refer to the *M9220-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011057)* for necessary information on operating and performance specifications for the actuator.

Refer to the *M9203-xxx-2(Z) Series Electric Spring Return Actuators Product Bulletin (LIT-12011674)* for necessary information on operating and performance specifications for the actuator.

Refer to the *M9208-xxx-x Series Electric Spring Return Actuators Product Bulletin (LIT-12011480)* for necessary information on operating and performance specifications for the actuator.

Refer to the *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.

# RA-2000 Airflow Measuring System

## Description

Since 1905, Johnson Controls has provided the highest quality control dampers and controls that fit your application and size requirements.

Johnson Controls presents the RA-2000 Airflow Measuring System with a one-piece ABS plastic flow sensing cross with a 16 inch (406 mm) diameter or less, and a two-piece anodized aluminum extrusion sensing tube with an 18 inch (457 mm) diameter and larger.

Refer to the *RA-2000 Airflow Measuring System Product Bulletin (LIT-1201677)* for important product information.

## Features

- Formed Shroud — inserts easily into round ductwork
- One-Piece Construction — increases rigidity and strength
- Optional Factory-Installed Actuator — reduces installation and commissioning time
- Airfoil Shaped Flow Sensing Blades 18 inch (457 mm) Diameter and Larger or ABS Plastic Flow Cross on All Other Units — limit pressure drop through the damper

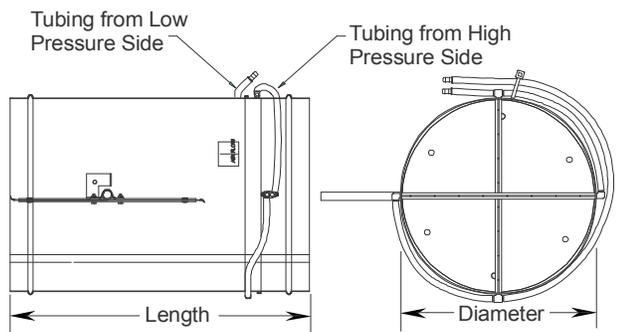


RA-2000 Airflow Measuring System

## Selection Charts

Use the following to select the appropriate product:

1. Determine the required size from the customer's drawing(s).
2. Select the damper size for your application using the damper dimensions.



Damper Dimensions

### Damper Dimensions<sup>1</sup>

Diameter, in. (mm)	Length, in. (mm)
06 to 10 (152 to 254)	17 (432)
12 to 20 (305 to 508)	27 (686)
Over 20 (508)	31 (787)

1. Actual size is 1/8 inch (3 mm) less than nominal opening diameter.

3. Select the required part number.

### Available Models

Code Number	Description
RAGddx	RA-2000 Airflow Measuring System

4. Enter the diameter of the damper.

dd = diameter (in inches), where  
 06 to 10 inches (1 inch increments)  
 10 to 24 inches (2 inch increments)

**Note:** Actual probe size is 1/8-inch (3 mm) less than nominal.

5. Enter the required options.

x = option required, where

N = No Actuator, includes DMPR-RA001 DPT

W = With M9208-GGA-3 Actuator, up to 12 inches (305 mm) in diameter, and M9220-GGA-1 Actuator, 14 inches (356 mm) in diameter and larger.

**Note:** Option N includes a mounting bracket for a field-installed actuator.

Example: RAG09WNNC is a round airflow measuring system with a galvanized air damper that has integral seals, stainless steel bearings, cross flow sensors, factory installed modulating spring return actuator, no control signal (Field 7), and Normally Closed (N.C.) operation (Fields 8 and 9). The system dimensions are 9 inches (228 mm) in diameter by 17 inches (432 mm) in length.

## Repair Information

If the RA-2000 Airflow Measuring System fails to operate within its specifications, replace the unit. For a replacement RA-2000 Airflow Measuring System, contact the nearest Johnson Controls® representative.

All RA-2000 Airflow Measuring Systems are built to order and cannot be returned due to ordering errors. All airflow measuring stations are backed by a 3-year warranty, which covers defects in materials or workmanship. Refer to the terms and conditions of sale for specifics.

**RA-2000 Airflow Measuring System (Continued)**

**Technical Specifications<sup>1</sup>**

RA-2000 Airflow Measuring Systems					
<b>Leakage - Fully Closed</b>	0.15 scfm maximum per inch of blade circumference at 4-inch w.g.				
<b>Operating Torque</b>	8 in. diameter at 2 in. w.g.				52 lb·in
	16 in. diameter at 2 in. w.g.				84 lb·in
	24 in. diameter at 2 in. w.g.				116 lb·in
<b>Pressure Drop (in. w.g.) - Fully Open</b>		1,000 cfm	2,000 cfm	3,000 cfm	4,000 cfm
	12 in.	0.017	0.06	0.15	0.25
	24 in.	0.005	0.010	0.010	0.010
<b>Velocity and Pressure</b>	400 to 4,000 fpm				
<b>Temperature Rating</b>	Standard Operating Conditions: -40 to 200°F (-40 to 93°C) Actuator: -4 to 122°F (-20 to 50°C)				
<b>Approximate Weight</b>	Damper: 5 lb/sq. ft (2.7 kg/sq. ft) Actuator: 2.9 lb (1.6 kg) per actuator				

1. Measuring stations are tested at an Air Movement and Control Association International (AMCA) Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Airflow Station Performance.

Refer to the *M9208-xxx-x Series Electric Spring Return Actuators Product Bulletin (LIT-12011480)* and *M9220-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011057)* for necessary information on operating and performance specifications for the actuator.

# RA-2001 Center-Averaging Flow Probe Kit

## Description

The RA-2001 Center-Averaging Flow Probe Kit was developed to satisfy the requirement for an accurate center-averaging flow probe for use in spiral duct applications. The RA-2001 probe installs in a cut slot in the existing duct. The DMPR-RA001 Pressure Transducer with LCD screen and field-selectable ranges ships with the device. All necessary mounting hardware and gasket material is included.

Refer to the *RA-2001 Center-Averaging Flow Probe Kit Product Bulletin (LIT-1900802)* for important product information.

## Features and Benefits

- Multipoint center averaging provides accurate flow readings.
- Insertion mounting allows easy installation.
- Factory-piped differential pressure transducer with display provides convenient visual reading for flow and allows easy installation.

## Application

The airflow measuring probes were developed to meet the market need for an air measuring station that is easily installed in an existing duct.

Each fully factory-assembled probe unit contains everything needed to install an air measuring station.

The standard 0 to 10 Volt transducer output signal is proportional to Cubic Feet per Minute (CFM) and may be routed to any Building Automation System (BAS) for continuous monitoring of the airflow. The transducer output signal may also be configured for 0-5 V or 4-20 mA.

All products are perfect for measuring airflow in existing ducts and install in minutes.

## Sample Specification

Install, at all locations indicated on plans and in accordance with schedules, a center-averaging differential pressure flow probe assembly.

Device shall be cross shaped, multi-point, center-averaging. Device shall be made of high-impact ABS material.

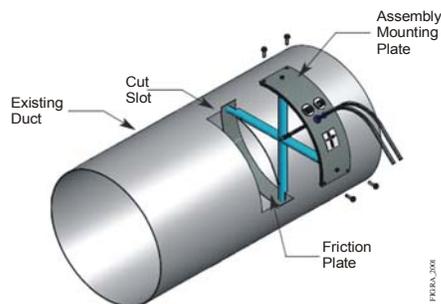
Flow probe shall output an amplified differential pressure signal that is at least 1.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube and be capable of measuring air volume to ±5% accuracy.

The complete assembly shall be equipped with a gasketed mounting plate and all necessary hardware.

Flow probe shall be assembled in an ISO9001-certified facility.

Accuracy shall be supported by testing done in accordance with AMCA test standards.

## Selection



RA-2001 Dimensions



RA-2001 Center-Averaging Flow Probe Kit

## Dimensions

Item	Dimension
Assembly Mounting Plate	3 in. wide
Friction Plate	1-1/2 in. wide
Diameter (Distance Between the Plates at the Center of the Curve)	(as ordered)

## Ordering Matrix<sup>1</sup>

Code Number	R	A	A	x	x	N
R = Round Damper						
A = Air-Measuring						
A = Galvanized Steel Frame and Plastic Cross-Flow Probes						
x x = Diameter, (6 to 16 in.)						
N = No Actuator						

1. The DMPR-RA001 transducer comes with the product (shipped loose).

## Flow Calculations (CFM)

$$CFM = (Area \times Ka) \times \sqrt{PAMS}$$

$$Area = \pi R^2 / 144$$

$$PAMS = \text{Velocity Pressure Inches Water Gage}$$

## Flow Calculation (CFM)

### Ka Factors by Inlet Size

Inlet Size, in. (mm)	Ka
6 (152)	2,282
7 (178)	2,496
8 (203)	2,590
9 (229)	2,642
10 (254)	2,633
12 (305)	2,408
14 (356)	2,820
16 (406)	2,749

## RA-2001 Center-Averaging Flow Probe Kit (Continued)

### Repair Information

If the RA-2001 Center-Averaging Flow Probe Kit fails to operate within its specifications, replace the unit. For a replacement RA-2001 Center-Averaging Flow Probe Kit, contact the nearest Johnson Controls® representative.

All Johnson Controls® RA-2001 Center-Averaging Flow Probe Kits are built to order and cannot be returned due to ordering errors. All RA-2001 Center-Averaging Flow Probe Kits are backed by a 3-year warranty, which covers defects in materials or workmanship. Refer to terms and conditions of sale for specifics.

### Technical Specifications

RA-2001 Center-Averaging Flow Probe Kit	
Frame	20 gauge galvanized steel
Probe Material	High-impact ABS plastic
Seal Material	3/16 in. (5 mm) thick polyurethane foam
Pressure Transducer	DMPR-RA001 Pressure Transducer
Accuracy	±5% of flow
Velocity Range	400 to 5,000 fpm (2.03 to 25.4 mps)
Operating Temperature	20° to 120°F (-6.7° to 48.9°C)
Minimum Size	6 in. (152 mm) diameter
Maximum Size	16 in. (406 mm) diameter

## RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System

### Description

RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System averages velocity and temperature from fan inlet sensors in a duct or plenum, providing accurate, dependable airflow measurement from 0 to 10,000 fpm (0 to 50.8 mps) within  $\pm 2\%$  accuracy.

Each sensor circuit is connected to a router that stores the calibration data. The router's microprocessor calculates flow and temperature and sends this information digitally to the DMPR-RA003 Electronic Controller, which provides air velocity and temperature information on an LCD screen. The transmitter sends the output to a Building Automation System (BAS) through 4 to 20 mA or 2 to 10 VDC analog outputs (using a 500 ohm resistor) or a 1 to 5 VDC analog output (using a 250 ohm resistor).

The factory-assembled RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System includes fan inlet sensors, CAT5e shielded cables, router box, and a DMPR-RA003 Electronic Transmitter.

Refer to the *RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System Product Bulletin (LIT-12011620)* for important product information.

### Features

- Aerodynamically Shaped, Surface Mount Fan Inlet Sensors
- Multiple-Pivot Hinge Design
- National Institute of Standards and Technology (NIST) Traceable Calibration at Each Sensing Point
- LCD Screen on DMPR-RA003 Electronic Controller
- CAT5e Cable with RJ-45 Connectors

### Application

The RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System meets the requirements for minimum outside air according to several agency specifications:

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62 and ASHRAE 90.1
- California Title 24
- International Mechanical Code (IMC)
- International Energy Conservation Code (IECC)

The RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System contributes to earning required Indoor Environmental Quality (EQ) and Energy and Atmosphere (EA) credits for U.S. Green Building Council® Leadership in Energy and Environmental Design (LEED) prerequisites for construction and operation.

### Sample Specifications

Furnish and install, at locations shown on plans or as in accordance with schedules, an electronic thermal dispersion type fan inlet Airflow and Temperature Measuring Station (AFTMS). AFTMS shall be surface mount type, with no exceptions.

Communications cable within the fan inlet sensor shall be soldered directly to the fan inlet sensor's Printed Circuit Board (PCB) to ensure absolute connectivity and long term accuracy.

Underwriters Laboratories, Inc.® (UL) Plenum-rated CAT5e communications cable with square terminal connectors, dust boot covers, and gold-plated contacts shall link sensors to the router and router to electronic controller.

Sensor to router communication cable shall be 10 ft (6.1 m) maximum. Router to Electronic Controller communications cable shall be a minimum of 10 ft (6.1 m) in length. Total router to electronic controller communications cable shall be available up to a maximum length of 50 ft (15.25 m) for a single router or 100 ft (30.5 m) for two routers, when specified.

Complete assembly shall be constructed and calibrated in an ISO 9001 certified facility.

Devices creating fan performance degradation (resulting in additional energy consumption) caused from pressure drop associated with probes or mounting apparatus in the center of the fan inlet are prohibited.

Unit shall be capable of monitoring the airflow and temperature at each fan inlet location through two or four sensing circuits. Unit shall be capable of reporting through an electronic controller that communicates with the Building Automation System (BAS).

Sensor circuit casings shall be constructed of UL94 flame-rated, high-impact ABS and include a stainless steel thermistor cap that maintains the precise calibrated flow over the heated and ambient measurement points. Each sensor circuit shall consist of two ceramic base, glass-encapsulated thermistors for measuring ambient temperature and velocity. Circuits shall be designed for operation in a wide range of environments, including high humidity and rapid thermal cycling.

Sensors shall terminate at a router containing a multiplexer circuit. Multiplexer shall include a microprocessor that collects data from each PCB and digitally communicates the average airflow and temperature of sensing point to the microprocessor-based electronic controller. Multiplexer board shall be completely encased in electrical potting material to prevent moisture damage.



**RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System**

Electronic controller shall be capable of processing up to 4 independent sensing points per airflow measuring location and shall operate on a fused 24 VAC supply.

Electronic controller shall feature a 16 x 2 character alphanumeric LCD screen, digital offset/gain adjustment, continuous performing sensor/controller diagnostics, and a visual alarm to detect malfunctions.

LCD screen shall be field-adjustable to display either I-P or SI units. Electronic controller output shall be 4 to 20 mA.

All electronic components of the assembly shall be Restriction of Hazardous Substances (RoHS) Directive compliant and UL rated.

Dedicated transformers shall be used for each air measurement station. If additional devices are connected to the same transformer, transformers with sufficient capacity for the total load shall be used.

System design shall avoid wiring multiple low-voltage devices from a common transformer that results in lower- than-expected voltage at the device and higher-than-expected current draw when devices are connected a great distance from the power source.

### Selection Charts

Use the following information to select the product:

1. Select the product code number required where **dd** is the diameter of duct (4 to 32 inches in 1-inch increments).
2. Enter option for desired cable length between router(s) and controller(s).

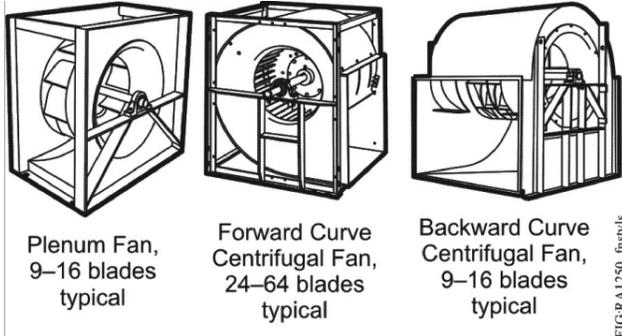
**Note:** Cable length between sensor and router is 10 ft (3 m) maximum length.

### RA-1250 Thermal Dispersion Fan Inlet Sensor Airflow Measuring System (Continued)

Example: RAF20NO is an RA-1250 Fan Inlet Thermal Dispersion Airflow Measuring System for use with forward-curved fans having a single inlet and a low sensor density. This model has a controller, a router, two inlet sensors, and a 20 ft (6 m) CAT5e cable between the router and controller.

#### Router-to-Controller Cable Length Options

Letter	Cable Length
O	20 ft (6 m)
P	30 ft (9 m)
Q	40 ft (12 m)
R	50 ft (15 m)



Fan Types

#### RA-1250 Fan Inlet Thermal Dispersion Airflow Measuring System Ordering Information

Code Number	Fan Type	Inlet Type and Sensor Density	Fan Inlet Thermal Dispersion Airflow Measuring System with
RAFddD	Forward Curve	Double Inlet - Low Density	Controller, Router and 4 sensors
RAFddH		Single Inlet - High Density	
RAFddN		Double Inlet - High Density	
RABddD	Backward Curve	Single Inlet - Low Density	2 Controllers, 2 Routers and 8 sensors
RABddH		Double Inlet - Low Density	
RABddN		Single Inlet - High Density	
RAPddD	Plenum / Plug	Double Inlet - Low Density	Controller, Router and 2 sensors
RAPddH		Single Inlet - High Density	
RAPddN		Double Inlet - High Density	
		Single Inlet - Low Density	2 Controllers, 2 Routers and 8 sensors
			Controller, Router and 2 sensors

#### Technical Specifications

RA-1250 Thermal Dispersion Probe Fan Inlet Sensor Airflow Measuring System	
Velocity Requirements	Minimum 0 fpm (0 mps) Maximum 10,000 fpm (50.8 mps)
Fan Degradation	Minimal
Sensor Accuracy	Airflow: $\pm 2\%$ of reading and $\pm 0.15\%$ repeatability Temperature: $\pm 0.10^\circ\text{F}$ 24 VAC internally fused power supply Velocity Output: 4 to 20 mA (Standard) or 2 to 10 VDC (requires 500-ohm resistor) Temperature Output: 4 to 20 mA (Standard) or 2 to 10 VDC (requires 500-ohm resistor) Fused outputs
Power Requirement	Dedicated 24 V, 20 VA with one router connected and 40 VA with two routers connected
Power Consumption	18 VA Maximum
Operating Conditions	-25 to 140°F (-32 to 60°C); 0-99% RH, noncondensing
Router Unit (One per Fan Location)	One microprocessor based multiplexer circuit Sensor/communications circuit Router circuits encapsulated in electronic potting compound
Approximate Weight	Controller: 2.9 lb (1.32 kg) Router: 1 lb (0.45 kg) Sensor: 0.5 lb (0.22 kg)

## PC-1250, PC-1251, and PC-1252 Counter-Balanced Backdraft Dampers

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including counter-balanced backdraft dampers in our product offering.

- **PC-1250 Counterbalanced Backdraft Damper**  
Low velocity  
Synthetic bearings
- **PC-1251 Counterbalanced Backdraft Damper**  
Medium velocity  
Ball bearings
- **PC-1252 Counterbalanced Backdraft Damper**  
High velocity  
Zytel bearings

All three counter-balanced backdraft dampers feature zinc-plated weights.

Refer to the PC-125x Counter-balanced Backdraft Dampers Product Bulletin (LIT-12011820) for important product application information.

### Features

- 3-year warranty on materials and workmanship provides confidence in company-backed products
- 15 to 25 working-day standard shipping after order entry results in fast response for short lead time projects.

### Repair Information

If a PC-125x damper fails to operate within its specifications, replace the unit. For a replacement damper, contact the nearest Johnson Controls® representative.



ID-125x Counter-balanced Backdraft Dampers

### Dimensions

All Johnson Controls height and width dimensions are from the outside edges of the frame. Actual damper size is 1/4 in. less than nominal. Maximum single panel selection sizes are described in the following table.

Damper Model	Maximum Single Panel Size
PC-1250	40 W x 48 in. H (1,016 x 1,219 mm)
PC-1251	48 W x 52 in. H (1,219 x 1,321 mm)
PC-1252	48 W x 52 in. H (1,219 x 1,321 mm)

### Pressure Data

Dampers may tolerate higher pressures and velocities than those listed in the following tables. Conservative ratings are presented intentionally in an effort to avoid misapplication. Consult a Johnson Controls® representative when a damper is to be applied in conditions exceeding recommended maximums.

Damper Width, in. (mm)	Maximum Back System Pressure - External Wind Velocity (in. wg)	Maximum System Velocity (fpm)	Leakage	
			% of Maximum Flow <sup>1</sup>	Total sq. ft/cfm
40 (1,016)	55 mph/1.5 in. wg	1,000	1.5	15.0
36 (914)	70 mph/2.5 in. wg	1,000	1.5	15.0
24 (610)	85 mph/3.5 in. wg	1,000	2.0	20.0
12 (305)	95 mph/4.5 in. wg	1,000	4.0	40.0

1. Based on pressure differential of 1 in. wg.

Damper Width, in. (mm)	Maximum Back System Pressure (in. wg)	Maximum System Velocity (fpm)	Leakage		Blades Start to Open	Blades Fully Open
			% of Maximum Flow <sup>1</sup>	Total sq. ft/cfm		
48 (1,219)	4.0 in. wg	2,500	0.7	17.5	0.02 in. wg	0.05 in. wg
36 (914)	8.0 in. wg	2,500	0.8	20		
24 (610)	12.0 in. wg	2,500	0.9	23		
12 (305)	16.0 in. wg	2,500	01.6	40		

1. Based on pressure differential of 1 in. wg.

## PC-1250, PC-1251, and PC-1252 Counter-Balanced Backdraft Dampers (Continued)

Damper Width, in. (mm)	Maximum Back System Pressure (in. wg)	Maximum System Velocity (fpm)	Leakage		Blades Start to Open	Blades Fully Open
			% of Maximum Flow <sup>1</sup>	Total sq. ft/cfm		
48 (1,219)	4.0 in. wg	2,500	0.6	15	0.01 in. wg	0.05 in. wg
36 (914)	8.0 in. wg	2,500	0.6	15		
24 (610)	12.0 in. wg	2,500	0.7	17.5		
12 (305)	16.0 in. wg	2,500	1.0	25		

1. Based on pressure differential of 1 in. wg.

### Ordering Information

Code Number/Character	FIELD														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>Product Family</b> P = Backdraft/Pressure Relief															
<b>Blade Operation</b> C = Counter-Balanced															
<b>Blade Type</b> H = High Pressure (PC-1252) L = Low Pressure (PC-1250) M = Medium Pressure (PC-1251)															
<b>Bearing/Seal Type</b> N = See <i>Dimensions</i> .															
<b>Actuator Type</b> N = Normal															
<b>Width Dimensions</b> ALL = 006 through 099 inches 1 inch increments															
<b>Height Dimensions</b> PC-1250 = 007 through 099 inches PC-1251 = 011 through 099 inches PC-1252 = 010 through 099 inches 1 inch increments															
<b>Options (Limit 2)</b> E = Exact Size F = Front Flange (Air Entering Side) G = Rear Flange (Air Leaving Side) U = Upward Flow															
<b>Ordering Code Number</b>	P	C	L	N	N	-	w	w	w	x	h	h	h	-	-

### Technical Specifications

PC-125x Counter-Balanced Backdraft Dampers		
<b>Maximum System Pressure</b>	PC-1250	Refer to Figure 3 in the <i>PC-125x Counter-balanced Backdraft Dampers Product Bulletin (LIT-12011820)</i> .
	PC-1251	Refer to Figure 4 in the <i>PC-125x Counter-balanced Backdraft Dampers Product Bulletin (LIT-12011820)</i> .
	PC-1252	Refer to Figure 5 in the <i>PC-125x Counter-balanced Backdraft Dampers Product Bulletin (LIT-12011820)</i> .
<b>Maximum System Velocity</b>	PC-1250	1,000 feet per minute (305 m per minute)
	PC-1251 and PC-1252	2,500 feet per minute (762 m per minute)
<b>Maximum Temperature</b>		-40°F (-40°C) minimum and 200°F (93°C) maximum
<b>Shipping Weight</b>	PC-1250	37.9 lb/sq. ft (17.2 kg/sq. ft)
	PC-1251	38.2 lb/sq. ft (17.3 kg/sq. ft)
	PC-1252	39.1 lb/sq. ft (17.7 kg/sq. ft)

# PD-1250 Pressure Relief Backdraft Damper

## Description

The PD-1250 Pressure Relief/Backdraft damper offers backdraft protection in light to medium duty applications that less than 12 cfm per square foot of leakage at 1/2 inch w. g.

Refer to the *PD-1250 Pressure Relief Backdraft Damper Product Bulletin (LIT-1201678)* for important product information.

## Features

- non-metallic blade-to-blade seal provides quiet operation during the highest spot velocities
- corrosion resistant aluminum construction
- blades that overlap the frame for maximum weather protection

## Factory Options

- E = Exact whole inch size, no undercut
- F = 1.5 inch L flange air entering side (Cannot be used with option G)
- G = 1.5 inch L flange air leaving side (Cannot be used with option F)
- U = Upward airflow

**Note:** Limit of two factory-installed options.

## To Order

Specify the code number from the selection chart. PD-1250 dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls® damper dimensions are from the outside edges of the damper frame.



PD-1250 Pressure Relief Backdraft Damper

## PD-1250 Pressure Relief Backdraft Damper Selection Chart

	Code Number	P	P	N	N	-	w	w	w	x	h	h	h
Application	P = Pressure Relief Backdraft												
Blade Operation	P = Parallel												
Blade/Frame	E = Extruded Aluminum/Extruded Aluminum												
	F = Formed Aluminum/Extruded Aluminum												
Bearing/Seal Type	N = None												
Actuator	N = None												
Width Dimensions	006 to 096 inches, 1-inch increments												
Height Dimensions	006 to 072 inches, 1-inch increments												
Options (limit two)	See Factory Options												

**Note:** Maximum single panel size is 48 inches wide x 72 inches high.

## Specifications

PD-1250 Pressure Relief Backdraft Damper			
		PPEN	PPFN
Maximum Back Pressure (external wind velocity)	12 in. (305 mm) wide	6 in. w.g. (100 mph)	4.5 in. w.g. (90 mph)
	24 in. (610 mm) wide	5 in. w.g. (100 mph)	3.5 in. w.g. (85 mph)
	36 in. (915 mm) wide	4 in. w.g. (90 mph)	2.5 in. w.g. (70 mph)
	40 in. (1016 mm) wide	3 in. w.g. (75 mph)	1.5 in. w.g. (55 mph)
Maximum Spot Velocity		2500 fpm	1500 fpm
Operational Pressures	Start to Open	0.10 in. w.g.	0.03 in. w.g.
	Fully Open	0.15 in. w.g.	0.10 in. w.g.
Leakage (at maximum back pressure)	12 in. (305 mm) wide	40 cfm/sq ft	40 cfm/sq ft
	24 in. (610 mm) wide	18 cfm/sq ft	20 cfm/sq ft
	36 in. (915 mm) wide	15 cfm/sq ft	15 cfm/sq ft
	40 in. (1016 mm) wide	15 cfm/sq ft	15 cfm/sq ft
Temperature Rating	-40°F to 200°F (-40°C to 93°C)		
Approximate Weight (Damper)	5 pounds/square foot (2.7 kg/square foot)		

**Note:** When used in fan discharge applications, damper should be located at a minimum distance equal to half the fan diameter away from the fan discharge.

**Note:** Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, and Shutters. This does not guarantee that other conditions will not occur in the actual environment where dampers must operate. Designs should provide a reasonable safety factor for damper performance by selecting at some point below damper leakage or pressure drop system requirements.

## Construction

Part	Construction
Frame	6063T5, extruded aluminum, 0.90 in. (2.3 mm) or 0.125 (3.2 mm) wall thickness, mitered corners
Blades	0.025 in. (6 mm) formed aluminum, 6063T5 extruded aluminum, 0.050 in. (1.2 mm) wall thickness
Linkage	Concealed in frame
Bearings	Synthetic
Blade Seal	Vinyl

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

## RP-2000 Pressure Relief Backdraft Damper

### Description

Since 1905, Johnson Controls has provided the highest quality control dampers and controls that fit your application and size requirements.

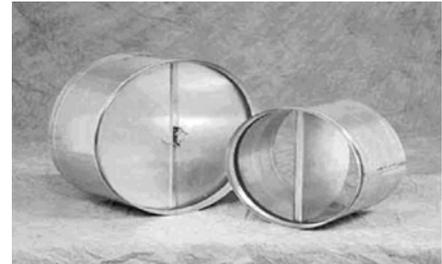
Johnson Controls now presents the RP-2000 Round Pressure Relief Damper with formed aluminum blade/ galvanized shroud damper.

Refer to the *RP-2000 Pressure Relief Backdraft Damper Product/Technical Bulletin (LIT-1201679)* for important product information.

- Galvanized Shroud fits standard or spiral duct
- Aluminum Blades with Non-Metallic Seals operates quietly when closing

### Repair Information

If the RP-2000 Round Pressure Relief Backdraft Damper fails to operate within its specifications, replace the unit. For a replacement RP-2000 Round Pressure Relief Backdraft Damper contact the nearest Johnson Controls® representative.



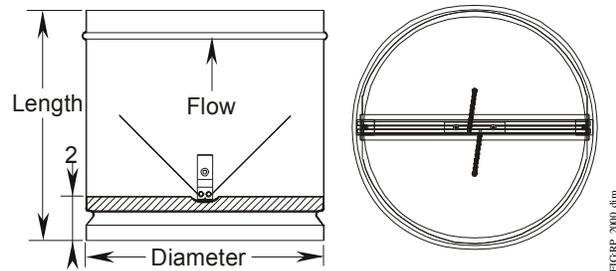
RP-2000

### Features

- Adjustable Spring sets pressure at which damper opens

### Construction

Part	Construction
Frame	20 gauge (1.0 mm) galvanized steel
Blades	0.016 in. (0.40 mm) aluminum
Blade Stop	20 gauge (1.0 mm) galvanized
Axle Keeper	20 gauge (1.0 mm) galvanized
Axles	3/16 in. diameter(4.8 mm) plated steel
Blade Seal	Vinyl foam



RP-2000 Dimensions

### Damper Dimensions

Diameter	Length
6 in. (152 mm) through 9 in. (229 mm)	6 in. (152 mm)
10 in. (254 mm) through 16 in. (406 mm)	10 in. (254 mm)
18 in. (441 mm) through 24 in. (610 mm)	14 in. (356 mm)

**Note:** Damper is furnished approximately 1/8 in. (3 mm) smaller than given opening dimensions.

### Selection Chart

	Code Number	R	P	G	d	d	N
Product Family	R = Round Dampers						
Application	P = Pressure Relief Backdraft						
Shroud Type	G = Galvanized						
Diameter	06 to 10-inches, 1 inch increments 12 to 24-inches, 2 inch increments						
Actuator	N = None						

### Performance Data

Pressure Drop (inches WG) - Fully Open	500 fpm	1,000 fpm	1,500 fpm	2,000 fpm	
6 inch	0.4	0.41	0.55	0.91	
24 inch	0.07	0.16	0.30	0.55	
<b>Maximum System Velocity</b>	2,000 fpm				
<b>Leakage for 6" Diameter Damper</b>					
Static Pressure, inch WG	1.0	1.5	2.0	2.5	3.0
Leakage, cfm/sq ft	8.7	11.0	10.6	11.6	13.0
<b>Temperature Rating</b>	-40 to 200°F (-40 to 93°C)				
<b>Approximate Weight</b>	5 lb/sq. ft (2.27 kg/sq. ft)				

**Note:** Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, Shutters. All dampers are labeled as to direction of airflow and position during testing.

### Submittal Specifications

Furnish and install Johnson Controls® RP-2000 Pressure Relief Backdraft dampers, which can be used for vertical or horizontal applications.

Shroud is to be constructed of 20-gauge galvanized sheet steel with integral rolled blade stop. The shroud shall include rolled stiffener beads to allow easy sealing to spiral duct work joints.

Blades are to be constructed of 0.016 inch thick aluminum with closing spring to ensure a tight seal and minimize back flow through the damper. Seals are to be vinyl foam pressed onto the blade. The blade hinge shall be designed with no frame penetrations, which would allow air leakage out of the duct.

Performance shall be designed for tight shutoff and tested in accordance with AMCA Standard 500. Leakage resistance for a 6-inch damper shall not exceed 8.7 cfm per square foot at a 1-inch pressure differential. The damper must be rated to operate over a temperature range of -40 to 200°F (-40 to 93°C) standard.

There shall be a spring adjustment to allow for field setting of pressure to open the damper.

Sizing shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance.

# M9102-AGA-2S, -3S and M9104-xGA-2S, -3S Series Electric Non-Spring Return Actuators

## Description

The M9102 and M9104 Series Actuators are direct-mount, non-spring return electric actuators that operate on AC 24 V power. These synchronous motor-driven actuators provide floating control (AGA), floating control with automatic shutoff (IGA), and proportional control with selectable 0-10 or 2-10 VDC (GGA). The -2S models are equipped with plenum cables, and the -3S models are equipped with terminal blocks.

All models are compact in size and are easily installed on Variable Air Volume (VAV) boxes, Variable Volume and Temperature (VVT) two-position zone applications, or small- to medium-sized dampers with a round shaft up to 1/2 in. (13 mm) in diameter or a 3/8 in. (10 mm) square shaft.

The M9102 Series Electric Non-spring Return Actuators provide a running torque of 18 lb·in (2 N·m), and the nominal travel time is 30-seconds at 60 Hz (36 seconds at 50 Hz) for 90° of rotation. The M9104 Series Electric Non-spring Return Actuators provide a running torque of 35 lb·in (4 N·m), and the nominal travel time is 60-seconds at 60 Hz (72 seconds at 50 Hz) for 90° of rotation.

Refer to the *M9102-AGA-2S, -3S and M9104-xGA-2S, -3S Series Electric Non-Spring Return Actuators Product Bulletin (LIT-1201742)* for important product application information.

## Features

- two torques available: 18 and 35 lb·in (2 and 4 N·m) — offer the most suitable choice for the specific application
- short 30-second travel time available — provides a quick response for two-position zone applications
- 35 dBA nominal audible noise rating — meets the audible noise requirements for open ceiling environments
- synchronous drive — provides a constant rotation time that is independent of the load
- 100,000 cycle rating — provides years of trouble-free service
- direct shaft mounting with single-screw coupler — reduces installation time and provides three-point shaft gripping
- magnetic clutch — protects the actuator gear train and the damper from damage due to excessive torque during a stall condition
- manual gear release — simplifies actuator setup and adjustments in the field
- plenum cable or screw terminal electric connections — make wiring quick and easy

- floating, floating with timeout, and proportional 0(2) to 10 VDC control inputs available — offer a full range of control input options
- small, compact design — allows installation in tight-fitting locations

## Applications

The M9102 and M9104 Series Electric Non-spring Return Actuators are designed to position balancing, control, round, and zone dampers in Heating, Ventilating, and Air Conditioning (HVAC) systems. These electric actuators are also designed to position blades in a VAV box, or they can be used in VVT two-position zone applications.

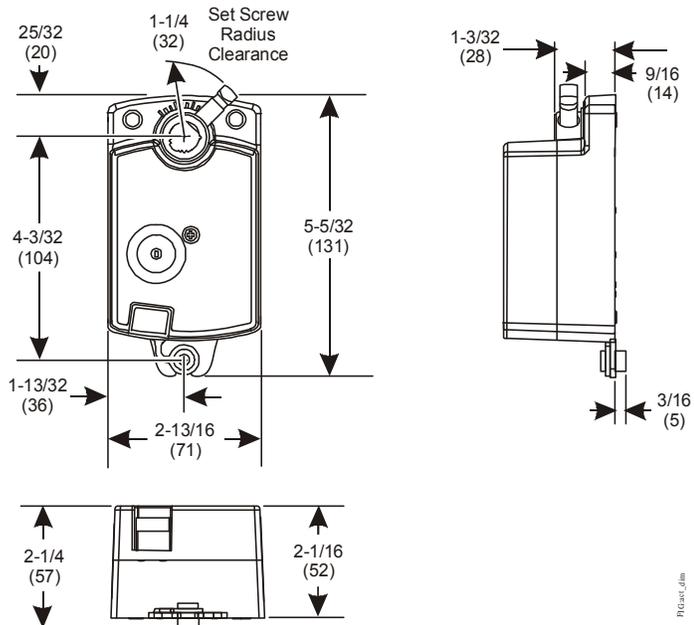
Each actuator mounts directly to the surface in any convenient orientation using a single No. 10 self-drilling sheet metal screw (included with the actuator). No additional linkages or couplers are required. Electrical connections on the actuator are clearly labeled to simplify installation.

## Repair Information

If the M9102 or M9104 Series Electric Non-spring Return Actuator fails to operate within its specifications, replace the unit. For a replacement electric actuator, contact the nearest Johnson Controls® representative.



**M9102/M9104 Series Electric Non-Spring Return Actuator**



**M9102/M9104 Series Electric Non-Spring Return Actuator Dimensions, in. (mm)**

## M9102-AGA-2S, -3S and M9104-xGA-2S, -3S Series Electric Non-Spring Return Actuators (Continued)

### Selection Chart

Code Number	Control Type	Running Torque	Travel Time	Electrical Connections
M9102-AGA-2S	Floating	18 lb-in (2 N·m)	30 Seconds at 60 Hz	48 in. (1.2 m) UL 444 Type CMP Plenum Rated cable with 19 AWG (0.75 mm <sup>2</sup> ) conductors and 1/4 in. (6 mm) ferrule ends
M9102-AGA-3S	Floating	18 lb-in (2 N·m)	30 Seconds at 60 Hz	M3 Screw Terminals
M9104-AGA-2S	Floating	35 lb-in (4 N·m)	60 Seconds at 60 Hz	48 in. (1.2 m) UL 444 Type CMP Plenum Rated cable with 19 AWG (0.75 mm <sup>2</sup> ) conductors and 1/4 in. (6 mm) ferrule ends
M9104-AGA-3S	Floating	35 lb-in (4 N·m)	60 Seconds at 60 Hz	M3 Screw Terminals
M9104-IGA-2S	Floating or On/Off	35 lb-in (4 N·m)	60 Seconds at 60 Hz	48 in. (1.2 m) UL 444 Type CMP Plenum Rated cable with 19 AWG (0.75 mm <sup>2</sup> ) conductors and 1/4 in. (6 mm) ferrule ends
M9104-IGA-3S	Floating or On/Off	35 lb-in (4 N·m)	60 Seconds at 60 Hz	M3 Screw Terminals
M9104-GGA-2S	Proportional	35 lb-in (4 N·m)	60 Seconds at 60 Hz	48 in. (1.2 m) UL 444 Type CMP Plenum Rated cable with 19 AWG (0.75 mm <sup>2</sup> ) conductors and 1/4 in. (6 mm) ferrule ends
M9104-GGA-3S	Proportional	35 lb-in (4 N·m)	60 Seconds at 60 Hz	M3 Screw Terminals

### Accessories

Code Number	Description
DMPR-KC003 <sup>1</sup>	7 in. (178 mm) Blade Pin Extension without Bracket for Johnson Controls Direct-Mount Damper Applications.
DMPR-KC010	Adjustable Blade Position Indicator Switch Kit with total switching load limited to 2,000 VA for the following applications: Pilot Duty: AC 24 V, 50 VA; AC 125/250/277 V, 125 VA Motor Load: AC 12/250/277 V, 1/3 hp Resistive Load: AC 125 V, 11 A; AC 250 V, 8 A; AC 277 V, 7 A (all maximum values)
DMPR-KC011	Hex Head Blade Pin Extension without Bracket
DMPR-KC012	Hex Head Blade Pin Extension without Bracket
M9000-200	Commissioning Tool that Provides a Control Signal to Drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators
M9104-100	Connector for 3/8 in. (10 mm) Flexible Metal Conduit (10 per package)

1. Furnished with the damper and may be ordered separately.

## M9102-AGA-2S, -3S and M9104-xGA-2S, -3S Series Electric Non-Spring Return Actuators (Continued)

### Technical Specifications

M9102-AGA-2S, -3S and M9104-xGA-2S, -3S Series Electric Non-Spring Return Actuators		
Power Requirements	M910x-AGA-xS	AC 24 V +25%/-20% at 50/60 Hz, 2.1 VA Supply, Class 2, Safety Extra-Low Voltage (SELV)
	M9104-IGA-xS	AC 24 V +25%/-20% at 50/60 Hz, 3.0 VA Supply, Class 2, SELV
	M9104-GGA-xS	AC 24 V +25%/-20% at 50/60 Hz, 3.6 VA Supply, Class 2, SELV
Control Type	M910x-AGA-xS	Floating Control without Timeout
	M9104-IGA-xS	Floating or On/Off Control with Timeout
	M9104-GGA-xS	Proportional Control
Input Signal	M910x-AGA-xS	AC 24 V +25%/-20% at 50/60 Hz, Class 2, SELV without Timeout
	M9104-IGA-xS	AC 24 V +25%/-20% at 50/60 Hz, Class 2, SELV with Timeout
	M9104-GGA-xS	0(2) to 10 VDC or 0(4) to 20 mA with field-furnished 500 ohm resistor
Feedback Signal	M9104-GGA-2S	0 to 10 VDC or 2 to 10 VDC for 90° (10 VDC at 1 mA) Corresponds to input signal span selection
Motor Input Impedance		200 ohms Nominal
Running Torque	M9102 Series	18 lb·in (2 N·m)
	M9104 Series	35 lb·in (4 N·m)
Travel Time	M9102 Series	30 Seconds at 60 Hz (36 Seconds at 50 Hz) for 90° of Rotation
	M9104 Series	60 Seconds at 60 Hz (72 Seconds at 50 Hz) for 90° of Rotation
Rotation Range		93° ± 3°, CW or CCW
Cycles		100,000 Full Stroke Cycles; 2,500,000 Repositions at Rated Running Torque
Audible Noise Rating		35 dBA Nominal at 39-13/32 in. (1 m)
Electrical Connections	M9102-AGA-2S M9104-xGA-2S	48 in. (1.2 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm <sup>2</sup> ) conductors and 1/4 in. (6 mm) ferrule ends
	M9102-AGA-3S, M9104-xGA-3S	M3 Screw Terminals
Mechanical Connections		Up to 1/2 in. (13 mm) Diameter Round Damper Shaft or 3/8 in. (10 mm) Square Damper Shaft
Enclosure	M9102-AGA-2S, M9104-xGA-2S	NEMA 2, IP42
	M9102-AGA-3S, M9104-xGA-3S	NEMA 1, IP40
Ambient Conditions	Operating	-4 to 140°F (-20 to 60°C); 90% RH Maximum, noncondensing
	Storage	-20 to 150°F (-29 to 66°C); 90% RH Maximum, noncondensing
Compliance	United States	UL Listed, File E27734, CCN XAPX (United States) and XAPX7 (Canada)
		Actuator Housing is Plenum Rated per CSA C22.2 No. 236/UL 1995, Heating and Cooling Equipment
	Europe	CE Mark - Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand	C-Tick Mark Australia/NZ Emissions Compliant
Shipping Weight		1.0 lb (0.5 kg)

## M9106-AGx-2N0x Series Electric Non-spring Return Actuators

### Description

The M9106-AGA-2N0x synchronous motor-driven actuators provide floating (3-wire) control and are easily installed on a Variable Air Volume (VAV) box. They may also be installed on a small or medium-sized damper with a round shaft up to 1/2 inch (13 mm) in diameter or a 3/8 inch (10 mm) square shaft.

These compact, non-spring return actuators have 53 lb-in (6 N·m) running torque in a compact easy-to-install package. The actuators are available with either a nominal 60-second travel time at 60 Hz (72 seconds at 50 Hz) or a nominal 120-second travel time at 60 Hz (144 seconds at 50 Hz) for 90° of rotation.

The M9106-AGS-2N02 Actuator/Transmitter combines an M9106-AGA-2N02 with a prewired DPT-2015 Differential Pressure Transmitter that has a 0 to 1.5 in. W.C. (0 to 374 Pa) differential pressure range.

### Features

- simple direct coupling reduces installation and commissioning time by eliminating damper linkages
- whisper quiet 35 dBA rating meets audible requirements for open ceilings
- long life brushless synchronous drive
- motor technology provides constant rotation time independent of load
- 100,000 cycle rating, 2,500,000 repositions
- direct shaft mount with single-screw coupler simplifies installation and provides 3-point shaft gripping
- magnetic clutch provides torque protection for the actuator gear train and damper
- manual gear release simplifies setup and field adjustments

### Selection Charts

#### M9106-AGx-2N0x Electric Non-spring Return Actuators

Code Number	Control Type	Torque / Timing / Voltage	Auxiliary Switches	Comments
M9106-AGA-2N01	Floating	53 lb-in (6 Nm) 60 Seconds at 60 Hz AC 24 V 50/60 Hz	None	Actuator only
M9106-AGA-2N02		53 lb-in (6 Nm) 120 Seconds at 60 Hz AC 24 V 50/60 Hz		
M9106-AGS-2N02		53 lb-in (6 Nm) 120 Seconds at 60 Hz AC 24 V 50/60 Hz		Actuator includes a DPT-2015 and CBL-2000-1

### Applications

The actuators are used to position balancing, control, round, and zone dampers in typical HVAC applications. They are also used to position the blades in a VAV box. The actuators mount directly to the surface of a VAV box, round damper, or small rectangular damper with a single No. 10 self-drilling sheet metal screw (included). There are no additional linkages or couplers required. Clearly labeled electrical terminals simplify installation. Refer to the damper or VAV box manufacturer's information to select the proper timing for the actuator.

Note: The damper rotation time must be defined at the controller, and the damper point definition must match the rotation time of the actuator.

When combined with a VAV controller, the actuator provides reliable integrated damper control. See the *M9106-AGx-2N0x Series Electric Non-spring Return Actuators Application Note (LIT-2681116)* for various configurations with and without the DPT-2015 differential pressure transmitter.

For more information, refer to the *M9106-AGx-2N0x Electric Non-spring Return Actuators Product Bulletin (LIT-2681126)* or the *M9106-AGx-2N0x Electric Non-spring Return Actuators Installation Instructions (Part No. 34-636-1077)*.



**M9106-AGS-2N0x Series Electric Non-spring Return Actuator**

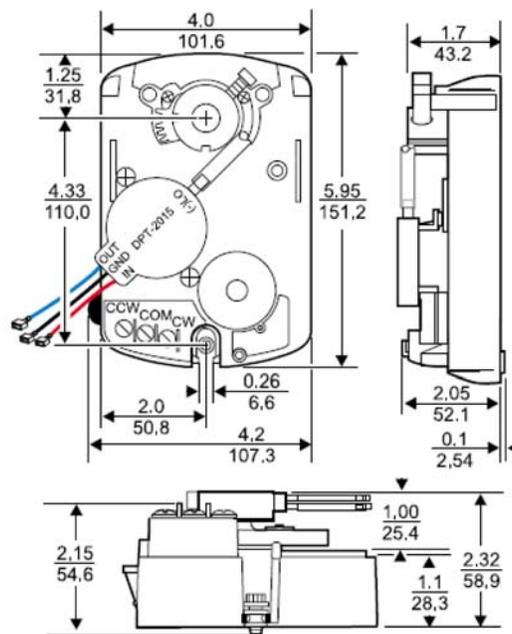
### Repair Information

If the M9106-AGS-2N0x Electric Actuator fails to operate within its specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls® representative.

**M9106-AGx-2N0x Series Electric Non-spring Return Actuators (Continued)**

**Accessories for M9106-AGx-2N0x Actuators**

Code Number	Description
CBL-2000-1	20 in. (0.5 m) wiring harness, UL accepted for plenum use, supplied with the M9106-AGS-2N02 and may be ordered separately; connects the M9106 and DPT-2015 to the VAV controller
CBL-2000-2	20 in. (0.5 m) plenum-rated wiring harness; Underwriters Laboratories, Inc.® (UL) accepted for plenum use; connects the M9101 and DPT-2015-0 to the VAV controller
CBL-2000-3	72 in. (1.8 m) plenum-rated wiring harness
DPT-2015-0	0 to 1.5 in. W.C. (0 to 374 Pa) differential pressure transmitter
DMPR-KC003	Blade Pin Extension without Bracket supplied with Johnson Controls CD-1300 dampers and may be ordered separately for all direct mount applications
DMPR-KC011	Hex Head Blade Pin Extension without Bracket
DMPR-KC012	Hex Head Blade Pin Extension with Bracket
M9000-200	Commissioning Tool provides a control signal to drive on/off, floating, proportional, or resistive actuators



Dimensions, in. (mm)

**M9106-AGx-2N0x Series Electric Non-spring Return Actuators (Continued)**

**Technical Specifications**

<b>M9106-AGx-2N0x Electric Non-spring Return Actuators</b>	
<b>Power Requirement</b>	M9106-AGA-2N01: AC 20...30 V at 50/60 Hz, 2.5 VA supply, Class 2 M9106-AGx-2N02: AC 20...30 V at 50/60 Hz, 2.1 VA supply, Class 2 DPT-2015: DC 15 V (DC 14.5...17 V) unregulated; 15 mA, maximum
<b>Control Type</b>	Floating
<b>Input Signal</b>	M9106-AGx-2N0x: 24 V (AC 20...30 V) at 50 or 60 Hz
<b>DPT 2015-0</b>	Pressure Range: 0 to 1.5 in. W.C. (0 to 374 Pa) Over Pressure Limit: 15 in. W.C. (3.74 kPa) Output Voltage: 0.5 to 4.5 VDC with 25,000 ohm minimum load impedance
<b>Input Impedance</b>	M9106-AGA-2N01: 200 ohms, nominal M9106-AGx-2N02: 250 ohms, nominal
<b>Feedback Signal</b>	N/A
<b>Auxiliary Switch Rating</b>	N/A
<b>Torque Rating</b>	53 lb·in (6 N·m)
<b>Cycle Life</b>	100,000 full cycles; 2,500,000 repositions rated at 53 lb·in (6 N·m)
<b>Audible Noise Rating</b>	35 dBA maximum at 39.4 in. (1 m)
<b>Rotation Range</b>	Adjustable from 30 to 90°, CW or CCW
<b>Rotation Time</b>	M9106-AGx-2N01: Nominal 60 seconds at 60 Hz and 72 seconds at 50 Hz for 90° M9106-AGS-2N02: Nominal 120 seconds at 60 Hz and 144 seconds at 50 Hz for 90°
<b>Electrical Connection</b>	No. 6-32 screw terminals
<b>Mechanical Connection</b>	3/8 to 1/2 in. (10 to 12.7 mm) round shaft or 3/8 in. (10 mm) square shaft
<b>Enclosure Rating</b>	NEMA1, IP30
<b>Ambient Operating Rating</b>	M9106-AGA-2N0x: 32 to 125°F (0 to 52°C); 90% RH maximum, noncondensing M9106-AGS-2N02: 32 to 125°F (0 to 52°C); 90% RH maximum, noncondensing 60 to 100°F (16 to 38°C); 90% RH maximum, noncondensing for DPT rated accuracy (Refer to <i>DPT-2015 Differential Pressure Transmitter for VAV Box Applications Installation Instructions [Part No. 24-7547-18]</i> .)
<b>Ambient Storage Rating</b>	-20 to 150°F (-29 to 66°C); 90% RH maximum, noncondensing
<b>Shipping Weight</b>	M9106-AGA-2N0x: 2.0 lb (0.91 kg) M9106-AGS-2N02: 2.2 lb (0.99 kg) with the DPT-2015
<b>Agency Compliance</b>	UL 873 Listed, File E27734, CCN XAPX CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02 CE Mark, EMC Directive 89/336/EEC

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

# M9106-xGx-2 Series Electric Non-Spring Return Actuators

## Description

The M9106-xGx-2 Series direct-mount electric actuators operate on AC 24 V power and are available for use with on/off, floating, or proportional controllers. These non-spring return actuators are easily installed on a Variable Air Volume (VAV) box, a damper with a round shaft up to 1/2 inch (13 mm) in diameter or a square shaft up to 3/8 inch (10 mm). The M9106 with a M9000-520 linkage can also be used to position VG1000 Series 1/2 in. (DN15) to 1-1/2 in. (DN40) ball valves.

The M9106 Series models have 53 lb-in. (6 N·m) running torque. These actuators have a nominal 60-second travel time for 90° of rotation at 60 Hz (72 seconds at 50 Hz) with a load-independent rotation time.

The M9106-xGC-2 models are available with integral auxiliary switches to perform switching functions at any angle within the selected rotation range. The -GGx models feature DC 0(2) to 10 V position feedback, and the -AGF models provide 10,000 ohm position feedback.

## Features

- simple direct coupling reduces installation and commissioning time and improves reliability by eliminating damper linkages. Single screw coupling provides three-point shaft gripping.
- designed for zone damper and ball valve actuator applications
- small, compact design — allows installation in tight-fitting locations
- on-off, floating and proportional control inputs
- 60-second running time at 60 Hz
- long life brushless synchronous drive motor technology – provides constant running time independent of load

- robust 53 lb-in. (6 N·m) torque rating
- whisper quiet 35 dBA noise rating
- magnetic clutch – provides over torque protection over the entire range of rotation
- -4 to 125°F (-20 to 52 °C) ambient temperature rating
- 100,000 full stroke cycle, 2,500,000 reposition rating
- manual gear release simplifies setup and field adjustments
- 1/2 in. NPT threaded conduit opening meets electrical code requirements and allows the use of flexible armored cable
- position feedback (-GGx models) provides simple, closed-loop control with accurate position sensing.
- adjustable rotation stops allow application versatility with 30 to 90° clockwise or counterclockwise rotation

## Applications

The M9106 actuators are used to position balancing, control, round, and zone dampers in typical Heat, Ventilating, and Air Conditioning (HVAC) applications. The M9106 can also be used with a M9000-520 linkage to control 1/2 in. (DN15) to 1-1/2 in. (DN40) VG1000 Series ball valves. The M9106 Series actuator mounts directly on the duct surface, round damper, or small rectangular damper with an anti-rotation bracket and two sheet metal screws (included). Additional linkages or couplers are not required.

Refer to the damper or VAV box manufacturer's information to select the proper timing for the actuator. Refer to the appropriate application note for specific wiring diagrams and information.



**M9106-xGx-2 Series Electric Non-Spring Return Actuator**

For more information, refer to the *M9106-xGx-2 Electric Non-Spring Return Actuators Product Bulletin (LIT-2681123)* or the *M9106-xGx-2 Electric Non-Spring Return Actuators Installation Instructions (Part No. 34-636-1085)*.

## Repair Information

If the M9106-xGx-2 Electric Actuator fails to operate within its specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls® representative.

## Selection Charts

### M9106-xGx-2 Electric Non-Spring Return Actuators

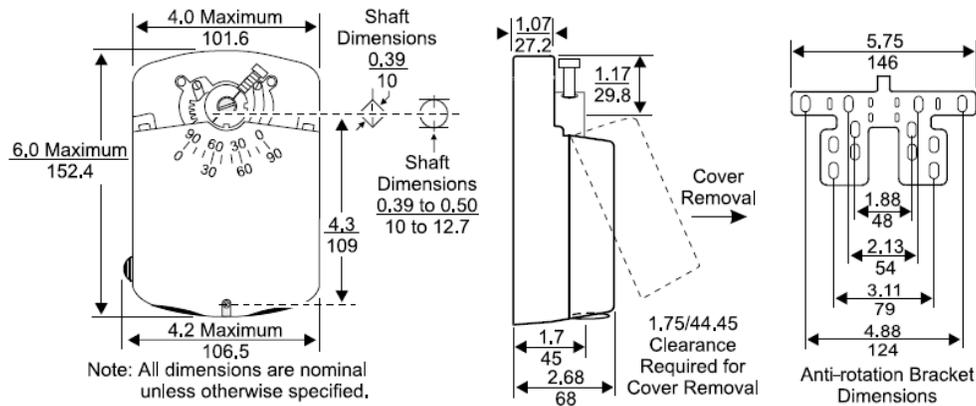
Code Number	Control Type	Torque / Voltage	Auxiliary Switches	Comments
M9106-AGA-2 <sup>1</sup>	Floating	53 lb-in. (6 N·m) 60 second timing at 60 Hz	None	
M9106-AGC-2 <sup>1</sup>			2-SPDT	
M9106-AGF-2 <sup>1</sup>	Floating with resistive feedback	AC 24 V 50/60 Hz	None	10,000 Ohm Feedback Pot
M9106-GGA-2	DC 0(2) to 10 V		None	DC 0(2) to 10 V Feedback
M9106-GGC-2	DC 0(4) to mA proportional		2-SPDT	
M9106-IGA-2	On-Off / Floating with timeout		None	Adjustable timing 1, 1.5, 2, 5.5 or 11 min.
M9106-IGC-2		2-SPDT		

1. To avoid excessive wear or drive time on the motor for the AGx models, use a controller and/or software that provides a time-out function to remove the signal at the end of rotation (stall). The -GGx and -IGx models have an auto shutoff to avoid excessive wear or drive time on the motor.

### M9106-xGx-2 Series Electric Non-Spring Return Actuators (Continued)

Accessories for M9106-xGx-2 Actuators

Code Number	Description
CBL-2000-1	20 in. (0.5 m) Wiring Harness, UL accepted for plenum use, connects the M9106 and DPT-2015 to the VAV controller
CBL-2000-2	20 in. (0.5 m) Plenum Rated Wiring Harness
CBL-2000-3	72 in. (1.8 m) Plenum Rated Wiring Harness
DPT-2015-0	0 to 1.5 in. W.C. (0 to 374 Pa) differential pressure transmitter
DMPR-KC003	Square Head Blade Pin Extension without Bracket supplied with Johnson Controls CD-1300 dampers and may be ordered separately for all direct mount applications
DMPR-KC010	Adjustable Blade Position Indicator Switch Kit with total switching load limited to 2000 VA for the following applications: Pilot Duty: AC 24 V, 50 VA; AC 125/250/277 V, 125 VA Motor Load: AC 125/250/277 V, 1/3 hp Resistive Load: AC 125 V, 11 A; AC 250 V, 8 A; AC 277 V, 7 A (all maximum values)
DMPR-KC011	Hex Head Blade Pin Extension without Bracket
DMPR-KC012	Hex Head Blade Pin Extension with Bracket
DMPR-KC213	Damper Jackshaft 1/2 in. Diameter, 1 Panel
DMPR-KC214	Damper Jackshaft 1/2 in. Diameter, 2 Panel
M9000-105	Pluggable 3-Terminal Block
M9000-106	Pluggable 4-Terminal Block
M9000-160	Replacement anti-rotation bracket for M9106 Series actuators
M9000-200	Commissioning Tool provides a control signal to drive on/off, floating, proportional, or resistive actuators
M9000-520	Valve Linkage Kit for field mounting an M9106 Series actuator to a 1/2 in. (DN15) to 1-1/2 in. (DN40) VG1000 Series ball valve



Dimensions, in./mm

**M9106-xGx-2 Series Electric Non-Spring Return Actuators (Continued)**

**Technical Specifications**

<b>M9106-xGx-2 Electric Non-Spring Return Actuators</b>		
<b>Power Requirement</b>	AGx: AC 20-30 V at 50/60 Hz, 2.5 VA Supply, Class 2 IGx: AC 20-30 V at 50/60 Hz, 2.8 VA Supply, Class 2 GGx: AC 20-30 V at 50/60 Hz, 3.2 VA Supply, Class 2	
<b>Control Type</b>	AGx: Floating IGx: On-Off, Floating GGx: DC 0(2) to 10 V or DC 0(4) to 20 mA proportional	
<b>Input Signal</b>	AGx and IGx: AC 20 to 30 V at 50/60 Hz GGx: DC 0 to 10 V or DC 0(4) to 20 mA	
<b>Input Signal Adjustments:</b>	AGx and IGx: CW and COM Terminals, CW rotation; CCW and COM Terminals, CCW rotation GGx (Voltage Input or Current Input): Jumper Selectable: DC 0(2) to 10 V or DC 0(4) to 20 mA Factory Setting: DC 0 to 10 V, CW rotation with signal increase Action is jumper selectable Direct (CW) or Reverse (CCW) with signal increase.	
<b>Input Impedance</b>	AGx: 200 ohms, nominal IGx: 160 ohms, nominal GGx: Voltage Input, 150,000 ohms; Current Input, 500 ohms	
<b>Feedback Signal</b>	AGF: 10,000 ohm potentiometer, 1 W GGx: DC 0 to 10 V or DC 2 to 10 V for 90° (1 mA); Corresponds to input signal span selection	
<b>Auxiliary Switch Rating</b>	xGC: Two Single-Pole, Double-Throw (SPDT) switches rated at AC 24 V, 1.5 A inductive, 3.0 A resistive, 35 VA maximum per switch, Class 2	
<b>Torque Rating</b>	1, 1.5, and 2 min. settings: 53 lb-in (6 N·m) 5.5 and 11 min. settings: 35 lb-in (4 N·m)	
<b>Cycle Life</b>	100,000 full cycles; 2,500,000 repositions rated at 53 lb-in (6 N·m)	
<b>Audible Noise Rating</b>	35 dBA maximum at 39.4 in. (1 m)	
<b>Rotation Range</b>	Adjustable from 30 to 90°, CW or CCW	
<b>Rotation Time</b>	IGx: Adjustable with switch settings (factory set for 1 min.) 60, 90, 120, 330, or 660 sec (1, 1.5, 2, 5.5 or 11 min.) at 60 Hz and 72, 108, 144, 396, or 792 sec at 50 Hz All Other Models: Nominal 60 seconds at 60 Hz and 72 seconds at 50 Hz for 90°	
<b>Electrical Connection</b>	1/4 in. spade terminals (To order optional pluggable terminal blocks, see <a href="#">Accessories for M9106-xGx-2 Actuators.</a> )	
<b>Mechanical Connection</b>	3/8 to 1/2 in. (10 to 12.7 mm) round shaft or 3/8 in. (10 mm) square shaft	
<b>Enclosure Rating</b>	NEMA 2, IP32	
<b>Ambient Operating Rating</b>	-4 to 125°F (-20 to 52°C); 90% RH maximum, noncondensing	
<b>Ambient Storage Rating</b>	IGx: -40 to 186°F (-40 to 86°C); 90% RH maximum, noncondensing All Other Models: -40 to 176°F (-40 to 80°C); 90% RH maximum, noncondensing	
<b>Shipping Weight</b>	2.4 lb (1.08 kg)	
<b>Compliance</b>  	<b>United States</b>	UL 873 Listed, File E27734, CCN XAPX
	<b>Canada</b>	CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02
	<b>Europe</b>	CE Mark - Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.

# M9108, M9116, M9124 and M9132 Series Electric Non-Spring Return Actuators

## Description

The M91xx Series includes M9108, M9116, M9124 and M9132 models. All of these direct-mount line of electric actuators operate on AC/DC 24 V power. The M91xx actuators are available for use with on-off, floating, proportional, or resistive controllers. These bidirectional actuators do not require a damper linkage, and are easily installed on a damper with a round shaft up to a 3/4 in. (20 mm) in diameter or a square shaft up to 5/8 in. (16 mm). They may be direct or remote mounted to a damper, or mounted to a valve using one of the M9000-5xx Valve Linkage Kits.

A single M91xx model delivers up to 280 lb-in (32 N·m) of torque. Two -AGx, -GGx, or -HGx models in tandem deliver twice the torque or 560 lb-in. (64 N·m). The angle of rotation is mechanically adjustable from 0 to 90° in 5-degree increments. Integral auxiliary switches are available to indicate end-stop position or to perform switching functions at any angle within the selected rotation range. Position feedback is available through switches, a potentiometer, or a DC 0(2) to 10 V signal.

## Features

- simple direct coupling reduces installation and commissioning time while improving reliability by eliminating damper linkages
- six torques: 70 to 560 lb·in (8 to 64 N·m) offer the most suitable choice for the application
- four control inputs meet the needs of most applications
- output position feedback provides simple closed-loop control with accurate position sensing
- electronic stall detection ensures higher reliability by deactivating the actuator motor when a stall condition is detected

- master/slave operation allows synchronized control for two actuators
- stacked for tandem applications
- zero and span adjustment (-HGx models) allows sequential operation of dampers from a single input signal of DC 0(2) to 10 V, DC 0(4) to 20 V, or DC 0(4) to 20 mA
- jumper-selectable rotation direction and manual gear release simplify installation, setup, and field adjustments
- NPT threaded housing provides easy connection for electrical fittings
- manual gear release simplifies damper/valve setup and commissioning

## Applications

M91xx actuators are designed to position air dampers and valves in HVAC systems. Applications include: positioning return air or exhaust dampers, controlling face and bypass dampers, positioning blades for variable volume fans, positioning VF4000 and VF5000 series butterfly valves, positioning VG1000 Series ball valves and VG7000 Series globe valves when used with the M9000-5xx Series Valve Linkages. Two each of the following models provide twice the amount of running torque of a single unit when mounted in tandem: M9116-GGx or -HGx, M9124-AGx, -GGx or -HGx, and M9132-AGx or -GGx.

Refer to the manufacturer's information to properly size the damper, valve, and/or actuator. Spring return actuators, such as the M9206 and M9216 Series actuators, are recommended for use with outdoor air dampers in cold climates. These compact M91xx actuators use a DC motor with stall detection circuitry that operates throughout the entire stroke.

The -GGx, -HGx, and -JGx models employ noise-filtering techniques on the control signal to eliminate repositioning due to line noise.



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Rotation is mechanically limited to 93° by integral end-stops. The position of the actuator is visually indicated from 0 to 90° on the cover. An anti-rotation bracket prevents lateral movement of the actuator. Pressing the spring-loaded gear release on the actuator cover disengages the gear train for manual repositioning of the coupler. For more information, refer to the *M9108, M9116, M9124, M9132 Series Electric Non-Spring Return Actuators Product Bulletin (LIT-2681058)* or the *M9108, M9116, M9124, M9132 Series Electric Non-Spring Return Actuators Installation Instructions (Part No. 34-636-399)*.

## Selection Charts

### M9108, M9116, M9124, and M9132 Electric Non-Spring Return Actuators (Part 1 of 2)

Code Number	Control Type	Torque / Voltage	Auxiliary Switches	Comments	
<b>M9108 Electric Non-spring Return Actuators</b>					
M9108-AGA-2	On-Off, Floating	70 lb·in (8 N·m) 25 to 50 seconds timing AC 24 V 50/60 Hz DC 24 V	None		
M9108-AGC-2			2-SPDT		
M9108-AGD-2			None		135 ohm potentiometer
M9108-AGE-2			2-SPDT		1,000 ohm potentiometer
M9108-GGA-2	DC 0(2) to 10 V DC 0(4) to mA proportional	70 lb·in (8 N·m) 25 to 50 seconds timing AC 24 V 50/60 Hz DC 24 V	None	DC 0(2) to 10 V Feedback	
M9108-GGC-2			2-SPDT		
M9108-HGA-2	DC 0 to 10 V DC 0 to 20 mA proportional Adjustable start and span		None	DC 0 to 10 V Feedback	
M9108-HGC-2			2-SPDT		
M9108-JGA-2	100 to 10,000 ohm potentiometer		None		
M9108-JGC-2			2-SPDT		

**M9108, M9116, M9124 and M9132 Series Electric Non-Spring Return Actuators  
(Continued)**

**M9108, M9116, M9124, and M9132 Electric Non-Spring Return Actuators (Part 2 of 2)**

Code Number	Control Type	Torque / Voltage	Auxiliary Switches	Comments	
<b>M9116 Electric Non-spring Return Actuators</b>					
M9116-AGA-2	On-Off, Floating	140 lb·in (16 N·m) 70 to 115 seconds timing AC 24 V 50/60 Hz DC 24 V	None		
M9116-AGC-2			2-SPDT		
M9116-AGD-2			None		135 ohm potentiometer
M9116-AGE-2			2-SPDT		1,000 ohm potentiometer
M9116-GGA-2	DC 0(2) to 10 V	140 lb·in (16 N·m) 70 to 115 seconds timing AC 24 V 50/60 Hz DC 24 V	None	DC 0(2) to 10 V Feedback	
M9116-GGC-2	DC 0(4) to mA proportional		2-SPDT		
M9116-HGA-2	DC 0 to 10 V		None	DC 0 to 10 V Feedback	
M9116-HGC-2	DC 0 to 20 mA proportional Adjustable start and span		2-SPDT		
M9116-JGA-2	100 to 10,000 ohm potentiometer		None		
M9116-JGC-2			2-SPDT		
<b>M9124 Electric Non-spring Return Actuators</b>					
M9124-AGA-2	On-Off, Floating		210 lb·in (24 N·m) 115 to 175 seconds timing AC 24 V 50/60 Hz DC 24 V	None	
M9124-AGC-2				2-SPDT	
M9124-AGD-2				None	
M9124-AGE-2		2-SPDT		1,000 ohm potentiometer	
M9124-GGA-2	DC 0(2) to 10 V	210 lb·in (24 N·m) 115 to 175 seconds timing AC 24 V 50/60 Hz DC 24 V	None	DC 0(2) to 10 V Feedback	
M9124-GGC-2	DC 0(4) to mA proportional		2-SPDT		
M9124-HGA-2	DC 0 to 10 V		None	DC 0 to 10 V Feedback	
M9124-HGC-2	DC 0 to 20 mA proportional Adjustable start and span		2-SPDT		
M9124-JGA-2	100 to 10,000 ohm potentiometer		None		
M9124-JGC-2			2-SPDT		
<b>M9132 Electric Non-spring Return Actuators</b>					
M9132-AGA-2	On-Off, Floating		280 lb·in (32 N·m) 115 to 205 seconds timing AC 24 V 50/60 Hz DC 24 V	None	
M9132-AGC-2				2-SPDT	
M9132-AGE-2				None	
M9132-GGA-2	DC 0(2) to 10 V	280 lb·in (32 N·m) 115 to 205 seconds timing AC 24 V 50/60 Hz DC 24 V	None	DC 0(2) to 10 V Feedback	
M9132-GGC-2	DC 0(4) to mA proportional		2-SPDT		

## M9108, M9116, M9124 and M9132 Series Electric Non-Spring Return Actuators (Continued)

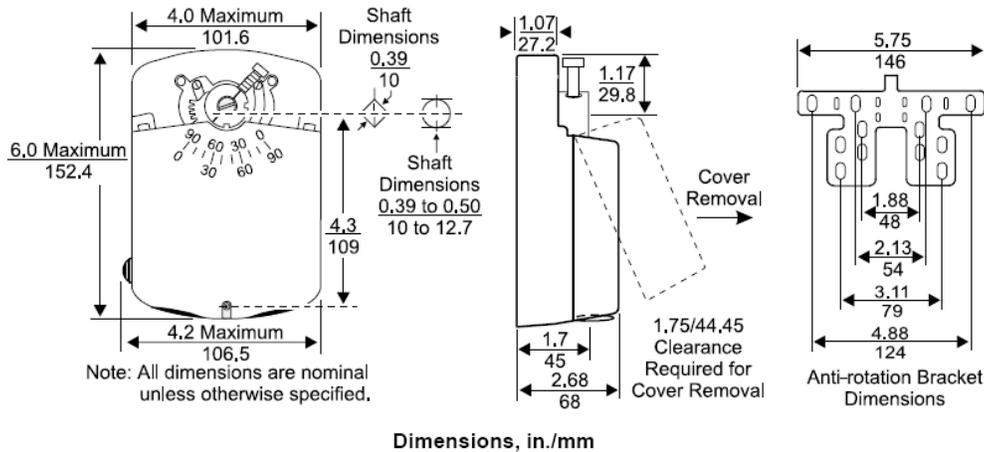
### Accessories for M9108, M9116, M9124, and M9132 Series Actuators

Code Number	Description
DMPR-KC003 <sup>1</sup>	Square Head Blade Pin Extension without Bracket for Johnson Controls CD-1300 direct-mount applications
DMPR-KC011	Hex Head Blade Pin Extension without Bracket
DMPR-KC012	Hex Head Blade Pin Extension with Bracket
DMPR-KC210	Damper Jackshaft 1 in. Diameter, 1 Panel
DMPR-KC211	Damper Jackshaft 1 in. Diameter, 2 Panel
DMPR-KC212	Damper Jackshaft 1 in. Diameter, 3 Panel
DMPR-KC213	Damper Jackshaft 1/2 in. Diameter, 1 Panel
DMPR-KC214	Damper Jackshaft 1/2 in. Diameter, 2 Panel
M9000-103	14 VA Transformer, 120/24 VAC, 60 Hz, Class 2
M9000-104	14 VA Transformer, 230/24 VAC, 60 Hz, Class 2
M9000-105	Pluggable 3-terminal block
M9000-151	Base Mount Linkage Kit for remote inside duct mounting (not intended for M9132 actuators or any tandem application)
M9000-153	Crank Arm Kit for remote mounting (not intended for M9132 actuators or any tandem application)
M9000-154	1 in. Jackshaft Coupler for mounting on a 1 in. diameter damper shaft
M9000-155	Manual Handle for positioning a damper or valve when power is removed from an M91xx actuator
M9000-158	Mounting Kit to tandem mount two M9116 -GGx or -HGx models; two M9124 -AGx, -GGx, or -HGx; or two M9132 -AGx or -GGx models on a damper
M9000-160	Replacement anti-rotation bracket for M91xx Series actuators
M9000-200	Commissioning Tool provides a control signal to drive on/off, floating, proportional, or resistive actuators.
M9000-516	Valve Linkage Kit for mounting M9108 actuators to 1/2 in. to 2 in. 2-way and 3-way VG1000 Series ball valves
M9000-518	Valve Linkage Kit for mounting M9124 actuators to 2-1/2 in. to 4 in. VG1xA5 Series flange body ball valves to VG1x43 1-1/2 in. valves

1. Furnished with the damper and may be ordered separately.

### Repair Information

If the M9108, M9116, M9124, or M9132 Electric Actuator fails to operate within its specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls® representative.



**M9108, M9116, M9124 and M9132 Series Electric Non-Spring Return Actuators (Continued)**

**Technical Specifications**

M9108, M9116, M9142, and M9132 Series Non-spring Return Actuators		
<b>Power Requirement</b>	M9108- and M9116-AGx: AC 20 to 30 V at 50/60 Hz or DC 24 V $\pm$ 10%; 6.5 VA supply minimum All Other Models: AC 20 to 30 V at 50/60 Hz or DC 24 V $\pm$ 10%; 7.5 VA supply minimum	
<b>Control Type</b>	AGx: On-Off and Floating GGx: DC 0(2) to 10 V or DC 0(4) to 20 mA proportional HGx: DC 0 to 10 V or DC 0 to 20 mA proportional with adjustable start and span JGx: Proportional from 100 to 10,000 ohm potentiometer controller	
<b>Input Signal</b>	AGx: V 24 AC at 50/60 Hz or DC 24 V GGx and HGx: DC 0(2) to 10 V, DC 0(4) to 20 V, or DC 0(4) to 20 mA JGx: Potentiometer value is 100 ohms minimum to 10,000 ohms maximum	
<b>Input Signal Adjustments</b>	AGx: Factory Setting, Terminals 1 and 2, CW rotation; Terminals 1 and 3, CCW rotation GGx and HGx (Voltage Input or Current Input): Jumper selectable: DC 0(2) to 10 V, DC 0(4) to 20 V, or DC0(4) to 20 mA Adjustable: Zero, DC 0 to 6 V, DC 0 to 12 V, or DC 0 to 12 mA Span, DC 2 to 10 V, DC 4 to 20 V, or DC 4 to 20 mA Factory Setting: DC 0 to 10 V, DC 0 to 20 mA, CW rotation with signal increase GGx, HGx, and JGx: Action is jumper selectable Direct (CW) or Reverse (CCW) with signal increase.	
<b>Input Impedance</b>	GGx and HGx: Voltage Input, 205,000 ohms for 0 (2) to 10 V and 410,000 ohms for 0 (4) to 20 V; Current Input, 500 ohms JGx: 1.8 Megohms	
<b>Feedback Signal</b>	AGD: 135 ohm feedback potentiometer AGE: 1,000 ohm feedback potentiometer GGx and HGx: DC 0 to 10 V or DC 2 to 10 V for 90° (10 VDC at 1 mA) corresponds to input signal span selection. JGx: DC 0 to 10 V for 90° (10 VDC at 1 mA)	
<b>Auxiliary Switch Rating</b>	xGC: Two Single-Pole, Double-Throw (SPDT) switches rated at 24 VAC 1.5 A inductive, 3.0 A resistive, 35 VA maximum per switch, Class 2	
<b>Torque Rating</b>	M9108: 70 lb·in (8 N·m) for one unit; not intended for tandem use M9116: 140 lb·in (16 N·m) for one unit, 280 lb·in (32 N·m) for two in tandem (-GGx, -HGx) M9124: 210 lb·in (24 N·m) for one unit, 420 lb·in (48 N·m) for two in tandem (-AGx, -GGx, -HGx) M9132: 280 lb·in (32 N·m) for one unit, 560 lb·in (64 N·m) for two in tandem (-AGx, -GGx)	
<b>Cycle Life</b>	M9108, M9116 and M9124 60,000 cycles at rated load M9132 30,000 cycles at rated load	
<b>Audible Noise Rating</b>	45 dBA at 1 m	
<b>Rotation Range</b>	0 to 90° in 5-degree increments, mechanically limited to 93° - rotation range is adjusted by repositioning the output hub	
<b>Rotation Time</b>	M9108: 30 seconds at 50% rated load, 25 to 50 seconds for 0 to 70 lb·in (0 to 8 N·m) M9116: 80 seconds at 50% rated load, 70 to 115 seconds for 0 to 140 lb·in (0 to 16 N·m) M9124: 130 seconds at 50% rated load, 115 to 175 seconds for 0 to 210 lb·in (0 to 24 N·m) M9132: 140 seconds at 50% rated load, 115 to 205 seconds for 0 to 280 lb·in (0 to 32 N·m)	
<b>Electrical Connection</b>	M9124- and M9132-AGx: 1/4 in. spade terminals with pluggable 3-terminal blocks (See <i>M9108, M9116, M9124 and M9132 Series Electric Non-Spring Return Actuators.</i> ) All Other Models: Screw terminals for 22 to 14 AWG; maximum of two 18, 20, or 22 AWG per terminal	
<b>Mechanical Connection</b>	3/8 to 3/4 in. (10 to 20 mm) diameter round shaft or 3/8 to 5/8 in. (10 to 16 mm) square shaft 1 in. (25.4 mm) diameter jackshaft with M9000-154 coupler	
<b>Enclosure Rating</b>	NEMA 2, IP42	
<b>Ambient Operating Rating</b>	-4 to 122°F (-20 to 50°C); 0 to 95% RH, noncondensing	
<b>Ambient Storage Rating</b>	-40 to 186°F (-40 to 86°C); 0 to 95% RH, noncondensing	
<b>Shipping Weight</b>	2.9 lb (1.3 kg)	
<b>Compliance</b>  	<b>United States</b>	UL 873 Listed, File E27734, CCN XAPX
	<b>Canada</b>	CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02
	<b>Europe</b>	CE Mark - Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

## M9203-xxx-2(Z) Series Electric Spring Return Actuators

### Description

The M9203-xxx-2(Z) Series Electric Spring Return Actuators provide control of dampers in HVAC systems. All actuators in this series provide 27 lb·in (3 N·m) rated torque. A mechanical spring return system provides rated torque with and without power applied to the actuator. The series includes the following control options:

- On/Off, 24 V, 85 to 264 VAC power
- On/Off and Floating Point, 24 V power
- Proportional, 24 V power, for 0(2) to 10 VDC or 0(4) to 20 mA Control Signal

These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 1/4 to 1/2 inch (6 to 12 mm) diameter with a universal clamp. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft. An optional line voltage auxiliary switch indicates an end-stop position or performs switching functions within the selected rotation range.

Refer to the *M9203-xxx-2(Z) Series Electric Spring Return Actuators Product Bulletin (LIT-12011674)* for important product application information.

### Features

- 27 lb·in (3 N·m) rated torque
- direct-coupled design
- reversible mounting
- electronic stall detection
- double-insulated construction
- microprocessor-controlled brushless DC motor (-AGx and -GGx types)
- external mode selection switch (-AGx and -GGx types)
- integral cables with colored and numbered conductors
- integral 1/2 inch (13 mm) threaded conduit connectors
- optional integrated auxiliary switch
- plenum rated models
- override control (proportional models only)
- Underwriters Laboratories Inc.® (UL), CE, and C-Tick compliance
- manufactured under International Standards Organization (ISO) 9001 quality control standards
- 5-year warranty



M9203-xxx-2(Z) Series Electric Spring Return Actuator

### Repair Information

If the M9203-xxx-2(Z) Series Electric Spring Return Actuator fails to operate within its specifications, replace the unit. For a replacement M9203-xxx-2(Z) actuator, contact the nearest Johnson Controls® representative.

### Accessories and Replacement Parts (Order Separately)

Code Number	Description
DMPR-KC003 <sup>1</sup>	7 in. (178 mm) Blade Pin Extension (without bracket) for Johnson Controls Direct-Mount Damper Applications (quantity 1)
M9000-200	Commissioning Tool that provides a control signal to drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (quantity 1)
M9000-321	Weathershield Kit for Damper Application of M9203 and M9208 Series Electric Spring Return Actuators (quantity 1)
M9000-341	Weathershield Kit for VG1000 Series Ball Valve application of M(VA)9104, M(VA)9203, and M(VA)9208 Series Electric Spring Return Actuators (quantity 1)
M9000-400	Jackshaft Linkage Adapter Kit (quantity 1)
M9000-560	Ball Valve Linkage Kit for applying M9104, M9203, and M9208 Series Electric Actuators to VG1000 Series Valves (quantity 1)
M9000-561	Thermal Barrier Kit for M9000-560 Ball Valve Linkage. Extends M(VA)9104, M(VA)9203, and M(VA)9208 Series Electric Spring Return Actuators applications to include low pressure steam (quantity 1)
M9000-604	Replacement Anti-Rotation Bracket Kit for M9203, M9208, M9210, and M9220 Series Electric Spring Return Actuators (quantity 1)
M9000-606	Position Indicator for Damper Applications (quantity 5)
M9000-607	Position Indicator for VG1000 Series Ball Valve Applications (quantity 5)
M9203-100	Remote Mounting Kit with Crankarm Kit (quantity 1)
M9203-110	Universal Mounting Kit without Crankarm Kit (quantity 1)
M9203-115	Universal Mounting Kit with Crankarm Kit (quantity 1)
M9203-150	Crankarm Kit (quantity 1)
M9203-250	Remote Mounting Kit with Crankarm Kit and Damper Linkage for D1300 Dampers (quantity 1)
M9203-601	Replacement Standard Coupler Kit (with Retainer) for Mounting M9203 Series Electric Spring Return Actuators (quantity 1)
M9203-602	Replacement Retainer for M9203 Series Electric Spring Return Actuators (quantity 5)
M9203-603	Adjustable Stop Kit for M9203 Series Electric Spring Return Actuators (quantity 1)

1. Furnished with the damper and may be ordered separately.

**M9203-xxx-2(Z) Series Electric Spring Return Actuators (Continued)**

**Selection Chart**

Code Number	Rotation Time for 90°		Power Requirements		Power Consumption			Input Signal			Position Feedback	Auxiliary Switch	Electrical Connection		
	Power On – Running (Seconds)	Power Off – Spring Return (Seconds)	24 VAC +/- 20%, VDC +/-10%	85 to 264 VAC	VA Rating, Transformer Sizing	VA: Running (Holding)	Amperage: Running (Holding)	On/Off	On/Off and Floating Point	0(2) to 10 VDC 0(4) to 20 mA (with 500 ohm Resistor)			0(2) to 10 VDC	1 SPDT, 5.0 A (2.9 A Inductive) at 240 V	48 in. (1.2 m) 18 AWG Appliance Cable
M9203-AGA-2	150	<25	X		6	4.7 (2.7)	---		X				X	X	X
M9203-AGB-2	150	<25	X		6	4.7 (2.7)	---		X			X	X	X	X
M9203-AGA-2Z	90	<25	X		6	5.1 (2.8)	---		X				X	X	X
M9203-AGB-2Z	90	<25	X		6	5.1 (2.8)	---		X			X	X	X	X
M9203-BGA-2	<75	<25	X		6	5.0 (2.5)	---	X					X	X	X
M9203-BGB-2	<75	<25	X		6	5.0 (2.5)	---	X				X	X	X	X
M9203-BUA-2	<75	<25		X		---	0.06 (0.02)	X					X	X	X
M9203-BUB-2	<75	<25		X		---	0.06 (0.02)	X				X	X	X	X
M9203-BUA-2Z	<30	<25		X		---	0.08 (0.02)	X					X	X	X
M9203-BUB-2Z	<30	<25		X		---	0.08 (0.02)	X				X	X	X	X
M9203-GGA-2	150	<25	X		6	4.7 (2.7)	---		X	X				X	X
M9203-GGB-2	150	<25	X		6	4.7 (2.7)	---		X	X		X	X	X	X
M9203-GGA-2Z	90	<25	X		6	5.1 (2.8)	---		X	X				X	X
M9203-GGB-2Z	90	<25	X		6	5.1 (2.8)	---		X	X		X	X	X	X

**Technical Specifications**

M9203-GGx-2(Z) Series Proportional Electric Spring Return Actuator (Part 1 of 2)		
Power Requirements	-GGx-2 Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 4.7 VA Running, 2.7 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 1.8 W Running, 1 W Holding Position Minimum Transformer Size: 6 VA per Actuator
	-GGx-2Z Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 5.1 VA Running, 2.8 VA Holding Position DC 24 V (DC 19.2 V to 28.8 V): Class 2 (North America) or SELV (Europe), 1.9 W Running, 1.1 W Holding Position Minimum Transformer Size: 6 VA per Actuator
Input Signal / Adjustments		Factory Set at DC 0 to 10 V, CW Rotation with Signal Increase Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with Field-Furnished 500 ohm 0.25 W Minimum Resistor Switch Selectable Direct or Reverse Action with Signal Increase
Control Input Impedance		Voltage Input: 100,000 ohm Current Input: 500 ohm with Field Furnished 500 ohm Resistor
Feedback Signal		DC 0 (2) to 10 V for Desired Rotation Range up to 95° Corresponds to Rotation Limits, 0.5 mA at 10 V Maximum
Auxiliary Switch Rating	-xxB Models	One Single-Pole, Double-Throw (SPDT), Double-Insulated Switch with Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction is Selectable with Mounting Position of Actuator: Actuator Face Labeled A Is Away from Damper or Valve: CCW Spring Return Actuator Face Labeled B Is Away from Damper or Valve: CW Spring Return

**M9203-xxx-2(Z) Series Electric Spring Return Actuators (Continued)**

<b>M9203-GGx-2(Z) Series Proportional Electric Spring Return Actuator (Part 2 of 2)</b>		
Rated Torque	Power On (Running)	27 lb-in (3 N·m) All Operating Temperatures
	Power Off (Spring Returning)	27 lb-in (3 N·m) All Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35° to 95° Maximum Position
Rotation Time for 90 Degrees of Travel	Power On (Running) -GGx-2 Models	150 Seconds Constant for 0 to 27 lb-in (3 N·m) Load, at all Operating Conditions
	Power On (Running) -GGx-2Z Models	90 Seconds Constant for 0 to 27 lb-in (3 N·m) Load, at all Operating Conditions
	Power Off (Spring Returning)	12 to 17 Seconds for 0 to 27 lb-in (3 N·m) Load, at Room Temperature 16 Seconds Nominal at Full Rated Load 22 Seconds Maximum with 27 lb-in (3 N·m) Load, at -22°F (-30°C)
Life Cycles		60,000 Full Stroke Cycles with 27 lb-in (3 N·m) Load 1,500,000 Repositions with 27 lb-in (3 N·m) Load
Audible Noise Rating	Power On (Running) -GGx-2 Models	<28 dBA at 27 lb-in. (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Running) -GGx-2Z Models	<37 dBA at 27 lb-in. (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<56 dBA at 27 lb-in. (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
Electrical Connections	-GGA-2(Z) Models	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	Auxiliary Switch (-xxB Models)	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral 1/2 in. (13 mm) Threaded Conduit Connector(s)
Mechanical Connections	Round Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
	Square Shafts	Range of Sizes: 1/4 to 5/16 in. (6 to 8 mm)
Enclosure Rating		NEMA 2 (IP54) for all Mounting Orientations
Ambient Conditions	Standard Operating	-22 to 140°F (-30 to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.38 x 3.23 x 2.26 in. (162 x 82 x 57.5 mm)
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment. (Models: All)
	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant. (Models: All)
Shipping Weight	-GGA Models:	2.0 lb (0.9 kg)
	-GGB Models:	2.4 lb (1.1 kg)



<b>M9203-AGx-2(Z) Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 1 of 3)</b>		
Power Requirements	-AGx-2 Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 4.7 VA Running, 2.7 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 1.8 W Running, 1 W Holding Position Minimum Transformer Size: 6 VA per Actuator
	-AGx-2Z Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 5.1 VA Running, 2.8 VA Holding Position DC 24 V (DC 19.2 V to 28.8 V): Class 2 (North America) or SELV (Europe), 1.9 W Running, 1.1 W Holding Position Minimum Transformer Size: 6 VA per Actuator

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

**M9203-xxx-2(Z) Series Electric Spring Return Actuators (Continued)**

M9203-AGx-2(Z) Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 2 of 3)		
<b>Input Signal</b>	<b>-AGx-2(Z) Models</b>	AC 19.2 to 28.8 V at 50/60 Hz or DC 24 V +20%/-10% Class 2 (North America) or SELV (Europe) Minimum Pulse Width: 500 ms
<b>Control Input Impedance</b>	<b>-AGx-2(Z) Models</b>	4,700 ohm
<b>Auxiliary Switch Rating</b>	<b>-xxB Models</b>	One Single-Pole, Double-Throw (SPDT), Double-Insulated Switch with Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
<b>Spring Return</b>		Direction Is Selectable with Mounting Position of Actuator: Actuator Face Labeled A Is Away from Damper or Valve: CCW Spring Return Actuator Face Labeled B Is Away from Damper or Valve: CW Spring Return
<b>Rated Torque</b>	<b>Power On (Running)</b>	27 lb-in (3 N·m) All Operating Temperatures
	<b>Power Off (Spring Returning)</b>	27 lb-in (3 N·m) All Operating Temperatures
<b>Rotation Range</b>		Maximum Full Stroke: 95° Adjustable Stop: 35 to 95° Maximum Position
<b>Rotation Time for 90 Degrees of Travel</b>	<b>Power On (Running) -AGx-2 Models</b>	150 Seconds Constant for 0 to 27 lb-in (3 N·m) Load, at All Operating Conditions
	<b>Power On (Running) -AGx-2Z Models</b>	90 Seconds Constant for 0 to 27 lb-in (3 N·m) Load, at All Operating Conditions
	<b>Power Off (Spring Returning)</b>	12 to 17 Seconds for 0 to 27 lb-in (3 N·m) Load, at Room Temperature 16 Seconds Nominal at Full Rated Load 22 Seconds Maximum with 27 lb-in (3 N·m) Load at -22°F (-30°C)
<b>Life Cycles</b>		60,000 Full Stroke Cycles with 27 lb-in (3 N·m) Load 1,500,000 Repositions with 27 lb-in (3 N·m) Load
<b>Audible Noise Rating</b>	<b>Power On (Running) -AGx-2 Models</b>	<28 dBA at 27 lb-in (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	<b>Power On (Running) -AGx-2Z Models</b>	<37 dBA at 27 lb-in (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	<b>Power On (Holding)</b>	<20 dBA at a Distance of 39-13/32 in. (1 m)
	<b>Power Off (Spring Returning)</b>	<56 dBA at 27 lb-in (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
<b>Electrical Connections</b>	<b>-AGA-2(Z) Models</b>	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	<b>Auxiliary Switch (-xxB Models)</b>	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
<b>Conduit Connections</b>		Integral 1/2 in. (13 mm) Threaded Conduit Connector(s)
<b>Mechanical Connections</b>	<b>Round Shafts</b>	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
	<b>Square Shafts</b>	Range of Sizes: 1/4 to 5/16 in. (6 to 8 mm)
<b>Enclosure Rating</b>		NEMA 2 (IP54) for all Mounting Orientations
<b>Ambient Conditions</b>	<b>Standard Operating</b>	-22 to 140°F (-30 to 60°C); 90% RH Maximum, Noncondensing
	<b>Storage</b>	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
<b>Dimensions</b>		6.38 x 3.23 x 2.26 in. (162 x 82 x 57.5 mm)

**M9203-xxx-2(Z) Series Electric Spring Return Actuators (Continued)**

M9203-AGx-2(Z) Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 3 of 3)		
	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All)
	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		-AGA Models: 2.0 lb (0.9 kg) -AGB Models: 2.4 lb (1.1 kg)

M9203-Bxx-2(Z) Series On/Off Electric Spring Return Actuators (Part 1 of 2)		
Power Requirements	-BGx-2 Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 5 VA Running, 1.6 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 2.8 W Running, 0.8 W Holding Position Minimum Transformer Size: 6 VA per Actuator
	-BUx-2 Models	AC 100 to 240 V (AC 85 V to 264 V) at 50/60 Hz: 0.06 A Running, 0.02 A Holding Position
	-BUx-2Z Models	AC 100 to 240 V (AC 85 V to 264 V) at 50/60 Hz: 0.08 A Running, 0.02 A Holding Position
Auxiliary Switch Rating	-xxB Models	One Single-Pole, Double-Throw (SPDT), Double-Insulated Switch with Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction Is Selectable with Mounting Position of Actuator: Actuator Side A Is Away from Damper or Valve: CCW Spring Return Actuator Side B Is Away from Damper or Valve: CW Spring Return
Rated Torque	Power On (Running)	27 lb·in (3 N·m) All Operating Temperatures
	Power Off (Spring Returning)	27 lb·in (3 N·m) All Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35 to 95° Maximum Position
Rotation Time for 90 Degrees of Travel	Power On (Running) -Bxx-2 Models	53 to 71 Seconds for 0 to 27 lb·in (3 N·m) Load, at Room Temperature 60 Seconds Nominal at Full Rated Load (0.25 rpm)
	Power On (Running) -BUx-2Z Models	24 to 28 Seconds for 0 to 27 lb·in (3 N·m) Load, at Room Temperature 27 Seconds Nominal at Full Rated Load (0.5 rpm)
	Power Off (Spring Returning)	19 to 23 Seconds for 0 to 27 lb·in (3 N·m) Load, at Room Temperature 22 Seconds Nominal at Full Rated Load 28 Seconds Maximum with 27 lb·in (3 N·m) Load at -22°F (-30°C)
Life Cycles		60,000 Full-Stroke Cycles with 27 lb·in (3 N·m) Load
Audible Noise Rating	Power On (Running) -Bxx-2 Models	<36 dBA at 27 lb·in. (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Running) -BUx-2Z Models	<45 dBA at 27 lb·in. (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<51 dBA at 27 lb·in. (3 N·m) Load, at a Distance of 39-13/32 in. (1 m)
Electrical Connections	Actuator (All Models)	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	Auxiliary Switch (-xxB Models)	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral 1/2 in. (13 mm) Threaded Conduit Connector(s)

**M9203-xxx-2(Z) Series Electric Spring Return Actuators (Continued)**

M9203-Bxx-2(Z) Series On/Off Electric Spring Return Actuators (Part 2 of 2)		
Mechanical Connections	Round Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
	Square Shafts	Range of Sizes: 1/4 to 5/16 in. (6 to 8 mm)
Enclosure Rating		NEMA 2 (IP54) for All Mounting Orientations
Ambient Conditions	Standard Operating	-22 to 140°F (-30 to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.38 x 3.23 x 2.26 in. (162 x 82 x 57.5 mm)
Compliance  	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		-BxA Models: 2.0 lb (0.9 kg) -BxB Models: 2.4 lb (1.1 kg)

## M9208-xxx-x Series Electric Spring Return Actuators

### Description

The M9208-xxx-x Series Electric Spring Return Actuators provide control of dampers in HVAC systems. All actuators in this series provide 70 lb-in (8 N-m) rated torque. A mechanical spring return system provides rated torque with and without power applied to the actuator. The series includes the following control options:

- On/Off, 24 V, 120 VAC, 230 VAC power
- On/Off and Floating Point, 24 V power
- Proportional, 24 V power, for 0(2) to 10 VDC or 0(4) to 20 mA Control Signal

These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 5/16 to 5/8 inch (8 to 16 mm) diameter with a universal clamp. For shafts up to 3/4 inch (19 mm) diameter use the accessory Large Shaft Coupler Kit M9208-600. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft. Optional line voltage auxiliary switches indicate an end-stop position or perform switching functions within the selected rotation range.

Refer to the *M9208-xxx-x Series Electric Spring Return Actuators Product Bulletin (LIT-12011480)* for important product application information.

### Features

- 70 lb-in. (8 N-m) rated torque
- direct-coupled design
- reversible mounting
- electronic stall detection
- double-insulated construction
- microprocessor-controlled brushless DC motor (-AGx and -GGx types)
- external mode selection switch (-AGx and -GGx types)
- locking manual override with auto release and crank storage
- integral cables with colored and numbered conductors
- integral connectors for 3/8 inch (10 mm) Flexible Metal Conduit (FMC)
- optional integrated auxiliary switches
- UL, CE, and C-Tick compliance
- manufactured under International Standards Organization (ISO) 9001 quality control standards
- 5-year warranty

### Repair Information

If the M9208-xxx-x Series Electric Spring Return Actuator fails to operate within its specifications, replace the unit. For a replacement M9208-xxx-x actuator, contact the nearest Johnson Controls® representative.



M9208-xxx-x Series Electric Spring Return Actuator

### Accessories and Replacement Parts (Order Separately)

Code Number	Description
DMPR-KC003 <sup>1</sup>	7 in. (178 mm) Blade Pin Extension (without bracket) for Johnson Controls Direct-Mount Damper Applications (quantity 1)
M9000-200	Commissioning Tool that provides a control signal to drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (quantity 1)
M9000-321	Weathershield Kit for Damper Application of M9203 and M9208 Series Electric Spring Return Actuators (quantity 1)
M9000-400	Jackshaft Linkage Kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft. (quantity 1)
M9000-560	Ball Valve Linkage Kit for applying M9203 and M9208 Series Electric Spring Return Actuators to VG1000 Series Valves (quantity 1)
M9000-604	Replacement Anti-Rotation Bracket Kit for M9208, M9210, and M9220 Series Electric Spring Return Actuators (quantity 1)
M9000-606	Position Indicator for Damper Applications of M9203 and M9208 Series Actuators (quantity 5)
M9200-100	Threaded Conduit Adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)
M9208-100	Remote Mounting Kit, including Mounting Bracket, M9208-150 Crankarm, Ball Joint, and mounting fasteners (quantity 1)
M9208-150	Crankarm Adapter Kit (quantity 1)
M9208-600	Large Shaft Coupler Kit (with Locking Clip) for Mounting M9208 Series Electric Spring Return Actuators on dampers with round shafts from 1/2 to 3/4 in. (12 to 19 mm) or square shafts from 3/8 to 9/16 in. (10 to 14 mm) (quantity 1)
M9208-601	Replacement Standard Coupler Kit (with Locking Clip) for mounting M9208 Series Electric Spring Return Actuators on dampers with round shafts from 5/16 to 5/8 in. (8 to 16 mm) or square shafts from 1/4 to 1/2 in. (6 to 12 mm) (quantity 1)
M9208-602	Replacement Locking Clips for M9208 Series Electric Spring Return Actuators (quantity 5)
M9208-603	Adjustable Stop Kit for M9208 Series Electric Spring Return Actuators (quantity 1)
M9208-604	Replacement Manual Override Cranks for M9208 Series Electric Spring Return Actuators with long crank radius: 2.83 in. (72 mm) (quantity 5)
M9208-605	Replacement Manual Override Cranks for M9208 Series Electric Spring Return Actuators with short crank radius: 1.83 in. (46.5 mm) (quantity 5)

1. Furnished with the damper and may be ordered separately.

**M9208-xxx-x Series Electric Spring Return Actuators (Continued)**

**Selection Chart**

Code Number	Rotation Time	For 90°	Power Requirements				Power Consumption			Input Signal		Position Feedback	Auxiliary Switches	Electrical Connection			
			Power On (Running)	Power Off (Spring Return)	24 VAC +/- 25%, VDC +20%/-10%	24 VAC +/- 20%, VDC +20%/-10%	120 VAC +/- 10%	230 VAC +/- 10%	VA Rating, Transformer Sizing	VA: Running (Holding)	Amperage: Running (Holding)			On/Off	Floating Point	0(2) to 10 VDC 0(4) to 20 mA (with 500 ohm Resistor)	0(2) to 10 VDC
M9208-AGA-2	150	17 to 25 <sup>1</sup>		x			8	7.9 (5.5)	-	x	x					x	x
M9208-AGA-3	150	17 to 25 <sup>1</sup>		x			8	7.9 (5.5)	-	x	x					x	x
M9208-AGC-3	150	17 to 25 <sup>1</sup>		x			8	7.9 (5.5)	-	x	x		x				
M9208-BGA-3	55 to 71	13 to 26 <sup>2</sup>	x				7	6.1 (1.2)	-	x						x	x
M9208-BGC-3	55 to 71	13 to 26 <sup>2</sup>	x				7	6.1 (1.2)	-	x			x			x	x
M9208-BAA-3	55 to 71	13 to 26 <sup>2</sup>			x		-	-	0.05 (0.03)	x						x	x
M9208-BAC-3	55 to 71	13 to 26 <sup>2</sup>			x		-	-	0.05 (0.03)	x			x			x	x
M9208-BDA-3	55 to 71	13 to 26 <sup>2</sup>				x	-	-	0.04 (0.03)	x						x	x
M9208-BDC-3	55 to 71	13 to 26 <sup>2</sup>				x	-	-	0.04 (0.03)	x			x			x	x
M9208-GGA-2	150	17 to 25 <sup>1</sup>		x			8	7.9 (5.5)	-			x	x			x	x
M9208-GGA-3	150	17 to 25 <sup>1</sup>		x			8	7.9 (5.5)	-			x	x			x	x
M9208-GGC-3	150	17 to 25 <sup>1</sup>		x			8	7.9 (5.5)	-			x	x	x		x	x

1. 22 seconds nominal at room temperature and rated load, 94 seconds maximum at rated load and -40°F (-40°C)
2. 21 seconds nominal at room temperature and rated load, 39 seconds maximum at rated load and -4°F (-20°C), 108 seconds maximum at 53 lb·in. (6 N·m) and -40°F (-40°C)

**M9208-xxx-x Series Electric Spring Return Actuators (Continued)**
**Technical Specifications**

M9208-GGx-x Series Proportional Electric Spring Return Actuator (Part 1 of 2)		
<b>Power Requirements</b>	-GGx Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 7.9 VA Running, 5.5 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 1.9 W Holding Position Minimum Transformer Size: 8 VA per Actuator
<b>Input Signal / Adjustments</b>	-GGx Models	Factory Set at DC 0 to 10 V, CW Rotation with Signal Increase; Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with Field-Furnished 500 ohm 0.25 W Minimum Resistor; Switch Selectable Direct or Reverse Action with Signal Increase
<b>Control Input Impedance</b>	-GGx Models	Voltage Input: 100,000 ohm Current Input: 500 ohm with Field Furnished 500 ohm Resistor
<b>Feedback Signal</b>	-GGx Models	DC 0 (2) to 10 V for Desired Rotation Range up to 95° Corresponds to Rotation Limits, 0.5 mA at 10 V Maximum
<b>Auxiliary Switch Rating</b>	-xxC Models	Two Single-Pole, Double-Throw (SPDT), Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
<b>Spring Return</b>		Direction Is Selectable with Mounting Position of Actuator: Actuator Face Labeled A Is Away from Damper or Valve: CCW Spring Return Actuator Face Labeled B Is Away from Damper or Valve: CW Spring Return
<b>Rated Torque</b>	<b>Power On (Running)</b>	70 lb·in (8 N·m) All Operating Temperatures
	<b>Power Off (Spring Returning)</b>	70 lb·in (8 N·m) All Operating Temperatures
<b>Rotation Range</b>		Maximum Full Stroke: 95° Adjustable Stop: 35° to 95° Maximum Position
<b>Rotation Time for 90 Degrees of Travel</b>	<b>Power On (Running)</b>	150 Seconds Constant for 0 to 70 lb·in (8 N·m) Load, at all Operating Conditions
	<b>Power Off (Spring Returning)</b>	17 to 25 Seconds for 0 to 70 lb·in (8 N·m) Load, at Room Temperature 22 Seconds Nominal at Full Rated Load 94 Seconds Maximum with 70 lb·in (8 N·m) Load, at -40°F (-40°C)
<b>Life Cycles</b>		60,000 Full Stroke Cycles with 70 lb·in (8 N·m) Load 1,500,000 Repositions with 70 lb·in (8 N·m) Load
<b>Audible Noise Rating</b>	<b>Power On (Running)</b>	<35 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	<b>Power On (Holding)</b>	<20 dBA at a Distance of 39-13/32 in. (1 m)
	<b>Power Off (Spring Returning)</b>	<52 dBA at 70 lb·in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
<b>Electrical Connections</b>	<b>Models: GGx-3</b>	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	<b>Models: GGA-2</b>	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	<b>Auxiliary Switches (-xxC Models)</b>	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
<b>Conduit Connections</b>		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
<b>Mechanical Connections</b>	<b>Round Shafts</b>	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	<b>Square Shafts</b>	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
<b>Enclosure Rating</b>		NEMA 2 (IP54) for all Mounting Directions
<b>Ambient Conditions</b>	<b>Standard Operating</b>	-40 to 140°F (-40 to 60°C); 90% RH Maximum, Noncondensing
	<b>Storage</b>	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
<b>Dimensions</b>		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)

**M9208-xxx-x Series Electric Spring Return Actuators (Continued)**

M9208-GGx-x Series Proportional Electric Spring Return Actuator (Part 2 of 2)		
	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		Models: -GGA: 3.43 lb (1.6 kg) Models: -GGC: 3.8 lb (1.7 kg)

M9208-AGx-x Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 1 of 2)		
Power Requirements	-AGx Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 7.9 VA Running, 5.5 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 1.9 W Holding Position Minimum Transformer Size: 8 VA per Actuator
Input Signal	-AGx Models	AC 19.2 to 28.8 V at 50/60 Hz or DC 24 V +20%/-10%, Class 2 (North America) or SELV (Europe) Minimum Pulse Width: 500 ms
Control Input Impedance	-AGx Models	3,000 ohm Control Inputs
Auxiliary Switch Rating	-xxC Models	Two SPDT, Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction Is Selectable with Mounting Position of Actuator: Actuator Face Labeled A Is Away from Damper or Valve: CCW Spring Return Actuator Face Labeled B Is Away from Damper or Valve: CW Spring Return
Rated Torque	Power On (Running)	70 lb-in (8 N·m) All Operating Temperatures
	Power Off (Spring Returning)	70 lb-in (8 N·m) All Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35 to 95° Maximum Position
Rotation Time for 90 Degrees of Travel	Power On (Running)	150 Seconds Constant for 0 to 70 lb-in (8 N·m) Load, at all Operating Conditions
	Power Off (Spring Returning)	17 to 25 Seconds for 0 to 70 lb-in (8 N·m) Load, at Room Temperature 22 Seconds Nominal at Full Rated Load 94 Seconds Maximum with 70 lb-in (8 N·m) Load, at -40°F (-40°C)
Life Cycles		60,000 Full Stroke Cycles with 70 lb-in (8 N·m) Load 1,500,000 Repositions with 70 lb-in (8 N·m) Load
Audible Noise Rating	Power On (Running)	<35 dBA at 70 lb-in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<52 dBA at 70 lb-in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
Electrical Connections	Models: AGx-3	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	Models: AGA-2	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	Auxiliary Switches (-xxC Models)	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical Connections	Round Shafts	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
Enclosure Rating		NEMA 2 (IP54) for all Mounting Directions

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

**M9208-xxx-x Series Electric Spring Return Actuators (Continued)**

<b>M9208-AGx-x Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 2 of 2)</b>		
<b>Ambient Conditions</b>	<b>Standard Operating</b>	-40 to 140°F (-40 to 60°C); 90% RH Maximum, Noncondensing
	<b>Storage</b>	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
<b>Dimensions</b>	6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)	
<b>Compliance</b>  	<b>United States</b>	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	<b>Canada</b>	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
	<b>Europe</b>	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	<b>Australia and New Zealand</b>	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
<b>Shipping Weight</b>	Models: -AGA: 3.43 lb (1.6 kg) Models: -AGC: 3.8 lb (1.7 kg)	

<b>M9208-Bxx-3 Series On/Off Electric Spring Return Actuators (Part 1 of 2)</b>		
<b>Power Requirements</b>	<b>-BGx Models</b>	AC 24 V (AC 18 V to 30 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 6.1 VA Running, 1.2 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 0.5 W Holding Position Minimum Transformer Size: 7 VA per Actuator
	<b>-BAx Models</b>	AC 120 V (AC 102 V to 132 V) at 60 Hz: 0.05 A Running, 0.03 A Holding Position
	<b>-BDx Models</b>	AC 230 V (AC 198 V to 264 V) at 50/60 Hz: 0.04 A Running, 0.03 A Holding Position
<b>Auxiliary Switch Rating</b>	<b>-xxC Models</b>	Two SPDT, Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
<b>Spring Return</b>	Direction Is Selectable with Mounting Position of Actuator: Actuator Side A Is Away from Damper or Valve: CCW Spring Return Actuator Side B Is Away from Damper or Valve: CW Spring Return	
<b>Rated Torque</b>	<b>Power On (Running)</b>	70 lb·in (8 N·m) All Operating Temperatures
	<b>Power Off (Spring Returning)</b>	70 lb·in (8 N·m) at Standard Operating Temperatures 53 lb·in (6 N·m) at Extended Operating Temperatures
<b>Rotation Range</b>	Maximum Full Stroke: 95° Adjustable Stop: 35 to 95°, Maximum Position	
<b>Rotation Time for 90 Degrees of Travel</b>	<b>Power On (Running)</b>	55 to 71 Seconds for 0 to 70 lb·in (8 N·m) Load, at All Operating Conditions 60 Seconds Nominal at Full Rated Load (0.25 rpm)
	<b>Power Off (Spring Returning)</b>	13 to 26 Seconds for 0 to 70 lb·in (8 N·m) Load, at Room Temperature 21 Seconds Nominal at Full Rated Load 39 Seconds Maximum with 70 lb·in (8 N·m) Load at -4°F (-20°C) 108 Seconds Maximum with 53 lb·in (6 N·m) Load at -40°F (-40°C)
<b>Life Cycles</b>	60,000 Full-Stroke Cycles with 70 lb·in. (8 N·m) Load	
<b>Audible Noise Rating</b>	<b>Power On (Running)</b>	<47 dBA at 70 lb·in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	<b>Power On (Holding)</b>	<20 dBA at a Distance of 39-13/32 in. (1 m)
	<b>Power Off (Spring Returning)</b>	<52 dBA at 70 lb·in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
<b>Electrical Connections</b>	<b>Actuator (All Models)</b>	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
	<b>Auxiliary Switches (-xxC Models)</b>	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm <sup>2</sup> ) Conductors and 0.25 in. (6 mm) Ferrule Ends
<b>Conduit Connections</b>	Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit	

**M9208-xxx-x Series Electric Spring Return Actuators (Continued)**

M9208-Bxx-3 Series On/Off Electric Spring Return Actuators (Part 2 of 2)		
<b>Mechanical Connections</b>	<b>Round Shafts</b>	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	<b>Square Shafts</b>	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
<b>Ambient Conditions</b>	<b>Extended Operating</b>	-40 to -4°F (-40 to -20°C); 90% RH Maximum, Noncondensing
	<b>Storage</b>	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
<b>Dimensions</b>		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)
<b>Compliance</b>  	<b>United States</b>	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	<b>Canada</b>	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
	<b>Europe</b>	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	<b>Australia and New Zealand</b>	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
<b>Shipping Weight</b>		Models: -BGC: 3.75 lb (1.7 kg) Models: -BAC and -BDC: 4.15 lb (1.9 kg)

# M9220 Series Electric Spring Return Actuators

## Description

The M9220-xxx-3 Actuators are direct mount, spring return electric actuators that operate with these available power options:

- AC 24 V at 50/60 Hz or DC 24 V (AGx, BGx, GGx, HGx)
- AC 120 V at 60 Hz (BAx)
- AC 230 V at 50/60 Hz (BDx)

These bidirectional actuators do not require a damper linkage, and are easily installed on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts using the standard shaft clamp included with the actuator. An optional M9220-600 Jackshaft Coupler Kit is available for 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts.

A single M9220-xxx-3 Electric Spring Return Actuator provides a running and spring return torque of 177 lb-in (20 N·m). Two or three models mounted in tandem deliver twice or triple the torque. Integral line voltage auxiliary switches are available on the xxC models to indicate end-stop position, or to perform switching functions within the selected rotation range.

Refer to the *M9220-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011057)* for important product application information.

## Features

- available torques of 177 lb·in (20 N·m) for single actuators, 354 lb·in (40 N·m) for two models, and 531 lb·in (60 N·m) for three models mounted in tandem — offer a selection that is most suitable for the application
- reversible mounting design — simplifies installation and enables the actuator to spring return in either direction
- electronic stall detection throughout entire rotation range — extends the life of the actuator by deactivating the actuator motor when an overload condition is detected
- removable coupler — adapts to a shorter damper shaft
- integral 48 in. (1.2 m) halogen-free cables with colored and numbered conductors — simplify field wiring
- integral auxiliary switches (xxC Models) — provide one fixed and one adjustable switch point with line voltage capability
- NEMA 2 (IP54) rated aluminum enclosure — protects the internal components of the actuator from dirt and moisture
- easy-to-use locking manual override with auto release and crank storage — allows for manual positioning of the actuator hub
- integral connectors for 3/8 in. flexible metal conduit — simplify installation and field wiring
- microprocessor-controlled brushless DC motor (-AGx, -GGx, and -HGx types) — provides constant run-time independent of torque



**M9220 Series Electric Spring Return Actuator**

## Applications

The M9220-xxx-3 Electric Spring Return Actuators provide reliable control of dampers and valves in Heating, Ventilating, and Air Conditioning (HVAC) systems. The M9220-xxx-3 Actuators are available for use with on/off, floating, and proportional controllers.

## Repair Information

If the M9220-xxx-3 Electric Spring Return Actuators fails to operate within its specifications, refer to the *M9220-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011057)* for a list of repair parts available.

## Selection Chart

Code Number	Control Type	Auxiliary Switches	Power Requirements
M9220-AGA-3	Floating	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-AGC-3	Floating	Two	AC 24 V at 50/60 Hz or DC 24 V
M9220-BAA-3	On/Off	None	AC 120 V at 60 Hz
M9220-BAC-3	On/Off	Two	AC 120 V at 60 Hz
M9220-BDA-3	On/Off	None	AC 230 V at 50/60 Hz
M9220-BDC-3	On/Off	Two	AC 230 V at 50/60 Hz
M9220-BGA-3	On/Off	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-BGC-3	On/Off	Two	AC 24 V at 50/60 Hz or DC 24 V
M9220-GGA-3	Proportional	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-GGC-3	Proportional	Two	AC 24 V at 50/60 Hz or DC 24 V
M9220-HGA-3	Proportional w/Adjustable Zero and Span	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-HGC-3	Proportional w/Adjustable Zero and Span	Two	AC 24 V at 50/60 Hz or DC 24 V

**M9220 Series Electric Spring Return Actuators (Continued)**

**Accessories**

Code Number	Description
<b>DMPR-KC003<sup>1</sup></b>	7 in. (178 mm) Blade Pin Extension (without Bracket) for Johnson Controls® Direct-Mount Damper Applications (quantity 5)
<b>M9000-153</b>	Crank arm (quantity 1)
<b>M9000-158</b>	Tandem Mounting Kit used to Mount Two Models of M9220-xxx-3 Series Proportional Electric Spring Return Actuators (quantity 1)
<b>M9000-170</b>	Remote Mounting Kit, Horizontal. Kit includes Mounting Bracket, M9000-153 Crank Arm, Ball Joint, and Mounting Bolts (quantity 1)
<b>M9000-171</b>	Remote Mounting Kit, Vertical. Kit includes Mounting Bracket, M9000-153 Crank Arm, Ball Joint, and Mounting Bolts (quantity 1)
<b>M9000-200</b>	Commissioning Tool that Provides a Control Signal to Drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (quantity 1)
<b>M9000-320</b>	Weather Shield Enclosure - NEMA 3R enclosure for protecting a single M9210/20 actuator from rain, sleet, or snow (quantity 1)
<b>M9000-400</b>	Jackshaft Linkage Kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft (quantity 1)
<b>M9000-604</b>	Replacement Anti-rotation Bracket Kit (with Screws) for M9220-xxx-3 Series Proportional Electric Spring Return Actuators (quantity 1)
<b>M9200-100</b>	Threaded Conduit Adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)
<b>M9220-600</b>	1 in. (25 mm) Jackshaft Coupler Kit (with Locking Clip) for Mounting M9220-xxx-3 Proportional Electric Spring Return Actuators on Dampers with 3/4 to 1-1/16 in. or 19 to 27 mm Round Shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm Square Shafts (quantity 1)
<b>M9220-601</b>	Replacement Coupler Kit (with Locking Clip) for Mounting M9220-xxx-3 Proportional Electric Spring Return Actuators on Dampers with 1/2 to 3/4 in. or 12 to 19 mm Round Shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm Square Shafts (quantity 1)
<b>M9220-602</b>	Replacement Locking Clips for M9220-xxx-3 Proportional Electric Spring Return Actuators (Five per Bag)
<b>M9220-603</b>	Adjustable Stop Kit for M9220-xxx-3 Proportional Electric Spring Return Actuators (quantity 1)
<b>M9220-604</b>	Replacement Manual Override Cranks for M9220-xxx-3 Proportional Electric Spring Return Actuators (Five per Bag)
<b>M9220-610</b>	Replacement Shaft Gripper, 10 mm Square Shaft with Locking Clip (quantity 1)
<b>M9220-612</b>	Replacement Shaft Gripper, 12 mm Square Shaft with Locking Clip (quantity 1)
<b>M9220-614</b>	Replacement Shaft Gripper, 14 mm Square Shaft with Locking Clip (quantity 1)

1. Furnished with the damper and may be ordered separately.



## M9220 Series Electric Spring Return Actuators (Continued)

### Technical Specifications

M9220-xxx Electric Spring Return Actuators (Part 1 of 2)		
Product Codes		M9220-AGx-3 Models: Floating M9220-Bxx-3 Models: On/Off M9220-GGx-3 Models: Proportional M9220-HGx-3 Models: Proportional Adjustable
Power Requirements	AGx, HGx, GGx Models	AC 24 V (19.2 to 30 V) at 50/60 Hz: Class 2, 15.5 VA Running, 7.7 VA Holding Position; DC 24 V (21.6 to 26.4 V): Class 2, 6.7 W Running, 2.9 W Holding Position
	BAX Models	AC 120 V (AC 102 to 132 V) at 60 Hz: 0.25 A Running, 0.13 A Holding Position
	BDx Models	AC 230 V (AC 198 to 264 V) at 50/60 Hz: 0.15 A Running, 0.09 A Holding Position
	BGx Models	AC 24 V (19.2 to 30 V) at 50/60 Hz: Class 2, 24.6 VA Running, 7.7 VA Holding Position; DC 24 V (21.6 to 26.4 V): Class 2, 17.6 W Running, 2.8 W Holding Position
Transformer Sizing Requirements	AGx, HGx, GGx Models	20 VA Minimum per Actuator
	Bxx Models	25 VA Minimum per Actuator
Input Signal/Adjustments	AGx Models	DC 0 (2) to 10 V or 0 (4) to 20 mA with Field Furnished 500 ohm resistor; Switch Selectable Direct or Reverse Action with Signal Increase, 500 ms minimum pulse width
	GGx Models	Factory Set DC 0 to 10 V, CW Rotation with Signal Increase; Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with Field Furnished 500 ohm, 0.25 W minimum resistor; Switch Selectable Direct or Reverse Action with Signal Increase
	HGx Models	Factory Set DC 0 to 10 V, CW Rotation with Signal Increase; Selectable DC 0 to 10 V or 0 to 20 mA with Field Furnished 500 ohm, 0.25 W minimum resistor; Start Point Programmable DC 0 to 10 V; Span Programmable DC 2 to 10 V; Switch Selectable Direct or Reverse Action with Signal Increase
Control Input Impedance	GGx, HGx Models	Voltage Input: 200,000 ohms; Current Input: 500 ohms with Field Furnished 500 ohm Resistor
Feedback Signal	GGx Models	0 (2) to 10 VDC for Desired Rotation Range up to 90°; Corresponds to Rotation Limits, 1 mA maximum
	HGx Models	0 to 10 VDC for Desired Rotation Range up to 90°; Corresponds to Rotation Limits, 1 mA maximum
Auxiliary Switch Rating	xxC Models	Two Single-Pole, Double-Throw (SPDT), Double-Insulated Switches with Gold Flash Contacts: AC 24 V, 50 VA Pilot Duty; AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty; AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction is Selectable with Mounting Position of Actuator: Side A, Actuator Face Away from Damper for CCW Spring Return; Side B, Actuator Face Away from Damper for CW Spring Return
Running and Spring Return Torque		177 lb·in (20 N·m) for a Single Actuator; 354 lb·in (40 N·m) for Two Models Mounted in Tandem 531 lb·in (60 N·m) for Three Models Mounted in Tandem
Valid Tandem Combinations		Two M9220-Bxx-3 Three M9220-AGx-3 One M9220-HGx-3 master with one or two M9220-GGx-3 slaves One M9220-GGx-3 master with one or two M9220-GGx-3 slaves
Rotation Range		Adjustable from 30 to 90° CW or CCW with Optional M9220-603 Adjustable Stop Kit; Mechanically Limited to 90°
Rotation Time Power On (Running)	AGx, HGx, GGx Models	150 Seconds for 0 to 177 lb·in (0 to 20 N·m) at All Operating Conditions; Independent of Load
	BGx Models	24 to 57 Seconds for 0 to 177 lb·in (0 to 20 N·m) at All Operating Conditions; 35 Seconds Nominal at Full Rated Load
Rotation Time Power Off (Spring Returning)	AGx, HGx, GGx Models	20 Seconds for 0 to 177 lb·in (0 to 20 N·m) at Room Temperature
	BGx Models	11 to 15 Seconds for 0 to 177 lb·in (0 to 20 N·m) at Room Temperature; 35 Seconds Maximum for 0 to 177 lb·in (0 to 20 N·m) at -22°F (-30°C) 130 Seconds Maximum for 0 to 177 lb·in (0 to 20 N·m) at -40°F (-40°C)
Cycles		60,000 Full Stroke Cycles; 1,500,000 repositions
Audible Noise Rating (AGx, HGx, GGx Models)	Power On (Running)	<40 dBA at 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<55 dBA at 39-13/32 in. (1 m)

**M9220 Series Electric Spring Return Actuators (Continued)**

M9220-xxx Electric Spring Return Actuators (Part 2 of 2)		
Audible Noise Rating (BGx Models)	Power On (Running)	<66 dBA at 39-13/32 in. (1 m)
	Power On (Holding)	<18 dBA at 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<66 dBA at 39-13/32 in. (1 m)
Electrical Connections	Actuator (All Models)	48 in. (1.2 m) Halogen-Free Cable with 18 AWG (0.75 mm <sup>2</sup> ) Wire Leads
	Auxiliary Switches (xxC Models)	48 in. (1.2 m) Halogen-Free Cable with 18 AWG (0.75 mm <sup>2</sup> ) Wire Leads
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical Connections	Standard Shaft Clamp Included with Actuator	1/2 to 3/4 in. or 12 to 19 mm Diameter Round Shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm Square Shafts
	Optional M9220-600 Jackshaft Coupler Kit	3/4 to 1-1/16 in. or 19 to 27 mm Diameter Round Shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm Square Shafts
Aluminum Enclosure		NEMA 2 (IP54) for All Mounting Orientations
Ambient Conditions	Operating	-40 to 131°F (-40 to 55°C); 90% RH Maximum, Noncondensing
	Storage	-85 to 185°F (-65 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		See <i>Dimensions</i> .
Compliance  	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight	xGx Models	6.4 lb (2.9 kg)
	BAX and BDx Models	7.6 lb (3.5 kg)

# FC-1600 1-1/2 Hour Curtain Fire Damper

## Description

The FC-1600 is a curtain-style fire damper using 20-gauge steel frames. It is 1-1/2 hour fire rated for use in dynamic or static systems.

Refer to the *FC-2000 1-1/2 Hour Curtain Fire Dampers Product Bulletin (LIT-1201701)* for important product information.

## Features

- dynamic or static listing
- vertical or horizontal installation
- low cost.

## To Order

Specify the code number from the selection chart.

## FC-1600 Curtain Fire Damper Selection Chart

	Code Number	F	O	V	N	-	w	w	x	x	h	h		
Application	F = Fire													
Blade Operation	C = Curtain													
Blade/Frame Type	K = Static Vertical Mount													
	L = Static Horizontal Mount													
	M = Dynamic Vertical Mount													
	N = Dynamic Horizontal Mount													
Closure Temperature	L = 165°F Fusible Link													
	M = 212°F Fusible Link													
	H = 265°F Fusible Link													
Actuator	N = None													
Width Dimension	See Note below													
Height Dimension	See Note below													
Options (limit 2)	See Factory Options													

**Note:** Blade/frame type K (static vertical mount) dampers are available 4 to 120 inches wide by 4 to 72 inches high, in 1 inch increments.

**Note:** Blade/frame type L (static horizontal mount) dampers are available 6 to 114 inches wide by 6 to 38 inches high, in 1-inch increments. If the width is not greater than 90 inches, the height may be increased up to 91 inches, in 1 inch increments.

**Note:** Blade/frame type M (dynamic vertical mount) dampers are available 6 to 33 inches wide by 6 to 36 inches high, in 1 inch increments.

**Note:** Blade/frame type N (dynamic horizontal mount) dampers are available 10 to 48 inches wide by 10 to 36 inches high, in 1 inch increments. If the width is not greater than 36 inches, the height may be increased up to 48 inches, in 1 inch increments.

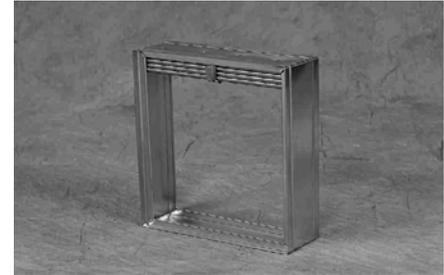
**Note:** Note: Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, and Shutters. All dampers are labeled as to direction of airflow and position during testing

## Construction

Part	Construction
Frame	5 in. x 1 in. x 20-gauge (127 mm x 25 mm x 1.0 mm), galvanized steel channel
Blades	24-gauge (0.7 mm) galvanized steel curtain type in air stream
Duct Collars	24-gauge x 2-1/2 in. (0.7 mm x 64 mm) long galvanized steel
Closure Spring	301 stainless steel constant force type
Sleeve	20-gauge, 12 in. long galvanized sheet steel
Fusible Link	Metallic that melts at the closure temperature

Not all combinations are available. For information about available combinations, please contact your Johnson Controls® representative. FC-1600 dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls damper dimensions are from the outside edges of the damper frame.

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



FC-1600 1-1/2 /Hour Curtain Fire Damper

## Factory Options

- E = Exact whole inch size no undercut
- F = Angle
- L = Sleeve, 20 gauge, 20 inch length
- V = Transition to round or oval

# FD-1600 1-1/2 Hour Dynamic Rated Multi-Blade Fire Dampers

## Description

The FD-1600 Fire Damper is designed to prevent the spread of fire with a 1-1/2 hour fire rating for use within a dynamic HVAC system during life safety situations.

The FD-1600 is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555 standards.

Refer to the *FD-1600 1-1/2 Hour Dynamic Rated Multi-Blade Fire Dampers Product Bulletin (LIT-1201630)* for important product information.

## Features

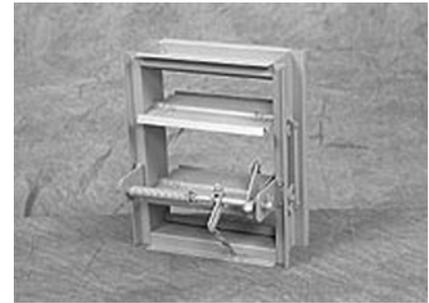
- 1-1/2 hour fire rating
- 5 inch x 1 inch hat channel frame reinforced with corner braces. Three-year warranty on materials and workmanship.
- shipping in as little as five working days from order entry

## To Order

Specify the code number from the selection chart. Not all combinations are available. For information about available combinations, please contact your Johnson Controls representative.

FD-1600 fire dampers are available in one inch increments. Actual damper size is 1/4 in. less than nominal. All Johnson Controls® damper dimensions are from the outside edges of the damper frame.

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



**FD-1600 1-1/2 Hour Dynamic Rated Multi-Blade Fire Dampers**

## FD-1600 Fire Damper Selection Chart

	Code Number	F	O	W	N	-	w	w	w	x	h	h	h			
<b>Application</b>	F = Fire															
<b>Blade Operation</b>	O = Opposed															
<b>Blade Type</b>	W = 16 gauge galvanized steel															
<b>Heat-actuated Device</b>	H = 350°F Fusible Link L = 165°F Fusible Link M = 212°F Fusible Link															
<b>Actuator Type</b>	N = None															
<b>Width Dimensions</b>	008 to 072, 1 inch increments															
<b>Height Dimensions</b>	008 to 096, 1 inch increments															
<b>Factory-installed Options</b>	E = Exact whole inch size, no undercut F = Angle L = Sleeve, 20 gauge, 20 in. length V = Transition to round or oval duct															

**Note:** Maximum single panel size is 36 inches x 48 inches

**Note:** Not all combinations are available.

FD-1600 dampers include standard 16-gauge galvanized Triple-V steel blades and stainless steel bearings with the linkage concealed in the frame.

Example: FOWLN-020x020 is a fire damper with 16 gauge blades in opposed operation, with nominal dimensions of 20 inches wide x 20 inches high and 165°F fusible link.

## Construction

Part	Construction
<b>Frame</b>	5 in. deep x 16-gauge galvanized steel
<b>Blades</b>	16-gauge galvanized steel, Triple V All blades are 6 in. nominal width and 8 in. maximum width.
<b>Linkage</b>	Concealed in the frame
<b>Blade Pin</b>	3/8 in. sq. steel, zinc plated
<b>Bearings</b>	Stainless steel
<b>Side Seal</b>	Flexible metal compression, stainless steel
<b>Blade Seal</b>	Stainless steel with extruded silicone
<b>Sleeve</b>	20-gauge galvanized steel, 20 in. long (optional)

**Note:** The optional sleeve is designed for use with standard breakaway connectors. Mounting angles are provided with the damper.

## Performance Specifications

FD-1600 1-1/2 Hour Dynamic Rated Multi-Blade Fire Dampers	
<b>Maximum Dynamic Rating</b>	4 in. w.c. static pressure at 2000 fpm in either direction of air flow
<b>Temperature Rating</b>	165°F (74°C), 212°F (100°C), or 285°F (141°C) fusible link
<b>Agency Listings</b>	UL/cUL
<b>Approx. Weight</b>	7 lb per square foot

**Note:** Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.

## Submittal Specifications

Fire dampers meeting or exceeding the following specifications shall be furnished and installed at locations shown on plans or as described in schedules. Dampers shall meet the requirements of NFPA90A, 92A and 92B and shall be 1-1/2 hour fire rated dampers for use where the duct passes through a fire rated barrier of less than three hours in accordance with the latest version of UL555S.

As part of the UL qualification, fire dampers shall have demonstrated a capacity to close under HVAC system operating conditions, with pressures up to 4 inches w.c. in the closed position and 2000 fpm air velocity in the open position.

The fire damper must be installed in accordance with the Standard NFPA-90B and Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Fire Damper Guide, at the point where a duct passes through a required fire barrier. The blades, when closed, shall be within the plane of the fire barrier (wall or floor).

## SD-1620 Class II Dampers

### Description

The SD-1620 Class II Smoke Dampers are designed to prevent the spread of smoke within a dynamic HVAC system during life safety situations.

The SD-1620 Series is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555S standard.

The SD-1620 Series includes factory-installed actuator which should be cycled at least once every six months or sooner as local codes require.

The SD-1620 is available with factory-installed blade position switch to connect to smoke control systems and indicate when blades are fully open or fully closed.

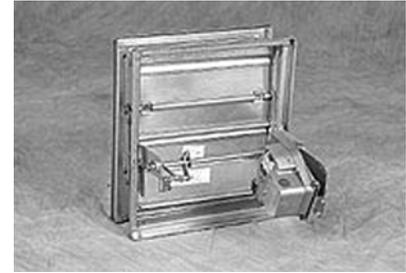
Refer to the *SD-1250 and SD-1600 Series Smoke Dampers Product Bulletin (LIT-1201592)* for important product information.

- three-year warranty on materials and workmanship.
- shipping in as little as five working days from order entry

### To Order

Specify the code number from the selection chart. RS-2000 smoke dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls® damper dimensions are from the outside edges of the damper frame.

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



SD-1620 Class II Smoke Damper

### Features

- 350°F rated actuators

### SD-1620 Class II Smoke Damper Selection Chart

	Code Number	S	W	S	-	w	w	x	h	h		
Application	S = Smoke											
Blade Operation	O = Opposed P = Parallel											
Blade Type	W = Triple-V											
Bearing/Seal	S = Standard (Stainless Steel/Silicone)											
Actuator Type	A = 120 VAC 250°F, Two-Position B = 24 VAC 250°F, Two-Position C = 120 VAC 350°F, Two-Position D = 24 VAC 350°F, Two-Position O = Pneumatic 250°F, Two-Position P = Pneumatic 350°F, Two-Position <sup>1</sup>											
Width Dimensions	008 to 144, 1 inch increments <sup>2</sup>											
Height Dimensions	006 to 096, 1 inch increments <sup>1, 2, 3</sup>											
Options (Limit two)	See Factory Options list											

1. The 350° pneumatic or modulating actuators are limited to a maximum width of 120 inches and a maximum height of 48 inches.
2. Maximum single panel size is 36 inches wide x 72 inches high. On multiple panel assemblies, each panel is a maximum of 36 x 48 inches.
3. Sizes less than 12 inches high are to be parallel operation only.

**Note:** Standard actuator installation is outside the air stream mounted on a side plate.

**Note:** SD-1620 Smoke Dampers include 16-gauge galvanized steel blades, stainless steel bearings, and stainless steel side seals.

Example: SOWSB-020x020 is a Class II smoke damper that has 16 gauge blades, opposed blade operation, stainless steel bearings, high-temperature blade seals, and side seals. Its dimensions are 20 inches wide x 20 inches high, with a 250°F 24 VAC electric actuator.

### Factory Options

- E = exact whole inch (no undercut)
  - I = factory-installed Blade Position Switch Kit
  - L = 20 gauge galvanized steel sleeve that is 20 inches in length
  - Q = internal mount actuator (electric minimum size is 10 x 21 inches pneumatic minimum size is 18 x 24 inches)
  - V = transition to round or oval duct (maximum size is 70 x 92 inches)
- Note:** Limit of two factory-installed options.

## SD-1620 Class II Dampers (Continued)

### Performance Data Specifications

SD-1620 Class II Smoke Dampers			
<b>Maximum Dynamic Rating</b>	4 in. w.c. static pressure at 2000 fpm		
<b>Ambient Operating Temperature</b>	-40°F to 200°F; (-40°C to 93°C)		
<b>Timing</b>	Drive open: 15 to 25 seconds typical Spring close: 15 seconds typical		
<b>Maximum Short Duration Operating Temperature</b>	250°F or 350°F; (121°C or 177°C) based on actuator selected		
<b>Pressure Drop inches w.c. - Fully Open</b>	<b>1000 fpm</b>	<b>2000 fpm</b>	
	24 in. x 24 in. 36 in. x 36 in.	0.03 0.02	0.11 0.10
<b>Field Installed Accessories</b>	None		
<b>Field Replaceable Parts</b>	SP100 blade position switch kit Actuators are field replaceable, refer to model number of actuator mounted on damper to order direct replacement		
<b>Approximate Weight</b>	9 lb per sq. ft		
<b>Electrically Actuated Two-Position Models:</b>			
<b>Electrical – Power Input</b>	120 VAC ±10%, 60 Hz 24 VAC +20%, -10%, 50/60 Hz		
<b>Electrical – Power Consumption</b>	120 V - Running: 0.18 A, 23 W, Holding: 0.13 A, 9 W maximum 24 V - Running: 23 VA, Holding: 8 VA maximum		

**Note:** Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.

### Construction

Part	Construction
<b>Frame</b>	5 in. deep x 16-gauge galvanized steel
<b>Blades</b>	16-gauge galvanized steel, Triple V All blades are 6 in. nominal width and 8 in. maximum width.
<b>Linkage</b>	Concealed in the frame
<b>Blade Pin</b>	1/2 in. hex steel, zinc plated
<b>Bearings</b>	Stainless steel
<b>Side Seal</b>	Flexible metal compression, stainless steel
<b>Blade Seal</b>	Stainless steel with extruded silicone
<b>Sleeve</b>	20-gauge galvanized steel, 20 in. long (optional) <sup>1</sup>
<b>Side Plate</b>	16-gauge galvanized steel

1. The optional sleeve is designed for use with standard breakaway connectors.

**Note:** All leakage-rated smoke damper systems are factory-assembled, connected to a power source, and cycled a minimum of ten times prior to shipment.

### Submittal Specifications

Smoke dampers meeting or exceeding the following specifications shall be furnished and installed at locations shown on plans or as described in schedules. Dampers shall meet the requirements of NFPA90A, 92A, and 92B, and shall be Class II Leakage Rated Dampers for use in smoke control systems in accordance with the latest version of Underwriters Laboratories, Inc. UL555S.

As part of the UL qualification, smoke dampers shall have demonstrated a capacity to open and close under Heating, Ventilating, and Air Conditioning (HVAC) system operating conditions, with pressures up to 4 inches w.c. in the closed position and 2000 feet per minute (fpm) air velocity in the open position.

In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250°F (121°C) or 350°F (177°C) depending upon the actuator. Appropriate pneumatic or electric actuators shall be installed by the damper manufacturer at the time of damper fabrication. Damper and actuator shall be supplied as a single entity that meets all applicable UL555S qualifications for both dampers and actuators. Each damper shall be rated for leakage and airflow in either direction through the damper. Damper and actuator assembly shall be factory cycled at least ten times to assure operation.

# SD-1630 Smoke Dampers

## Description

Johnson Controls provides a leakage-rated damper for life safety smoke management systems that meets new Underwriters Laboratories Inc.® (UL) leakage testing procedures and fits your size and application requirements:

- SD-1630 Class I leakage resistance galvanized steel one-piece airfoil blade Smoke Dampers are listed under the latest Underwriters Laboratories Inc.® (UL) Standard 555S, and carry the UL/cUL label. UL listing number is R11172.

All Smoke Dampers include actuators that have been tested and approved as a matched set, rated for 250°F or 350°F temperature degradation operation:

- California State Fire Marshall (CSFM) 3230-0245:110 (SD-1630)
- National Fire Protection Association (NFPA) Standards 80, 90A, 92A, 92B and 101

Refer to the *SD-1250 and SD-1600 Series Smoke Dampers Product Bulletin (LIT-1201592)* for important product information.

## Sample Specification

Smoke dampers meeting or exceeding the following specifications shall be furnished and installed at locations shown on plans or as described in schedules:

- Dampers shall meet the requirements of NFPA 80, 90A, 92A, 92B, and 101 and shall be either Class I or Class II Leakage Rated Dampers for use in smoke control systems in accordance with the latest version of UL555S.
- As part of the UL qualification, smoke dampers shall have demonstrated a capacity to open and close under HVAC system operating conditions, with pressures up to 4 inches w.g. in the closed position and 2,000 fpm air velocity in the open position.
- In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250°F or 350°F, depending upon the actuator.
- Appropriate electric/pneumatic actuators (specifier selects one) shall be installed by the damper manufacturer at the time of damper fabrication.
- Damper and actuator shall be supplied as a single entity which meets all applicable UL555S qualifications for both dampers and actuators.
- Each damper shall be rated for leakage and airflow in either direction through the damper.
- Damper and actuator assembly shall be factory cycled to ensure operation.

## Selection Charts

Use the following to select the product:

1. Determine required size and type of damper.
2. Select the features from the *Ordering Template* that match the operation and performance required.
3. Enter width and height of damper.
4. Enter options required.

## Features

- 3-Year Warranty on Materials and Workmanship
- Fast Track Shipping - as Quick as 5 Working Days after Order Entry
- Modulating Actuators (SD-1630 Only)
- Available Factory-Installed Blade Position Switch Kit with Direct Coupling

## Applications

The SD-1600 Series Smoke Dampers meet specifications requiring a Class I or Class II leakage-rating at 250°F or 350°F. SD-1600 Series smoke dampers are tested according to UL Standard 555S for dampers that are used in Heating, Ventilating, and Air Conditioning (HVAC) smoke systems.

SD-1600 Series smoke dampers meet the requirements for the International Building Codes (IBC). Each SD-1600 Series smoke damper includes factory-installed actuator(s) per UL Testing. Smoke dampers up to maximum tested sizes are rated for either vertical or horizontal mounting.



SD-1630 Smoke Damper

Smoke Dampers include 16-gauge galvanized steel blades, stainless steel bearings, and stainless steel side seals.

Example: SOGSB-020x020 is an SD-1620 smoke damper that has 16-gauge blades, opposed blade operation, stainless steel bearings, high-temperature blade seals, and side seals. Its dimensions are 20 inches wide x 20 inches high, with a 250°F 24 VAC electric actuator.

Maximum size and area limitations are determined by past UL testing. Future testing may include additional actuators or expand present limits. Actual damper size is 1/4 inch less than nominal. For example, a damper ordered 24 inches wide x 32 inches high is shipped 23-3/4 inches wide x 31-3/4 inches high.

### SD-1630 Panel Size Limits

Damper	Width x Height, in. (mm)
<b>Standard</b>	
Maximum, 1 Panel	32 (813) x 72 (1,829)
Multiple Panels	32 (813) x 48 (1,219)
<b>Modulating</b>	
Maximum, 1 Panel	32 (813) x 48 (1,219)

### Option List<sup>1</sup>

Code	Option Description
E	Exact size, no undercut
I	Factory Installed Blade Position Switch Kit <sup>2</sup>
L	20 gauge galvanized steel sleeve, 20 in. length
Q	Internal mount actuator <sup>3</sup>
V	Transition to round or oval duct <sup>4</sup>

1. Dampers have a maximum of two factory-installed options.
2. One kit provided per damper opening, not one kit per actuator or shipped section.
3. Minimum size for an electric actuator is 012 x 021 inches. Minimum size for a pneumatic actuator is 018 x 024 inches
4. Minimum size is 006 x 004 inches. Maximum size is 070 x 094 inches.

### SD-1630 Smoke Dampers (Continued)

#### Smoke Damper Ordering Template<sup>1</sup>

	Code Number	S		S	-	w	w	w	x	h	h	h
<b>Application</b>	S = Smoke											
<b>Blade Operation</b>	O = Opposed (greater than 12 inches) P = Parallel											
<b>Blade Type</b>	G = Class I Airfoil (SD-1630)											
<b>Bearing/Seal</b>	S = Standard (stainless steel/silicone)											
<b>Actuator Type</b>	A = 120 VAC 250°F B = 24 VAC 250°F C = 120 VAC 350°F D = 24 VAC 350°F G = 24 VDC 250°F Modulating (class I Airfoil only) <sup>2</sup> O = Pneumatic 250°F (8-13# spring range) P = Pneumatic 350°F (8-13# spring range) Q = Pneumatic Modulating (class I Airfoil only) 250° F (8-13# spring range) <sup>2</sup>											
<b>Width Dimensions</b>	008 to 144, 1-inch increments											
<b>Height Dimensions</b>	006 to 096, 1-inch increments											
<b>Factory-installed Options</b>	See <i>Option List</i> for selection and combinations.											

- Standard product includes the actuator mounted outside the air stream on a 12 inch wide side plate. Only certain damper and actuator combinations have been evaluated and found suitable for volume control use. As such, only use dampers marked **Also Suitable For Use As Volume Control Damper** for volume control applications.
- These dampers are **Also Suitable For Use As Volume Control Damper** for volume control applications.

Smoke dampers have round or oval connections for low or medium pressure.

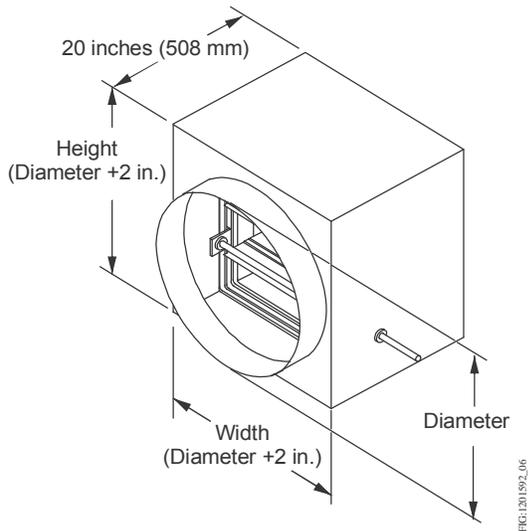
Round connections are a minimum of 4 inches (102 mm) in diameter. The rectangular size of the damper is 2 inches (51 mm) larger than the connection dimension ordered.

Smoke dampers supplied with oval connections are a minimum of 6 inches wide x 4 inches high (152 mm x 102 mm). The rectangular size of the damper is 2 inches (51 mm) larger than the width and height of the connection dimensions.

**Note:** The maximum dimension of the transition is 070 x 094 inches.

#### Repair Information

If the SD-1630 Smoke Damper fails to operate within its specifications, replace the unit. For a replacement SD-1630 damper, contact the nearest Johnson Controls® representative.



Transitions

## SD-1630 Smoke Dampers (Continued)

### Technical Specifications

All leakage rated smoke damper systems are cycled prior to shipping. Actuators should be field-wired together so the smoke damper assembly operates as one assembly.

Part	Construction
Frame	5 in. deep x 16-gauge galvanized steel or aluminum
Blades	SD-1630 – 14-gauge equivalent galvanized steel, one-piece airfoil All blades are 6 in. nominal width and 8 in. maximum width.
Linkage	Concealed in the frame
Blade Pin	1/2 in. plated steel hex
Bearings	Stainless steel
Side Seal	Flexible metal compression, stainless steel
Blade Seal	Extruded silicone
Sleeve	20-gauge galvanized steel, 20 in. long (optional)
Side Plate	16-gauge galvanized steel

SD-1630 Smoke Dampers <sup>1 2</sup>		
Maximum Dynamic Rating	4 in. w.c. static pressure at 2000 fpm	
Ambient Operating Temperature	-40 to 200°F (-40 to 93°C)	
Electrical – Power Input	120 VAC ±10%, 60 Hz 24 VAC +20%, -10%, 50/60 Hz	
Electrical – Power Consumption	120 V - Running: 0.18 A, 23 W, Holding: 0.13 A, 9 W maximum 24 V - Running: 23 VA, Holding: 8 VA maximum	
Modulating Control Signal	0-10 VDC or 4-20 mA	
Timing	Drive open: 15 to 25 seconds typical Spring close: 15 seconds typical	
Maximum Short Duration Operating Temperature	250 or 350°F (121 or 177°C) based on actuator selected	
Pressure Drop (inches WG) - Fully Open	1,000 fpm	2,000 fpm
24 inches x 24 inches	0.03	0.11
36 inches x 48 inches	0.02	0.10
Field Installed Accessories	None	
Field Replace Parts	SP100 position switch kit (DMPR-KC013 or DMPR-KC014) Actuators are field replaceable, refer to model number of actuator mounted on damper to order direct replacement.	
Approximate Weight	7 lb/sq. ft	

- Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.
- All Johnson Controls Dampers are built to order, just in time, and cannot be returned due to customer ordering errors. All dampers are backed by a 3-year warranty, which covers defects in materials or workmanship when used in our defined applications. Refer to terms and conditions of sale for specifics.

# SD-1250 Smoke Dampers

## Description

Johnson Controls provides a leakage-rated damper for life safety smoke management systems that meets the new Underwriters Laboratories Inc. ® (UL) leakage testing procedures and fits your size and application requirements:

- SD-1250 Class I leakage resistance aluminum frame and aluminum airfoil shaped blades

Smoke Dampers are listed under the latest Standard 555S, and carry the UL/cUL label. UL listing number is R11172.

All Smoke Dampers include actuators that have been tested and approved as a matched set, rated for 250°F or 350°F temperature degradation operation:

- National Fire Protection Association (NFPA) Standards 80, 90A, 92A, 92B and 101

Refer to the *SD-1250 and SD-1600 Series Smoke Dampers Product Bulletin (LIT-1201592)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship
- Fast Track Shipping - as Quick as 5 Working Days after Order Entry
- Available Factory-Installed Blade Position Switch Kit with Direct Coupling

## Application

The SD-1250 Series Smoke Dampers meet specifications requiring a Class I leakage rating at 250°F. The SD-1600 Series Smoke Dampers meet specifications requiring a Class I or Class II leakage-rating at 250°F or 350°F. SD-1250 and SD-1600 Series smoke dampers are tested according to UL Standard 555S for dampers that are used in Heating, Ventilating, and Air Conditioning (HVAC) smoke systems.

SD-1250 Series smoke dampers meet the requirements for the International Building Codes (IBC). Each SD-1250 Series smoke damper includes factory-installed actuator(s) per UL Testing. Smoke dampers up to maximum tested sizes are rated for either vertical or horizontal mounting.



SD-1250 Smoke Damper

## Sample Specification

Smoke dampers meeting or exceeding the following specifications shall be furnished and installed at locations shown on plans or as described in schedules:

- Dampers shall meet the requirements of NFPA 80, 90A, 92A, 92B, and 101 and shall be either Class I or Class II Leakage Rated Dampers for use in smoke control systems in accordance with the latest version of UL555S.
- As part of the UL qualification, smoke dampers shall have demonstrated a capacity to open and close under HVAC system operating conditions, with pressures up to 4 inches w.g. in the closed position and 2,000 fpm air velocity in the open position.
- In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250°F or 350°F, depending upon the actuator.
- Appropriate electric/pneumatic actuators (specifier selects one) shall be installed by the damper manufacturer at the time of damper fabrication.
- Damper and actuator shall be supplied as a single entity which meets all applicable UL555S qualifications for both dampers and actuators.
- Each damper shall be rated for leakage and airflow in either direction through the damper.
- Damper and actuator assembly shall be factory cycled to ensure operation.

## Selection Charts

Use the following to select the product:

1. Determine required size and type of damper.
2. Select the features from the *Smoke Damper Ordering Template* that match the operation and performance required.
3. Enter width and height of damper.
4. Enter options required.

Smoke Dampers include 16-gauge galvanized steel blades, stainless steel bearings, and stainless steel side seals.

Example: SOESB-020x020 is an SD-1250 smoke damper that has 16-gauge blades, opposed blade operation, stainless steel bearings, high-temperature blade seals, and side seals. Its dimensions are 20 inches wide x 20 inches high, with a 250°F 24 VAC electric actuator.

Maximum size and area limitations are determined by past UL testing. Future testing may include additional actuators or expand present limits. Actual damper size is 1/4 inch less than nominal. For example, a damper ordered 24 inches wide x 32 inches high is shipped 23-3/4 inches wide x 31-3/4 inches high.

### SD-1250 Panel Size Limits

Damper	Width x Height, in. (mm)
Maximum, 1 Panel	36 (914) x 48 (1,219)

### Options List<sup>1</sup>

Code	Option Description
E	Exact size, no undercut
I	Factory Installed Blade Position Switch Kit <sup>2</sup>
L	20 gauge galvanized steel sleeve, 20 in. length
Q	Internal mount actuator <sup>3</sup>
V	Transition to round or oval duct <sup>4</sup>

1. Dampers have a maximum of two factory-installed options.
2. One kit provided per damper opening, not one kit per actuator or shipped section.
3. Minimum size for an electric actuator is 012 x 021 in. Minimum size for a pneumatic actuator is 018 x 024 in.
4. Minimum size is 006 x 004 in. Maximum size is 070 x 094 in.

### SD-1250 Smoke Dampers (Continued)

#### Smoke Damper Ordering Template<sup>1</sup>

	Code Number	S		S	-	w	w	w	x	h	h	h
Application	S = Smoke											
Blade Operation	O = Opposed (greater than 12 inches) P = Parallel											
Blade Type	E = Class I Aluminum Frame and Blade (SD-1250)											
Bearing/Seal	S = Standard (stainless steel/silicone)											
Actuator Type	A = 120 VAC 250°F B = 24 VAC 250°F C = 120 VAC 350°F D = 24 VAC 350°F O = Pneumatic 250°F (8-13# spring range) P = Pneumatic 350°F (8-13# spring range)											
Width Dimensions	008 to 144, 1-inch increments											
Height Dimensions	006 to 096, 1-inch increments											
Factory-installed Options	See <i>Option List</i> for selection and combinations.											

1. Standard product includes the actuator mounted outside the air stream on a 12 inch wide side plate. Only certain damper and actuator combinations have been evaluated and found suitable for volume control use. As such, only use dampers marked **Also Suitable For Use As Volume Control Damper** for volume control applications.

Smoke dampers have round or oval connections for low or medium pressure.

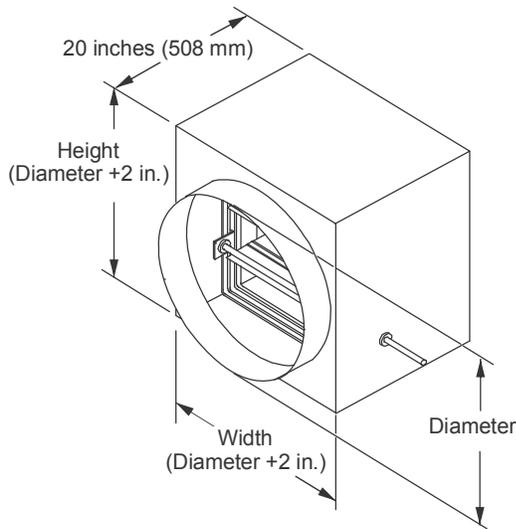
Round connections are a minimum of 4 inches (102 mm) in diameter. The rectangular size of the damper is 2 inches (51 mm) larger than the connection dimension ordered.

Smoke dampers supplied with oval connections are a minimum of 6 inches wide x 4 inches high (152 mm x 102 mm). The rectangular size of the damper is 2 inches (51 mm) larger than the width and height of the connection dimensions.

**Note:** The maximum dimension of the transition is 070 x 094 inches.

#### Repair Information

If the SD-1250 Smoke Damper fails to operate within its specifications, replace the unit. For a replacement SD-1250 damper, contact the nearest Johnson Controls® representative.



Transitions

FIGURE 1592\_06

## SD-1250 Smoke Dampers (Continued)

### Technical Specifications

All leakage rated smoke damper systems are cycled prior to shipping. Actuators should be field-wired together so the smoke damper assembly operates as one assembly.

Part	Construction
Frame	5 in. deep x 16-gauge galvanized steel or aluminum
Blades	SD-1250 – One-piece 6063T5 extruded aluminum, airfoil shape All blades are 6 in. nominal width and 8 in. maximum width.
Linkage	Concealed in the frame
Blade Pin	1/2 in. plated steel hex
Bearings	Stainless steel
Side Seal	Flexible metal compression, stainless steel
Blade Seal	Extruded silicone
Sleeve	20-gauge galvanized steel, 20 in. long (optional)
Side Plate	16-gauge galvanized steel

SD-1250 Smoke Dampers <sup>1 2</sup>		
Maximum Dynamic Rating	4 in. w.c. static pressure at 2,000 fpm	
Ambient Operating Temperature	-40 to 200°F (-40 to 93°C)	
Electrical – Power Input	120 VAC ±10%, 60 Hz 24 VAC +20%, -10%, 50/60 Hz	
Electrical – Power Consumption	120 V - Running: 0.18 A, 23 W, Holding: 0.13 A, 9 W maximum 24 V - Running: 23 VA, Holding: 8 VA maximum	
Modulating Control Signal	0 to 10 VDC or 4 to 20 mA	
Timing	Drive open: 15 to 25 seconds typical Spring close: 15 seconds typical	
Maximum Short Duration Operating Temperature	250 or 350°F (121 or 177°C) based on actuator selected	
Pressure Drop (inches WG) - Fully Open	1,000 fpm	2,000 fpm
24 inches x 24 inches	0.03	0.11
36 inches x 48 inches	0.02	0.10
Field Installed Accessories	None	
Field Replace Parts	SP100 position switch kit (DMPR-KC013 or DMPR-KC014) Actuators are field replaceable, refer to model number of actuator mounted on damper to order direct replacement.	
Approximate Weight	7 lb/sq. ft	

- Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.
- All Johnson Controls Dampers are built to order, just in time, and cannot be returned due to customer ordering errors. All dampers are backed by a 3-year warranty, which covers defects in materials or workmanship when used in our defined applications. Refer to terms and conditions of sale for specifics.

# FS-1620 Class II Combination Fire/Smoke Dampers

## Description

The FS-1620 Fire/Class II Smoke Dampers are designed to prevent the spread of smoke and 1-1/2 hour fire rating for use within a dynamic HVAC system during life safety situations.

The FS-1620 is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555S and UL-555 standards.

The FS-1620 includes a factory installed actuator which should be cycled at least once every six months or sooner as local codes require.

The FS-1620 is available with factory installed blade position switch to connect to smoke control systems and indicate when blades are fully open or fully closed.

Refer to the *FS-1600 Series Combination Fire/Smoke Dampers Product Bulletin (LIT-1201593)* for important product information.

## Features

- 1-1/2 hour fire rating
- 250 or 350°F rated actuators

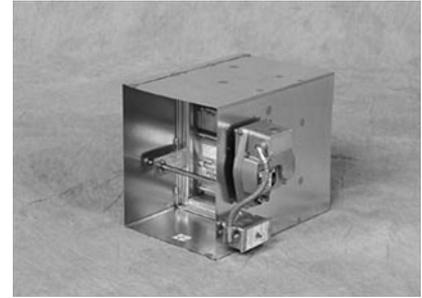
- three-year warranty on materials and workmanship
- shipping in as little as five working days from order entry

## To Order

Specify the code number from the selection chart. For information about available combinations, please contact your Johnson Controls® Representative. (Not all combinations are available.)

FS-1620 standard dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls damper dimensions are from the outside edges of the damper frame.

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



**FS-1620 Class II Combination Fire/Smoke Damper**

## FS-1620 Class II Combination Fire/Smoke Damper Selection Chart

	Code Number	T	O	W	-	w	w	w	x	h	h	h
<b>Application</b>	T = Fire/Smoke											
<b>Blade Operation</b>	O = Opposed											
<b>Blade Type</b>	W = Triple-V											
<b>Heat-actuated Device</b>	L = 165°F actuation M = 212°F actuation H = 250°F actuation											
<b>Actuator Type</b>	A = 120 VAC 250°F, Two-Position B = 24VAC 250°F, Two-Position C = 120 VAC 350°F, Two-Position D = 24 VAC 350°F, Two-Position O = Pneumatic 250°F, Two-Position P = Pneumatic 350°F, Two-Position <sup>1</sup>											
<b>Width Dimensions</b>	008 to 120, 1 inch increments <sup>1, 2</sup>											
<b>Height Dimensions</b>	007 to 096, 1 inch increments <sup>1, 2</sup>											
<b>Options (Limit two)</b>	See Factory Options list											

1. Fire/smoke dampers with 350° pneumatic or modulating actuators are limited to a maximum height of 48 inches.
2. Maximum single panel size is 30 inches wide x 72 inches high.

**Note:** Standard actuator installation is outside the air stream mounted on the sleeve.

**Example** TOWLA –020x020 is a Class II, 1-1/2 hour combination fire/smoke damper that has triple-vee blades, opposed blade operation, stainless steel bearings, dimensions are 20 inches wide x 20 inches high, with a 20 inch-long/20 gauge sleeve, a 120 VAC electric actuator, and a 165°F electric fuse link.

## Factory Options

- D = DSDN, no flow duct smoke detector
- E = exact whole inch (no undercut)
- F = fast angle with sleeve (panels up to 72 inches wide x 48 inches high will include one angle, panels larger than 72 x 48 inches will include two angles)
- I = factory-installed Blade Position Switch Kit
- Q = internal mount actuator (minimum size for electric = 10 inches wide x 21 inches high, pneumatic = 18 inches x 24 inches)
- V = transition to round or oval duct (maximum size is 70 x 92 inches)

**Note:** Limit of two factory-installed options.

## FS-1620 Class II Combination Fire/Smoke Dampers (Continued)

### Performance Data Specifications

FS-1620 Class II Combination Fire/Smoke Dampers			
<b>Maximum Dynamic Rating</b>	4 in. w.c. static pressure at 2000 fpm		
<b>Ambient Operating Temperature</b>	-40°F to 200°F; (-40°C to 93°C)		
<b>Timing</b>	Drive open: 15 to 25 seconds typical Spring close: 15 seconds typical		
<b>Maximum Short Duration Operating Temperature</b>	250°F or 350°F; (121°C or 177°C) based on actuator selected		
<b>Pressure Drop inches w.c. - Fully Open</b>	<b>1000 fpm</b>	<b>2000 fpm</b>	
	<b>24 in. x 24 in.</b>	0.03	0.11
	<b>36 in. x 36 in.</b>	0.02	0.10
<b>Field Installed Accessories</b>	None		
<b>Field Replaceable Parts</b>	SP100 blade position switch kit Actuators are field replaceable, refer to model number of actuator mounted on damper to order direct replacement		
<b>Approximate Weight</b>	9 lb/sq. ft		
<b>Electrically Actuated models:</b>			
<b>Electrical – Power Input</b>	120 VAC ±10%, 60 Hz 24 VAC +20%, -10%, 50/60 Hz		
<b>Electrical – Power Consumption</b>	120 V - Running: 0.18 A, 23 W, Holding: 0.13 A, 9 W maximum 24 V - Running: 23 VA, Holding: 8 VA maximum		

**Note:** Dampers are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.

### Construction

Part	Construction
<b>Frame</b>	5 in. deep x 16-gauge galvanized steel
<b>Blades</b>	16-gauge galvanized steel, Triple V
<b>Linkage</b>	Concealed in the frame
<b>Blade Pin</b>	1/2 in. hex steel, zinc plated
<b>Bearings</b>	Stainless steel
<b>Side Seal</b>	Flexible metal compression, stainless steel
<b>Blade Seal</b>	Stainless steel with extruded silicone
<b>Sleeve</b>	20-gauge galvanized steel, 20 in. long <sup>1</sup>
<b>Side Plate</b>	16-gauge galvanized steel

- The sleeve is designed for use with standard breakaway connectors. Mounting angles are provided with the damper.

**Note:** All leakage-rated smoke damper systems are factory-assembled, connected to a power source, and cycled a minimum of three times prior to shipment.

### Submittal Specifications

Combination Fire/Smoke dampers meeting or exceeding the following specifications shall be furnished and installed at locations shown on plans or as described in schedules. Dampers shall meet the requirements of NFPA90A, 92A, and 92B and shall be Class II leakage rated dampers for use in smoke control systems and 1-1/2 hour fire rating in accordance with the latest version of UL555S.

As part of the UL qualification, fire/smoke dampers shall have demonstrated a capacity to open and close under HVAC system operating conditions, with pressures up to 4 inches w.c. in the closed position and 2000 fpm air velocity in the open position.

In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250°F (121°C) or 350°F (177°C) depending upon the actuator. Appropriate pneumatic or electric actuators (specifier selects one) shall be installed by the damper manufacturer at the time of damper fabrication. Damper and actuator shall be supplied as a single entity which meets all applicable UL555S qualifications for both dampers and actuators. Each damper shall be rated for leakage and airflow in either direction through the damper. Damper and actuator assembly shall be factory cycled at least 10 times to assure operation.

# FS-1630 Class I Combination Fire/Smoke Dampers

## Description

The FS-1630 Fire/Class II Smoke Dampers are designed to prevent the spread of smoke and 1-1/2 hour fire rating for use within a dynamic HVAC system during life safety situations.

The FS-1630 is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555S and UL-555 standards.

The FS-1630 includes a factory-installed actuator which should be cycled at least once every six months or sooner as local codes require.

The FS-1630 is available with factory-installed blade position switch to connect to smoke control systems and indicate when blades are fully open or fully closed.

Refer to the *FS-1600 Series Combination Fire/Smoke Dampers Product Bulletin (LIT-1201593)* for important product information.

- shipping in as little as five working days from order entry

## To Order

Specify the code number from the selection chart. For information about available combinations, please contact your Johnson Controls® representative. (Not all combinations are available.)

FS-1630 standard dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls damper dimensions are from the outside edges of the damper frame.

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



**FS-1630 Class I Combination Fire/Smoke Damper**

## Features

- 1-1/2 hour fire rating
- 250 or 350°F rated actuators
- three-year warranty on materials and workmanship.

## FS-1630 Class II Combination Fire/Smoke Damper Selection Chart

	Code Number	T	O	G	-	w	w	w	x	h	h	h
<b>Application</b>	T = Fire/Smoke											
<b>Blade Operation</b>	O = Opposed											
<b>Blade Type</b>	G = Airfoil											
<b>Heat-actuated Device</b>	L = 165°F actuation M = 212°F actuation H = 250°F actuation											
<b>Actuator Type</b>	A = 120 VAC 250°F, Two-Position B = 24VAC 250°F, Two-Position C = 120 VAC 350°F, Two-Position D = 24 VAC 350°F, Two-Position F = 120 VAC 250°F Modulating G = 24 V 250°F Modulating O = Pneumatic 250°F, Two-Position P = Pneumatic 350°F, Two-Position <sup>1</sup> Q = Pneumatic, Modulating <sup>1</sup>											
<b>Width Dimensions</b>	008 to 120, 1 inch increments <sup>1, 2</sup>											
<b>Height Dimensions</b>	007 to 096, 1 inch increments <sup>1, 2</sup>											
<b>Options (Limit two)</b>	See Factory Options list											

1. Fire/smoke dampers with 350° pneumatic or modulating actuators are limited to a maximum height of 48 inches.
2. Maximum single panel size is 30 inches wide x 72 inches high.

**Note:** Standard actuator installation is outside the air stream mounted on the sleeve.

Example: TOGLA-020x020 is a Class I, 1-1/2 hour combination fire/smoke damper that has airfoil blades, opposed blade operation, stainless steel bearings, dimensions are 20 inches wide x 20 inches high, with a 20 inch long/20 gauge sleeve, a 120 VAC electric actuator, and a 165°F electric fuse link.

## Factory Options

- D = DSDN, no flow duct smoke detector
- E = exact whole inch (no undercut)
- F = fast angle with sleeve (panels up to 72 inches wide x 48 inches high include one angle; panels larger than 72 x 48 inches include two angles)
- I = factory-installed Blade Position Switch Kit
- Q = internal mount actuator (minimum size for electric = 10 inches wide x 21 inches high, pneumatic = 18 inches x 24 inches)
- V = transition to round or oval duct (maximum size is 70 x 92 inches)

**Note:** Limit of two factory-installed options.

# RF-2000 True Round Fire Damper

## Description

The RF-2000 Fire Damper is designed to prevent the spread of fire with a 1-1/2 hour fire rating for use within a dynamic HVAC system during life safety situations.

The RF-2000 is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555 standards.

Refer to the *RF-2000 True Round Fire Damper Product Bulletin (LIT-1201627)* for important product information.

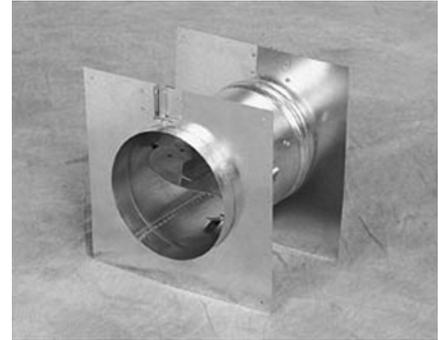
## Features

- 1-1/2 hour fire rating
- three-year warranty on materials and workmanship.
- shipping in as little as five working days from order entry

## To Order

Specify the code number from the selection chart. RF-2000 fire dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls® damper dimensions are from the outside edges of the damper frame.

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



RF-2000 True Round Fire Damper

## RF-2000 True Round Fire Damper Selection Chart

	Code Number	R	F	G	d	d	N	N	C
Product Family	R = Round Damper								
Application	F = Fire								
Shroud Type	G = Galvanized								
Diameter	06 in. to 24 in. (1 in. increments)								
Closure Temperature	L = 165°F M = 212°F H = 285°F								
Actuator	N = None								
Operation	NC = Normally Closed								
Options	None								

Example: A 6 inch fire damper with 165°F fuselink is RFG06LNNC.

## Submittal Specifications

Furnish and install Johnson Controls true round fire dampers at locations shown on plans or as described in schedules.

Damper shrouds are to be constructed of formed 20-gauge galvanized sheet steel.

Damper blades are to be constructed with 1-piece 14-gauge galvanized steel minimum.

Damper performance shall be 1-1/2 hour fire rated under the latest UL Standard 555 and bear a UL label attesting to same. Each true round fire damper shall be equipped with a fuse link, which shall activate at a designated temperature, causing the damper to close and lock in the closed position.

Damper sizing shall be by the designer in accordance with accepted industry practices to insure proper system performance.

## Construction

Part	Construction
Shroud	20-gauge galvanized sheet steel, 14 in. integral sleeve and retaining "cinch" plates
Blade	Single skin, 14-gauge equivalent thickness galvanized steel
Shaft	4 in. to 8 in. long; 5/16 in. (8 mm) diameter steel
Bearings	Stainless steel sleeve pressed into frame
Fuse Link	165°F, 212°F, or 285°F

## Performance Data Specifications

RF-2000 True Round Fire Damper	
Diameter	Approximate Weight
4 in. (102 mm)	2 lb (0.91 kg)
8 in. (203 mm)	4 lb (1.81 kg)
12 in. (305 mm)	7 lb (3.18 kg)
16 in. (406 mm)	9 lb (4.08 kg)
20 in. (508 mm)	13 lb (5.90 kg)
22 in. (559 mm)	15 lb (6.80 kg)

**Note:** Dampers are tested using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.

# RS-2000 True Round Smoke Damper

## Description

The RS-2000 is a true round Class I Smoke Damper designed to prevent the spread of smoke within a dynamic HVAC system during life safety situations.

The RS-2000 is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555S standard.

The RS-2000 includes a factory-installed actuator which should be cycled at least once every six months or sooner as local codes require.

The RS-2000 is available with factory-installed blade position switch to connect to smoke control systems and indicate when blades are fully open or fully closed.

Refer to the *RS-2000 True Round Class 1 Fire Damper Product Bulletin (LIT-1201628)* for important product information.

## Features

- 350°F rated actuators
- three-year warranty on materials and workmanship.
- shipping in as little as five working days from order entry

## To Order

Specify the code number from the selection chart. RS-2000 smoke dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls® damper dimensions are from the outside edges of the damper frame.

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



RS-2000 True Round Smoke Damper

## RS-2000 True Round Class I Smoke Damper Selection Chart

	Code Number	R	S	G	d	d	N		N	C
Product Family	R = Round Damper									
Application	S = Smoke									
Shroud Type	G = Galvanized									
Diameter	06 in. to 24 in. (1 in. increments)									
Closure Temperature	N = None									
Actuator	C = 120 VAC Electric, 350°F D = 24 VAC Electric, 350°F P = 8-13 lb Pneumatic 350°F									
Operation	NC = Normally Closed									
Options	I = Blade Position Indicator Switch									

Example: An 8 in. smoke damper with 120 V, 350°F electric actuator is RSG08NCNC.

## Performance Data Specifications

RS-2000 True Round Smoke Damper		
Diameter	With Electric Actuator	With Pneumatic Actuator
4 in. (102 mm)	8 lb (3.63 kg)	7 lb (3.18 kg)
8 in. (203 mm)	10 lb (4.54 kg)	9 lb (4.08 kg)
12 in. (305 mm)	13 lb (5.90 kg)	12 lb (5.44 kg)
16 in. (406 mm)	15 lb (6.80 kg)	14 lb (6.35 kg)
20 in. (508 mm)	19 lb (8.62 kg)	18 lb (8.16 kg)
22 in. (559 mm)	21 lb (9.53 kg)	20 lb (9.07 kg)

**Note:** Dampers are tested using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.

## Construction

Part	Construction
Shroud	20-gauge galvanized sheet steel, 14 in. integral sleeve
Blade	Single skin, 14-gauge equivalent thickness galvanized steel
Shaft	4 in. to 8 in. long; 5/16 in. (8 mm) diameter steel
Bearings	Stainless steel sleeve pressed into frame

## Submittal Specifications

Furnish and install Johnson Controls true round smoke dampers at locations shown on plans or as described in schedules.

Damper shrouds are to be constructed of formed 20-gauge galvanized sheet steel.

Damper blades are to be constructed with 1-piece 14-gauge galvanized steel minimum.

Damper performance shall meet the requirements of NFPA90A, 92A and 92B and shall be classified as Leakage Rated Dampers for use in smoke control systems in accordance with the latest version of UL555S. The leakage rating under UL555S shall be leakage Class I (4 cfm/sq. ft. at 1 inch w.g.). In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 350°F(177°C). The damper manufacturer shall install appropriate electric/pneumatic actuators (specifier selects one) at the time of damper fabrication.

Damper sizing shall be by the designer in accordance with accepted industry practices to insure proper system performance.

# RT-2000 Combination Fire/Smoke Damper

## Description

The RT-2000 Fire/Class I Smoke Dampers are designed to prevent the spread of smoke and 1-1/2 hour fire rating for use within a dynamic HVAC system during life safety situations.

The RT-2000 is Underwriters Laboratories Inc.® (UL) listed and tested to the latest UL-555S and UL-555 standards.

The RT-2000 includes a factory installed actuator which should be cycled at least once every six months or sooner as local codes require.

The RT-2000 is available with factory installed blade position switch to connect to smoke control systems and indicate when blades are fully open or fully closed.

Refer to the *RT-2000 Combination Fire/Smoke Damper Product Bulletin (LIT-1201629)* for important product information.

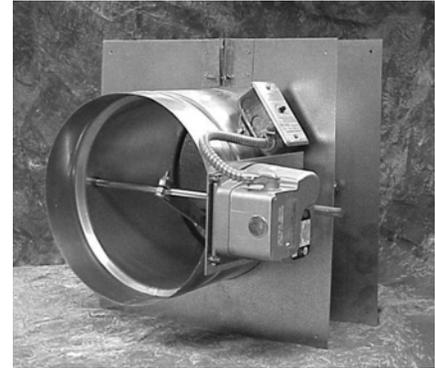
## Features

- 1-1/2 hour fire rating
- 350°F rated actuators
- three-year warranty on materials and workmanship.
- shipping in as little as five working days from order entry

## To Order

Specify the code number from the selection chart. RT-2000 fire/smoke dampers are available in one inch increments. Actual damper size is 1/4 inch less than nominal. All Johnson Controls® damper dimensions are from the outside-edges of the damper frame.

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



**RT-2000 Combination Fire/Smoke Damper**

## RT-2000 Round Fire/Smoke Damper Selection Chart

	Code Number	R	T	G	d	d		N	C
<b>Product Family</b>	R = Round Damper								
<b>Application</b>	T = Combination Fire/Smoke								
<b>Shroud Type</b>	G = Galvanized								
<b>Diameter</b>	06 in. to 24 in. (1 in. increments)								
<b>Closure Temperature</b>	L = 165°F M = 212°F H = 250°F								
<b>Actuator</b>	C = 120 VAC Electric, 350°F D = 24 VAC Electric, 350°F P = 8-13 lb Pneumatic, 350°F								
<b>Operation</b>	NC = Normally Closed								
<b>Options</b>	I = Blade Position Indicator Switch								

Example: An 8 in. fire/smoke damper with 120 V, 250°F electric actuator at low actuation is RTG08LANC.

## Submittal Specifications

Furnish and install Johnson Controls true round combination fire/smoke dampers at locations shown on plans or as described in schedules.

Damper shrouds are to be constructed of formed 20-gauge galvanized sheet steel.

Damper blades are to be constructed with 1-piece 14-gauge galvanized steel minimum.

Damper performance shall be 1-1/2 hour fire rated under the latest UL Standard 555 and bear a UL label attesting to same.

Damper sizing shall be by the designer in accordance with accepted industry practices to insure proper system performance.

## Construction

Part	Construction
<b>Shroud</b>	20-gauge galvanized sheet steel, 14 in. integral sleeve and retaining cinch plates
<b>Blade</b>	Single skin, 14-gauge equivalent thickness galvanized steel
<b>Shaft</b>	5/16 in. (8 mm) diameter steel
<b>Bearings</b>	Stainless steel sleeve pressed into frame
<b>Fuse Link</b>	165°F, 212°F, or 250°F

## Performance Specifications

RT-2000 Combination Fire/Smoke Damper			
<b>Temperature Limits</b>	250°F (121°C) or 350°F (177°C) depending on actuator		
<b>Approximate Weight</b>	<b>Diameter</b>	<b>With Electric Actuator</b>	<b>With Pneumatic Actuator</b>
	4 in. (102 mm)	8 lb (3.63 kg)	7 lb (3.18 kg)
	8 in. (203 mm)	10 lb (4.54 kg)	9 lb (4.08 kg)
	12 in. (305 mm)	13 lb (5.90 kg)	12 lb (5.44 kg)
	16 in. (406 mm)	15 lb (6.80 kg)	14 lb (6.35 kg)
	20 in. (508 mm)	19 lb (8.62 kg)	18 lb (8.16 kg)
	22 in. (559 mm)	21 lb (9.53 kg)	20 lb (9.07 kg)

**Note:** Dampers are tested using instrumentation and procedures in accordance with AMCA Standard No. 500-89, Test Methods for Louvers, Dampers, and Shutters.

## ID-123x Airfoil Blade Industrial Damper

### Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including Industrial style dampers in our product offering.

ID-123x dampers are available in sizes up to 999 in. W x 999 in. H (25,375 mm x 25,375 mm), with either a galvanized, 304 stainless steel, or aluminum frame and a choice of seals:

- Ethylene Propylene Diene Monomer (EPDM)
- stainless steel jamb
- silicone
- Polyvinyl Chloride (PVC)

Refer to the *ID-123x Airfoil Blade Industrial Damper Product Bulletin (LIT-12011353)* for important product information.

### Features

- 3-Year Warranty on Materials and Workmanship – provides confidence in company-backed products
- 15 to 25 Working-Day Standard Shipping after Order Entry – results in fast response for short lead time projects



ID-1230 Airfoil Blade Industrial Damper

### Repair Information

If the ID-123x Airfoil Blade Industrial Damper fails to operate within its specifications, replace the unit. For a replacement damper, contact the nearest Johnson Controls® representative.

### Selection Chart

	Code Number	FIELD															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<b>Product Family</b>	I = Industrial Volume Control																
<b>Blade Operation</b>	O = Opposed P = Parallel																
<b>Blade Type</b>	A = Airfoil 1/2 in. Axle (ID-1230) B = Airfoil 3/4 in. Axle (ID-1231)																
<b>Bearing/Seal Type</b>	E = Stainless Steel/EPDM H = Stainless Steel/Silicone S = Stainless Steel/Polyvinyl Chloride (PVC)																
<b>Actuator Type</b>	N = None																
<b>Width Dimensions</b>	www = 005 through 999 inches 1 inch increments																
<b>Height Dimensions</b>	hhh = 005 through 999 inches 1 inch increments																
<b>Options (Limit of 2)</b>	A = Aluminum Construction B = Bolted Axle C = Full Length Axle E = Exact Size I = Indicator Switch J = Jackshaft K = 14 Gauge Hat Channel S = 304 Stainless Steel Construction																
<b>Code Number</b>		I	O	A	S	N	-	w	w	w	x	h	h	h	-	-	

## ID-123x Airfoil Blade Industrial Damper (Continued)

### Technical Specifications

ID-123x Airfoil Blade Industrial Damper		
<b>Performance Data for Damper Width of 48 in. (1,219 mm)</b>		
Maximum System Pressure	ID-1230	10 in. wg (2.5 kPa)
	ID-1231	12 in. wg (3.0 kPa)
Maximum System Velocity	4,000 feet per minute (1,219 m per minute)	
Leakage with Seals	4.0 cubic feet per minute/square foot (1.2 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.10	
Leakage without Seals	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.80	
<b>Performance Data for Damper Width of 12 in. (305 mm)</b>		
Maximum System Pressure	ID-1230	24 in. wg (6.0 kPa)
	ID-1231	32 in. wg (8.0 kPa)
Maximum System Velocity	ID-1230	4,000 feet per minute (1,219 m per minute)
	ID-1231	6,000 feet per minute (1,825 m per minute)
Leakage with Seals	ID-1230	13.0 cubic feet per minute/square foot (3.9 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.33
	ID-1231	13.0 cubic feet per minute/square foot (3.9 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.22
Leakage without Seals	All Units	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.00
Maximum Temperature	250°F (121°C) Damper can be supplied for temperatures between 250°F (121°C) and 400°F (204°C) by increasing clearance between blade ends and frame.	
Minimum Size	Single blade, parallel action: 5 in. W x 5 in. H (127 mm W x 127 mm H) Two blade, parallel or opposed action: 8 in. W x 14 in. H (203 mm W x 356 mm H)	
Maximum Size (Single Section)	ID-1230	48 in. W x 96 in. H (1,219 mm W x 2,438 mm H)
	ID-1231	60 in. W x 96 in. H (1,524 mm W x 2,438 mm H)
Shipping Weight	ID-1230	20.0 lb/sq. ft (9.07 kg/sq. ft)
	ID-1231	21.1 lb/sq. ft (9.57 kg/sq. ft)

### Construction

Part	Construction
Frame	3 in. x 1 in. x 12-gauge (76 mm x 25 mm x 2.8 mm) standard galvanized steel, optional 304 stainless steel, or aluminum
Blade	16-gauge (1.6 mm) triple V-groove constructions, standard galvanized steel, optional 304 stainless steel or aluminum construction; 6-inch nominal width, 8 in. (203 mm) maximum width
Axle	ID-1230: 1/2 in. (13 mm) diameter plated steel ID-1231: 3/4 in. (19 mm) diameter plated steel
Linkage	Face linkage in airstream
Bearings	Stainless steel sleeve pressed into frame
Finish	Mill galvanized

### Sample Specification

Furnish and install, at locations shown on plans or in accordance with schedules, industrial grade induct mount control dampers meeting the following minimum construction standards:

- Damper frame must be 3 inches x 1 inch x 12-gauge (76 mm x 25 mm x 2.8 mm) galvanized steel.
- Blades must be formed double skin airfoil shaped construction, maximum 8 inches (203 mm) wide and minimum 16-gauge (1.6 mm) galvanized steel.
- Axle material must be plated steel rod (specifier select based on model), 0.5 inch (13 mm) or 0.75 inch (19 mm) diameter.
- Bearings must be stainless steel sleeve pressed into frame.
- Oil impregnated bronze, synthetic, or bolt-on style are not acceptable.
- Linkage must be located on damper blade face in airstream for easy access and maintenance. External linkage out of airstream is not acceptable.
- Maximum pressure drop across a 48 inch x 48 inch (1,219 mm x 1,219 mm) unit must not exceed 0.06 wg at 32,000 cubic feet per minute (cfm).
- Standard damper design allows application in systems with 10 inches or 17 inches Static Pressure (SP) across a minimum 48 inch (1,219 mm) long blade.
- Submittal data must include published leakage, pressure drop, and maximum pressure data based on Air Movement and Control Association International (AMCA) Standard 500 testing. Data must cover a full range of damper sizes; data from one size sample is not acceptable.
- If required, dampers must be equipped with blade and jamb seals for low-leakage application. Blade seals must be mechanically attached to the blade. Adhesive-type seals are not acceptable. Jamb seals must be flexible stainless steel located between the blade edge and jamb for maximum sealing compression. Windstops or sponge seals are not acceptable. Leakage must not exceed 4 cfm per square foot at 1 inch SP.

# ID-121x 12-Gauge U-Channel Industrial Damper

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including industrial style dampers in our product offering.

ID-121x dampers are available in sizes up to 999 inches W x 999 inches H (25,375 mm x 25,375 mm), with either a galvanized, 304 stainless steel, or aluminum frame, and a choice of seals:

- Polyvinyl Chloride (PVC)
- Ethylene Propylene Diene Monomer (EPDM)
- stainless steel jamb
- silicone

Refer to the *ID-121x 12-Gauge U-Channel Industrial Damper Product Bulletin (LIT-12011356)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship – provides confidence in company-backed products
- 15 to 25 Working-Day Standard Shipping after order entry – results in fast response for short lead time projects

## Repair Information

If the ID-121x 12-Gauge U-Channel Industrial Damper fails to operate within its specifications, replace the unit. For a replacement damper, contact the nearest Johnson Controls® representative.



**ID-1210 12-Gauge U-Channel Industrial Damper**

## Selection Chart

	Code Number	FIELD														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>Product Family</b>	I = Industrial Volume Control															
<b>Blade Operation</b>	O = Opposed P = Parallel															
<b>Blade Type</b>	V = Triple-V/U-Channel 1/2 in. Axle (ID-1210) W = Triple-V/U-Channel 3/4 in. Axle (ID-1211)															
<b>Bearing/Seal Type</b>	E = Stainless Steel/EPDM H = Stainless Steel/Silicone S = Stainless Steel/None P = Stainless Steel/PVC Coated Fabric															
<b>Actuator Type</b>	N = None															
<b>Width Dimensions</b>	www = 005 through 999 inches 1 inch increments															
<b>Height Dimensions</b>	hhh = 005 through 999 inches 1 inch increments															
<b>Options (Limit of 2)</b>	A = Aluminum Construction B = Bolted Axle C = Full Length Axle E = Exact Size I = Indicator Switch J = Jackshaft K = 14-Gauge Hat Channel S = 304 Stainless Steel Construction															
<b>Code Number</b>		I	O	V	S	N	-	w	w	w	x	h	h	h	-	-

## Construction

Part	Construction
<b>Frame</b>	3 in. x 1 in. x 12-gauge (76 mm x 25 mm x 2.8 mm) standard galvanized steel, optional 304 stainless steel or aluminum
<b>Blade</b>	16-gauge (1.6 mm) triple V-groove construction; standard galvanized steel, optional 304 stainless steel or aluminum construction, 8 in. (203 mm) maximum width
<b>Axle</b>	Minimum 0.5 in. (13 mm) diameter plated steel
<b>Linkage</b>	Face linkage in airstream
<b>Bearings</b>	Stainless steel sleeve pressed into frame
<b>Finish</b>	Mill galvanized

## ID-121x 12-Gauge U-Channel Industrial Damper (Continued)

### Technical Specifications

ID-121x 12-Gauge U-Channel Industrial Damper		
<b>Performance Data for Damper Width of 48 in. (1,219 mm)</b>		
Maximum System Pressure	ID-1210	2.75 in. wg (0.7 kPa)
	ID-1211	6.75 in. wg (1.7 kPa)
Maximum System Velocity	ID-1210	3,000 feet per minute (914 m per minute)
	ID-1211	3,500 feet per minute (1,066 m per minute)
Leakage with Seals	ID-1210	4.3 cubic feet per minute/square foot (1.3 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.14
	ID-1211	4.3 cubic feet per minute/square foot (1.3 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.12
Leakage without Seals	ID-1210	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.06
	ID-1211	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.91
<b>Performance Data for Damper Width of 12 in. (305 mm)</b>		
Maximum System Pressure	ID-1210	8.25 in. wg (2.0 kPa)
	ID-1211	20.0 in. wg (5.0 kPa)
Maximum System Velocity	ID-1210	3,000 feet per minute (914 m per minute)
	ID-1211	3,500 feet per minute (1,066 m per minute)
Leakage with Seals	ID-1210	13.0 cubic feet per minute/square foot (4.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.43
	ID-1211	13.0 cubic feet per minute/square foot (4.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.37
Leakage without Seals	ID-1210	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 2.00
	ID-1211	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.71
Maximum Temperature	250°F (121°C) Damper can be supplied for temperatures between 250°F (121°C) and 400°F (204°C) by increasing clearance between blade ends and frame.	
Minimum Size	Single blade, parallel action: 5 in. W x 5 in. H (127 mm W x 127 mm H) Two blade, parallel or opposed action: 8 in. W x 14 in. H (203 mm W x 356 mm H)	
Maximum Size	Single section: 48 in. W x 96 in. H (1,219 mm W x 2,438 mm H) Multiple section assembly: Unlimited size	
Shipping Weight	ID-1210	16.7 lb/sq. ft (7.6 kg/sq. ft)
	ID-1211	18.7 lb/sq. ft (8.5 kg/sq. ft)

### Sample Specification

Furnish and install at locations shown on the plans or in accordance with schedules, industrial grade induct mount control dampers that meet the following minimum construction standards:

- Damper frame must be minimum 3 inches x 1 inch x 12-gauge (76 mm x 25 mm x 2.8 mm) galvanized steel channel.
- Blades must be formed triple v-groove design, maximum 8 inches (203 mm) wide and minimum 16-gauge (1.6 mm) galvanized steel.
- Axle material must be plated steel rod (specifier select based on model), 0.5 inch (13 mm) or 0.75 inch (19 mm) diameter.
- Bearings must be stainless steel sleeve pressed into frame. Oil impregnated bronze, synthetic, or bolt-on style bearings are not acceptable.
- Linkage must be located on damper blade face in airstream for easy access and maintenance. External linkage outside of airstream is not acceptable.
- Maximum pressure drop across a 48 inch x 48 inch (1,219 mm x 1219 mm) unit must not exceed 0.06 inches wg at 32,000 cubic feet per minute (CFM).
- Standard damper design allows application in system with 2.8 inches or 6.8 inches static pressure (SP) across a minimum 48 inch (1,219 mm) long blade.
- Submittal data must include published leakage, pressure drop, and maximum pressure data based on Air Movement and Control Association International (AMCA) Standard 500 testing. Data must cover a full range of damper sizes; data from one size sample is not acceptable.
- If required, dampers must be equipped with blade and jamb seals for low-leakage application. Blade seals must be mechanically attached to the blade. Adhesive-type seals are not acceptable. Jamb seals must be flexible stainless steel located between the blade edge and jamb for maximum sealing compression. Windstops or sponge seals are not acceptable. Leakage must not exceed 4.3 CFM per square foot at 1 inch SP.

# ID-141x 12-Gauge Hat Channel Industrial Damper

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including industrial style dampers in our product offering.

ID-141x dampers are available in sizes up to 48 inches W (1,219 mm) x 96 inches H (2,438 mm), with a galvanized or 304 stainless steel frame, and a choice of seals:

- stainless steel jamb
- none
- Ethylene Propylene Diene Monomer (EPDM)
- silicone

Refer to the *ID-141x 12-Gauge Hat Channel Industrial Damper Product Bulletin (LIT-12011355)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship – provides confidence in company-backed products
- 15 to 25 Working-Day Standard Shipping after Order Entry – results in fast response for short lead time projects



**ID-1410 12-Gauge Hat Channel Industrial Damper**

## Repair Information

If the ID-141x 12-Gauge Hat Channel Industrial Damper fails to operate within its specifications, replace the unit. For a replacement damper, contact the nearest Johnson Controls® representative.

## Selection Chart

	Code Number	FIELD														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>Product Family</b>	I = Industrial Volume Control															
<b>Blade Operation</b>	O = Opposed P = Parallel															
<b>Blade Type</b>	H = Triple-V/Hat Channel 1/2 in. Axle (ID-1410) J = Triple-V/Hat Channel 3/4 in. Axle (ID-1411)															
<b>Bearing/Seal Type</b>	E = Stainless Steel/EPDM H = Stainless Steel/Silicone S = Stainless Steel/None															
<b>Actuator Type</b>	N = None															
<b>Width Dimensions</b>	www = 005 through 048 inches 1 inch increments															
<b>Height Dimensions</b>	hhh = 005 through 096 inches 1 inch increments															
<b>Options (Limit of 2)</b>	A = Aluminum Construction B = Bolted Axle C = Full Length Axle E = Exact Size I = Indicator Switch J = Jackshaft K = 12-Gauge Hat Channel S = 304 Stainless Steel Construction															
<b>Code Number</b>		I	O	A	S	N	-	w	w	w	x	h	h	h	-	-

## Construction

Part	Construction
<b>Frame</b>	8 in. x 2 in. x 12-gauge (203 mm x 51 mm x 2 mm) steel channel
<b>Blade</b>	16-gauge (1.6 mm) triple v-groove stainless steel construction; 5 in. (127 mm) nominal width, 8 in. (203 mm) maximum width
<b>Axle</b>	ID-1410: 1/2 in. (13 mm) diameter plated steel ID-1411: 3/4 in. (19 mm) diameter plated steel
<b>Linkage</b>	Side linkage out of airstream; 3/16 in. x 3/4 in. (5 mm x 19 mm) plated steel tie bars; 3/8 in. (10 mm) diameter stainless steel pivot pins with lock type retainers; 10-gauge (4 mm) galvanized steel clevis arms.
<b>Bearings</b>	Stainless steel sleeve pressed into frame
<b>Finish</b>	Mill galvanized

## ID-141x 12-Gauge Hat Channel Industrial Damper (Continued)

### Technical Specifications

ID-141x 12-Gauge Hat Channel Industrial Damper		
<b>Performance Data for Damper Width of 48 in. (1,219 mm)</b>		
Maximum System Pressure	ID-1410	2.5 in. wg (0.62 kPa)
	ID-1411	6.75 in. wg (1.7 kPa)
Maximum System Velocity	ID-1410	3,000 feet per minute (914 m per minute)
	ID-1411	3,500 feet per minute (1,066 m per minute)
Leakage with Seals	ID-1410	4.3 cubic feet per minute/square foot (1.3 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.14
	ID-1411	4.3 cubic feet per minute/square foot (1.3 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.12
Leakage without Seals	ID-1410	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.60
	ID-1411	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.91
<b>Performance Data for Damper Width of 12 in. (305 mm)</b>		
Maximum System Pressure	ID-1410	8.25 in. wg (2.0 kPa)
	ID-1411	20.0 in. wg (5.0 kPa)
Maximum System Velocity	ID-1410	3,000 feet per minute (914 m per minute)
	ID-1411	3,500 feet per minute (1,066 m per minute)
Leakage with Seals	ID-1410	13.0 cubic feet per minute/square foot (4.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.43
	ID-1411	13.0 cubic feet per minute/square foot (4.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.37
Leakage without Seals	ID-1410	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 2.00
	ID-1411	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.71
Maximum Temperature	250°F (121°C) Damper can be supplied for temperatures between 250°F (121°C) and 400°F (204°C) by increasing clearance between blade ends and frame.	
Minimum Size	Single blade, parallel action: 6 in. W x 6 in. H (152 mm W x 152 mm H) Two blade, parallel or opposed action: 6 in. W x 12 in. H (152 mm W x 305 mm H)	
Maximum Size	48 in. W x 96 in. H (1,219 mm W x 2,438 mm H)	
Shipping Weight	ID-1410	34.0 lb/sq. ft (15.4 kg/sq. ft)
	ID-1411	35.7 lb/sq. ft (16.2 kg/sq. ft)

### Sample Specification

Furnish and install at locations shown on plans or in accordance with schedules, industrial grade control dampers meeting the following minimum construction standards:

- Damper frame must be a minimum of 8 inches x 2 inches x 12-gauge (203 mm x 51 mm x 2 mm) galvanized steel channel.
- Blades must be triple v-groove design, maximum 8 inches (203 mm) wide and minimum 16-gauge (1.6 mm) galvanized steel.
- Axle material must be plated steel rod (specifier select based on model), 0.5 inch (13 mm) or 0.75 inch (19 mm) diameter.
- Bearings must be stainless steel sleeve pressed into frame. Oil impregnated bronze or synthetic style bearings are not acceptable.
- Linkage must be located in jamb out of airstream and constructed of minimum 10-gauge (3.5 mm) steel clevis arms with 3/16 inch x 3/4 inch (4.8 mm x 19 mm) plated steel tie bars pivoting on 3/8 inch (9.5 mm) diameter stainless steel pivot pins with lock type retainers.
- Standard construction includes locking hand quadrant for manual operation or crank lever for motor operation.
- Submittal data must include published leakage, pressure drop, and maximum pressure data based on Air Movement and Control Association International (AMCA) Standard 500 testing. Data must cover a full range of damper sizes; data from one size sample is not acceptable.
- If required, dampers must be equipped with blade and jamb seals for low-leakage application. Blade seals must be mechanically attached to the blade. Adhesive-type seals are not acceptable. Jamb seals must be flexible stainless steel located between the blade edge and jamb for maximum sealing compression. Windstops or sponge seals are not acceptable.

# RM-1200 Slim Round Control Damper

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including round industrial style dampers in our product offering.

RM-1200 dampers are available in sizes up to 48 inches (122 cm) in diameter with galvanized steel, aluminum, or 304 stainless steel frames with no seals, neoprene seals, or silicone seals. The RM-1200 dampers feature the blade seals locked inside the blade.

RM-1200 heavy duty dampers are designed for airflow modulation and shutoff in industrial applications. These dampers are equipped with blade seals for low leakage applications.

Refer to the *RM-1200 Slim Round Control Damper Product Bulletin (LIT-12011358)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship
- 15 to 25 Working-Day Standard Shipping after Order Entry

## Repair Information

If the RM-1200 Slim Round Control Damper fails to operate within its specifications, replace the unit. For a replacement RM-1200 Damper, contact the nearest Johnson Controls® representative.



RM-1200 Slim Round Control Damper

## Selection Chart

	Code Number	FIELD					
		1	2	3	4	5	6
Product Family	R = Round Dampers	R	M	G	d	d	X
Application	M = Slim line Galvanized <sup>1</sup>						
Shroud Type	A = Aluminum G = Galvanized Steel S = Stainless Steel						
dd = Diameter	04 in. through 48 in. in increments of 1 in.						
Actuator	M = Manual Locking Quadrant N = None						

- Under 6 inches (152 mm) in diameter: 2 inches x 12 ga. (5 cm x 2.7 mm),  
6 to 12 inches (152 to 305 mm) in diameter: 2 inches x 1/2 inch x 14 ga. (5 cm x 1.3 cm x 1.8 mm)  
12 to 24 inches (305 to 610 mm) in diameter: 2 inches x 1/2 inch x 1/8 inch (5 cm x 1.3 cm x 0.3 cm)  
34 to 40 inches (610 to 1,016 mm) in diameter: 2 inches x 1 inch x 3/16 inch (5 cm x 2.5 cm x 0.5 cm)  
40 to 48 inches (1,016 to 1,219 mm) in diameter: 2-1/2 inches x 1-1/2 inches x 1/4 inch (6.4 cm x 3.8 cm x 0.6 cm)

## Performance Data

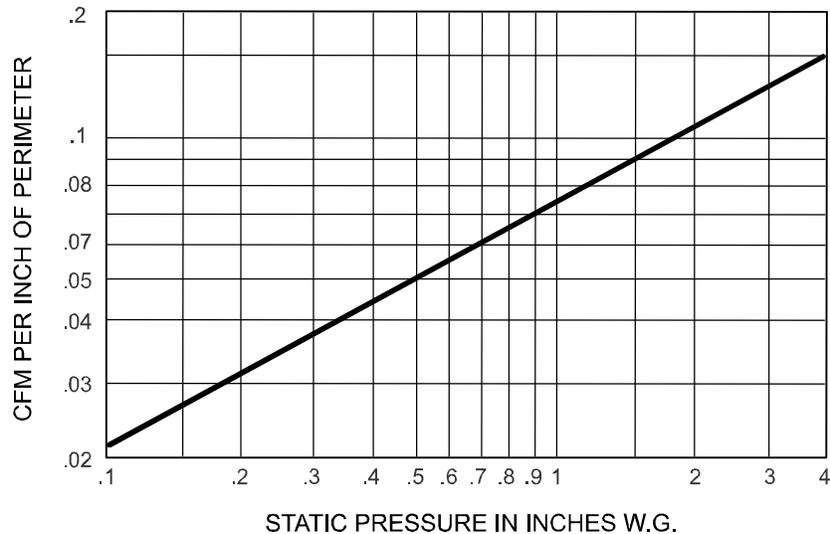
To determine damper leakage, enter the Damper Leakage Chart from the top side. Given the static pressure the damper encounters in closed position, move vertically over diagonal line, then move left to cfm of leakage per inch of perimeter.

Example: Damper operating at 1.5 inches w.g. (0.37 kPa) static pressure leaks .09 cfm per inch of perimeter (.11 lps per cm of perimeter).

Total leakage on an 8 inch (20.3 cm) round is 8 x 3.14 x 0.09 CFM per inch perimeter = 2.26 cfm (20.3 cm x 3.14 x 0.11 lps per cm = 7.59 lps) leakage.

Ratings are based on AMCA Standard 500 using Test Set-up Apparatus Figure 5.3 (damper installed with duct upstream and downstream).

Static pressure and cfm (lps) are corrected to 0.075 lb/cubic ft (1.2 kg/cubic m).



Damper Leakage Chart

### RM-1200 Slim Round Control Damper (Continued)

To determine static pressure drop through an open damper, enter the Static Pressure Drop Chart from the left side. Given the cfm of airflow through the damper, follow the cfm line to the diagonal line with the damper size required, then down to the static pressure drop of the unit.

Example: The pressure drop of an 8 inch (20.3 cm) damper with 700 cfm (330 lps) flow is 0.06 inches w.g. (.015 kPa).

**Static Pressure, in. w.g. (kPa)**

Damper Diameter, in. (cm)	Minimum Inch-Pounds (Newton Meter) Torque at 2 in. w.g. (0.5 kPa) or Less Static Pressure
4 (10.2)	36 (4.07)
5 (12.7)	40 (4.52)
6 (15.2)	44 (4.97)
7 (17.8)	48 (5.42)
8 (20.3)	52 (5.88)
9 (22.9)	56 (6.33)
10 (25.4)	60 (6.78)
12 (30.5)	68 (7.69)
14 (35.6)	76 (8.59)
16 (40.6)	84 (9.49)
18 (45.7)	92 (10.39)
20 (50.8)	100 (11.30)
22 (55.9)	108 (12.20)
24 (61)	116 (13.11)

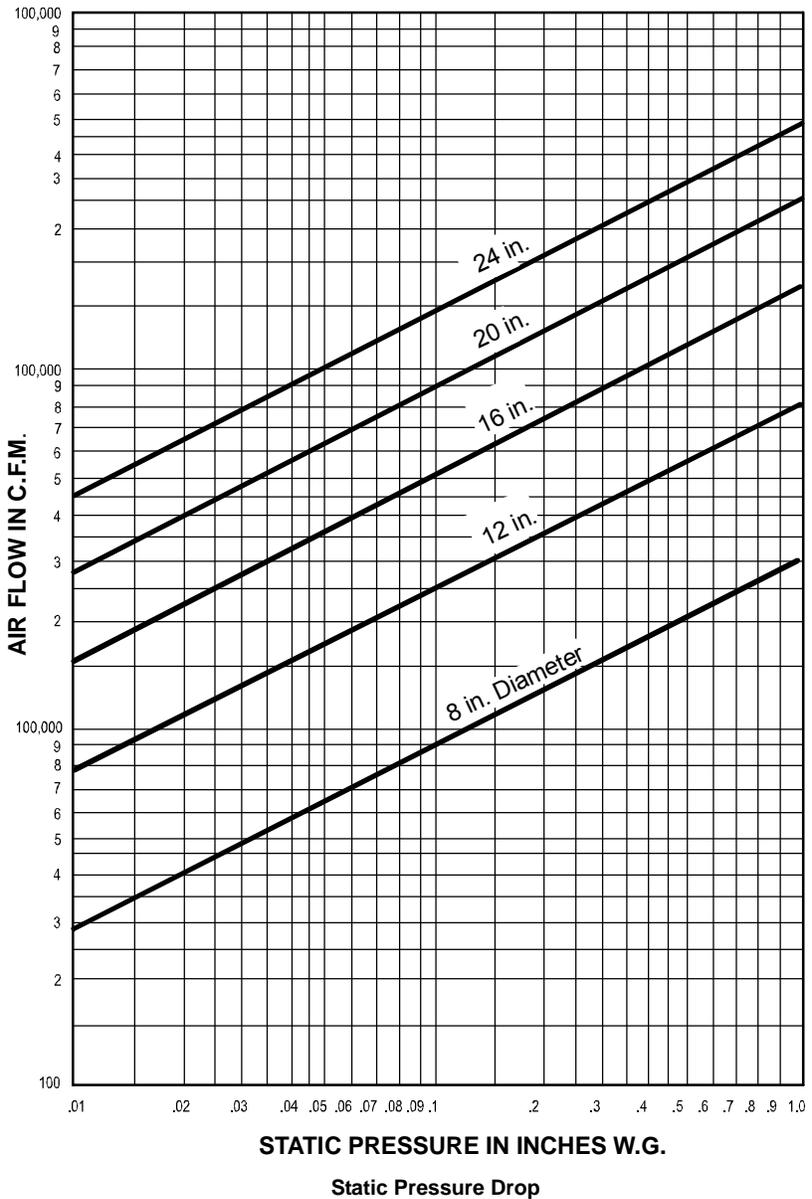


FIG. RM1200\_press\_dip

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

## ID-1430, ID-1431, ID-1432, and ID-1433 Industrial Dampers

### Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including industrial-style dampers in our product offering. The available Industrial Damper models include:

- **ID-1430 Industrial Damper**  
Class 1 leakage with seals  
8 in. deep frame  
1/2 in. (13 mm) axle
- **ID-1431 Industrial Damper**  
Class 1 leakage with seals  
8 in. deep frame  
3/4 in. (19 mm) axle
- **ID-1432 Industrial Damper**  
Class 1 leakage with seals  
8 in. deep frame  
3/4 in. (19 mm) axle
- **ID-1433 Industrial Damper**  
Class 1 leakage with seals  
8 in. deep frame  
3/4 in. (19 mm) axle

Standard frame and blade materials are galvanized steel. Optional materials include aluminum and 304 stainless steel.

Refer to the *ID-143x Industrial Dampers Product Bulletin (LIT-12011864)* for important product application information.

### Features

- 3-year warranty on materials and workmanship provides confidence in company-backed products
- 15 to 25 working-day standard shipping after order entry results in fast response for short lead time projects.



ID-143x Industrial Dampers

### Repair Information

If an ID-143x damper fails to operate within its specifications, replace the unit. For a replacement damper, contact the nearest Johnson Controls® representative.

### Dimensions

All Johnson Controls height and width dimensions are from the outside edges of the frame. Actual damper size is 1/4 in. less than nominal.

Size Limits	Width x Height, in. (mm)
Minimum Single Panel	6 x 6 (152 x 152)
Maximum Single Panel	60 x 72 (1,524 x 1,829)
Maximum Multiple Panel	999 x 999 (25,375 x 25,375)
Size Increment	1 in. increments

**Note:** Actual size is 1/4 in. (6 mm) less than nominal.

### Leakage and Pressure

Dampers may tolerate higher pressures and velocities than those listed in the following tables. Conservative ratings are presented intentionally in an effort to avoid misapplication. Consult a Johnson Controls® representative when a damper is to be applied in conditions exceeding recommended maximums.

#### Damper Leakage for ID-1430 Models

Damper Width, in. (mm)	Maximum System Pressure (in. wg)	Maximum System Velocity (fpm)	Leakage without Seals <sup>1</sup>		Leakage with Seals <sup>1</sup>		Ultra-Low Leakage	
			% of Maximum Flow	Total sq ft/cfm	% of Maximum Flow	Total sq ft/cfm	% of Maximum Flow	Total sq ft/cfm
48 (1,219)	10.0	4,000	0.80	32.0	0.10	4.0	0.07	2.9
36 (914)	14.8	4,000	0.80	32.0	0.10	4.0	0.07	2.9
24 (610)	19.3	5,000	0.80	40.0	0.16	8.0	0.12	5.8
12 (305)	24.0	6,000	1.00	60.0	0.22	13.0	0.16	9.5

1. Leakage information based on pressure differential of 1 in. wg tested per AMCA Standard 500 using elastomer blade seals and compression jamb seals. ID-1430 models can be used in systems with total pressure exceeding 14 in. wg by reducing the damper section width as indicated above. For example, maximum design total pressure of 14 in. wg requires an ID-1430 damper with maximum section width of 36 in.

**ID-1430, ID-1431, ID-1432, and ID-1433 Industrial Dampers (Continued)**

**Damper Leakage for ID-1431 Models**

Damper Width, in. (mm)	Maximum System Pressure (in. wg)	Maximum System Velocity (fpm)	Leakage without Seals <sup>1</sup>		Leakage with Seals <sup>1</sup>		Ultra-Low Leakage	
			% of Maximum Flow	Total cfm	% of Maximum Flow	Total cfm	% of Maximum Flow	Total cfm
60 (1524)	12.0	4,000	0.80	32.0	0.10	4.0	0.07	2.9
48 (1,219)	17.0	5,000	0.80	32.0	0.08	4.0	0.06	2.9
36 (914)	22.0	5,000	0.80	32.0	0.08	4.0	0.06	2.9
24 (610)	27.0	5,000	0.80	40.0	0.16	8.0	0.12	5.8
12 (305)	32.0	6,000	1.00	60.0	0.22	13.0	0.16	9.5

1. Leakage information based on pressure differential of 1 in. wg tested per AMCA Standard 500 using elastomer blade seals and compression jamb seals. ID-1431 models can be used in systems with total pressure exceeding 22 in. wg by reducing the damper section width as indicated above. For example, maximum design total pressure of 22 in. wg requires an ID-1431 damper with maximum section width of 36 in.

**Damper Leakage for ID-1432 Models**

Damper Width, in. (mm)	Maximum System Pressure (in. wg)	Maximum System Velocity (fpm)	Leakage without Seals <sup>1</sup>		Leakage with Seals <sup>1</sup>		Ultra-Low Leakage	
			% of Maximum Flow	Total cfm	% of Maximum Flow	Total cfm	% of Maximum Flow	Total cfm
60 (1524)	13.0	5,000	0.64	32.0	0.08	4.0	0.06	2.9
48 (1,219)	15.0	5,000	0.64	32.0	0.08	4.0	0.06	2.9
36 (914)	17.0	5,000	0.64	32.0	0.08	4.0	0.06	2.9
24 (610)	19.0	6,000	0.67	40.0	0.13	8.0	0.10	5.8
12 (305)	21.0	6,000	1.00	60.0	0.22	13.0	0.16	9.5

1. Leakage information based on pressure differential of 1 in. wg tested per AMCA Standard 500 using elastomer blade seals and compression jamb seals. ID-1432 models can be used in systems with total pressure exceeding 17 in. wg by reducing the damper section width as indicated above. For example, maximum design total pressure of 4 in. wg requires an ID-1432 damper with maximum section width of 36 in.

**Damper Leakage for ID-1433 Models**

Damper Width, in. (mm)	Maximum System Pressure (in. wg)	Maximum System Velocity (fpm)	Leakage without Seals <sup>1</sup>		Leakage with Seals <sup>1</sup>		Ultra-Low Leakage	
			% of Maximum Flow	Total cfm	% of Maximum Flow	Total cfm	% of Maximum Flow	Total cfm
60 (1524)	20.0	5,000	0.64	32.0	0.08	4.0	0.06	2.9
48 (1,219)	26.0	5,000	0.64	32.0	0.08	4.0	0.06	2.9
36 (914)	32.0	5,000	0.64	32.0	0.08	4.0	0.06	2.9
24 (610)	35.0	6,000	0.67	40.0	0.13	8.0	0.10	5.8
12 (305)	44.0	6,000	1.00	60.0	0.22	13.0	0.16	9.5

1. Leakage information based on pressure differential of 1 in. wg tested per AMCA Standard 500 using elastomer blade seals and compression jamb seals. ID-1433 models can be used in systems with total pressure exceeding 22 in. wg by reducing the damper section width as indicated above. For example, maximum design total pressure of 32 in. wg requires an ID-1433 damper with maximum section width of 36 in.

**ID-1430, ID-1431, ID-1432, and ID-1433 Industrial Dampers (Continued)**

**Ordering Information**

**ID-143x Industrial Dampers**

	Code Number/Character	FIELD															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<b>Product Family</b>	I = Industrial Volume Control																
<b>Blade Operation</b>	O = Opposed P = Parallel																
<b>Blade Type</b>	C = Airfoil/14 Gauge 1/2 in. Axle (ID-1430) D = Airfoil/14 Gauge 3/4 in. Axle (ID-1431) F = Airfoil/12 Gauge Hat Channel 3/4 in. Axle (ID-1432) G = Airfoil/10 Gauge Hat Channel 3/4 in. Axle (ID-1433)																
<b>Bearing/Seal Type</b>	E = Stainless Steel/EPDM H = Stainless Steel/Silicone S = Stainless Steel/None																
<b>Actuator Type</b>	N = None																
<b>Width Dimensions</b>	www = 005 through 048 inches 1 inch increments Note: See Technical Specifications for exact dimensions																
<b>Height Dimensions</b>	hhh = 005 through 096 inches 1 inch increments																
<b>Options (Limit 2)</b>	A = Aluminum Construction B = Bolted Axle C = Full Length Axle E = Exact Size I = Indicator Switch J = Jackshaft K = 12 Gauge Hat Channel S = 304 Stainless Steel Construction																
<b>Ordering Code Number</b>		I	O	C	S	N	-	w	w	w	x	h	h	h	-	-	

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**ID-1430, ID-1431, ID-1432, and ID-1433 Industrial Dampers (Continued)**
**Technical Specifications**

ID-143x Industrial Dampers		
<b>Performance Data for Damper Width of 48 in. (1,219 mm)</b>		
<b>Maximum System Pressure</b>	ID-1430	15.0 wg (0.62 kPa)
	ID-1431	26.0 in. wg (1.7 kPa)
<b>Maximum System Velocity</b>	ID-1430	3,000 feet per minute (914 m per minute)
	ID-1431	3,500 feet per minute (1,066 m per minute)
<b>Leakage with Seals</b>	ID-1430	4.3 cubic feet per minute/square foot (1.3 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.14
	ID-1431	4.3 cubic feet per minute/square foot (1.3 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.12
<b>Leakage without Seals</b>	ID-1430	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.60
	ID-1431	32.0 cubic feet per minute/square foot (9.8 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.91
<b>Performance Data for Damper Width of 12 in. (305 mm)</b>		
<b>Maximum System Pressure</b>	ID-1432	8.25 in. wg (2.0 kPa)
	ID-1433	20.0 in. wg (5.0 kPa)
<b>Maximum System Velocity</b>	ID-1432	3,000 feet per minute (914 m per minute)
	ID-1433	6,000 feet per minute (1,828 m per minute)
<b>Leakage with Seals</b>	ID-1432	13.0 cubic feet per minute/square foot (4.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.43
	ID-1433	13.0 cubic feet per minute/square foot (4.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 0.37
<b>Leakage without Seals</b>	ID-1432	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 2.00
	ID-1433	60.0 cubic feet per minute/square foot (18.0 cubic meters per minute/square meter) - based on pressure differential of 1 in. wg (0.25 kPa) Percent of maximum flow: 1.71
<b>Maximum Temperature</b>	250°F (121°C) Damper can be supplied for temperatures between 250°F (121°C) and 400°F (204°C) by increasing clearance between blade ends and frame.	
<b>Minimum Size</b>	Single blade, parallel action: 6 in. W x 6 in. H (152 mm W x 152 mm H) Two blade, parallel or opposed action: 6 in. W x 12 in. H (152 mm W x 305 mm H)	
<b>Maximum Size</b>	ID-1430	48 in. W x 96 in. H (1,219 mm W x 2,438 mm H)
	ID-1431	60 in. W x 96 in. H (1,524 mm W x 2,438 mm H)
	ID-1432	60 in. W x 96 in. H (1,524 mm W x 2,438 mm H)
	ID-1433	60 in. W x 96 in. H (1,524 mm W x 2,438 mm H)
<b>Shipping Weight</b>	ID-1430	37.9 lb/sq. ft (17.2 kg/sq. ft)
	ID-1431	38.2 lb/sq. ft (17.3 kg/sq. ft)
	ID-1432	39.1 lb/sq. ft (17.7 kg/sq. ft)
	ID-1433	39.5 lb/sq. ft (17.9 kg/sq. ft)

## RV-1600 16-Gauge Round Control Damper

### Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including round industrial style dampers in our product offering.

RV-1600 dampers are available in sizes up to 48 inches (122 cm) diameter with galvanized steel, aluminum, or 304 stainless steel frames with no seals, neoprene seals, or silicone seals.

RV-1600 dampers are ruggedly built, flanged frame dampers that serve well in hostile environments and extreme conditions. These dampers are equipped with blade seals for low leakage applications.

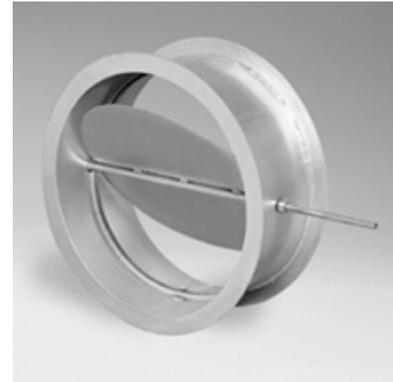
Refer to the *RV-1600 16-Gauge Round Control Damper Product Bulletin (LIT-12011359)* for important product information.

### Features

- 3-Year Warranty on Materials and Workmanship
- 15 to 25 Working-Day Standard Shipping after Order Entry

### Repair Information

If the RV-1600 16-Gauge Round Control Damper fails to operate within its specifications, replace the unit. For a replacement RV-1600 Damper, contact the nearest Johnson Controls® representative.



**RV-1600 16-Gauge Round Control Damper**

### Selection Chart

	Code Number	FIELD					
		1	2	3	4	5	6
<b>Product Family</b>	R = Round Dampers	R	V	G	d	d	X
<b>Application</b>	V = Control – 16 gauge shroud						
<b>Shroud Type</b>	A = Aluminum/Neoprene Seals B = Galvanized/No Seals N = Galvanized/Neoprene Seals G = Galvanized/Silicone Seals S = Stainless Steel/Silicone Seals						
<b>dd = Diameter</b>	04 in. through 48 in. in increments of 1 in.						
<b>Actuator</b>	N = None						

### Performance Data

AMCA Standard 500 provides a reasonable basis for testing and rating dampers. Testing to AMCA 500 is performed under a certain set of laboratory conditions. This does not guarantee that other conditions do not occur in the actual environment where dampers must operate.

Designs should provide a reasonable safety factor for damper performance by selecting at some point below damper leakage and pressure drop system requirements.

### Leakage Data

Damper Diameter	Maximum System Velocity, cfm (lps)	Leakage with Continuous Seals		Leakage with Sponge Blade-stops	
		% of Maximum Flow	Total cfm (lps)	% of Maximum Flow	Total cfm (lps)
48 in. (1,219 mm)	2,500 (1,179)	0.45	11.30 (28.7)	1.40	35 (88.9)
36 in. (914 mm)	2,500 (1,179)	0.34	8.50 (21.6)	1.10	28 (71.1)
24 in. (610 mm)	2,500 (1,179)	0.23	5.65 (14.4)	1.00	25 (63.5)
12 in. (305 mm)	4,000 (1,888)	0.07	2.85 (7.24)	0.40	15 (38.1)
6 in. (152 mm)	4,000 (1,888)	0.04	1.41 (3.58)	0.20	7.5 (19.1)

# RL-1000 10-Gauge Round Control Damper

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including round industrial style dampers in our product offering.

RL-1000 dampers are available in sizes up to 60 inches (152 cm) diameter with galvanized steel or 304 stainless steel frames with no seals, neoprene seals, or silicone seals.

RL-1000 dampers are heavy duty control dampers for medium pressure industrial and Heating, Ventilating, and Air Conditioning (HVAC) systems. These dampers are built with solid steel construction and an all-welded frame with a continuous plated steel axle. These dampers are equipped with blade seals for low leakage applications

Refer to the *RL-1000 10-Gauge Round Control Damper Product Bulletin (LIT-12011432)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship
- 15 to 25 Working-Day Standard Shipping after Order Entry

## Repair Information

If the RL-1000 Heavy Duty Round Control Damper fails to operate within its specifications, replace the unit. For a replacement RL-1000 Damper, contact the nearest Johnson Controls® representative.



RL-1000 Heavy Duty Round Control Damper

## Selection Chart

	Code Number	FIELD					
		1	2	3	4	5	6
<b>Product Family</b>	R = Round Dampers	R	G	G	d	d	X
<b>Application</b>	G = Control – 10 gauge shroud						
<b>Shroud/Seal</b>	B = Galvanized/No Seals N = Galvanized/Neoprene Seals G = Galvanized/Silicone Seals S = 304 Stainless Steel/Silicone Seals						
<b>dd = Diameter</b>	04 in. through 60 in. in increments of 1 in.						
<b>Actuator</b>	M = Manual Locking Quadrant N = None						

## Performance Data

To determine leakage at static pressure differentials higher than 1 inch water gage, multiply leakage at 1 inch (determined from the Damper Leakage Table) by correction factor for higher static pressure (determined from the Leakage Correction Factor Table).

Leakage ratings are based on AMCA Standard 500 using Test Setup Apparatus Figure 5.5. Torque applied holding damper closed at 10 lb·in/sq. ft (1.13 N·m/m<sup>3</sup>) of damper with minimum of 20 lb·in (2.26 N·m).

Dampers may tolerate higher pressures and velocities than those listed here. Conservative ratings are presented intentionally in an effort to avoid misapplication. Consult your Johnson Controls® representative when damper is to be applied in conditions exceeding recommended maximums.

## Damper Leakage

Damper Width	Maximum System Pressure, in. w.g. (kPa)	Maximum System Velocity, fpm (mps)	Leakage with Seals <sup>1</sup>		Leakage without Seals <sup>1</sup>	
			% of Maximum Flow	Total cfm (lps)	% of Maximum Flow	Total cfm (lps)
60 in. (1,524 mm)	6.0 (1.5)	4,000 (20.3)	0.057	45 (21.2)	0.286	225 (106)
48 in. (1,219 mm)	6.0 (1.5)	4,000 (20.3)	0.069	35 (16.5)	0.2348	175 (82.6)
36 in. (914 mm)	8.0 (2.0)	5,000 (25.4)	0.079	28 (13.2)	0.353	125 (59)
24 in. (610 mm)	8.0 (2.0)	6,000 (30.5)	0.132	25 (11.8)	0.450	85 (40.1)
12 in. (305 mm)	10.0 (2.48)	6,000 (30.5)	0.318	15 (7.08)	1.060	50 (23.6)

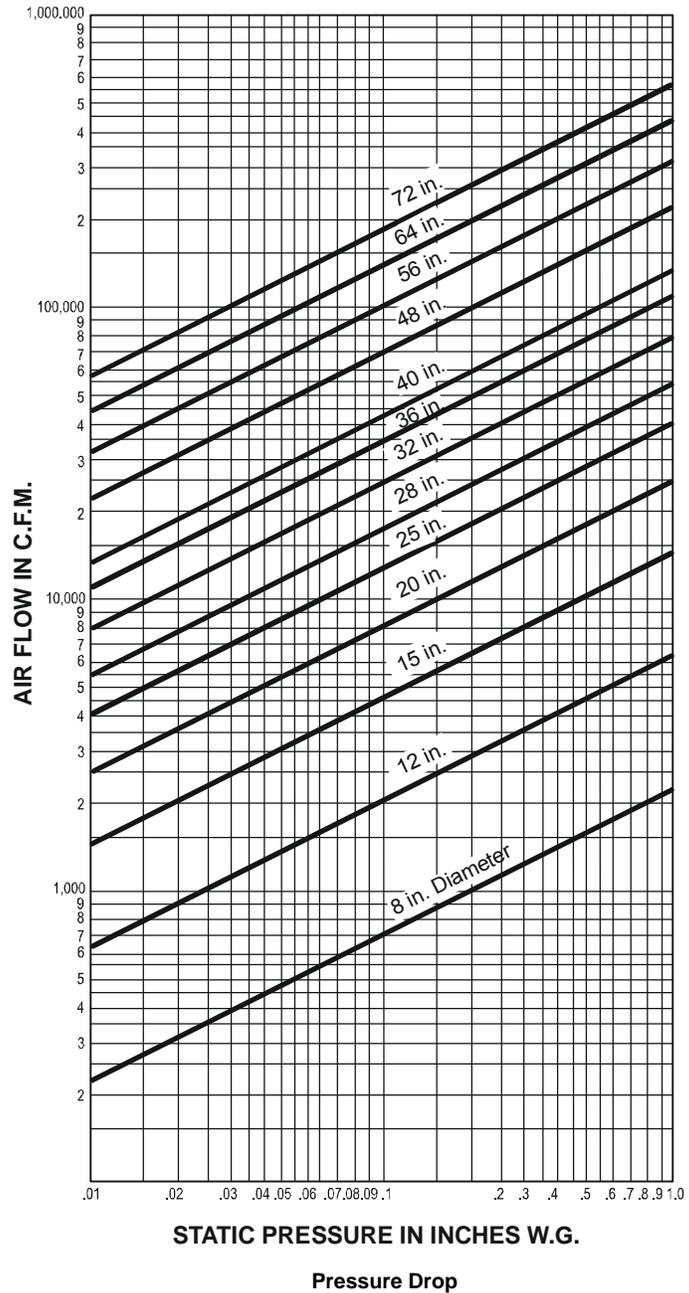
1. Leakage information based on pressure differential of 1 inch w.g. (0.25 kPa).

## Leakage Correction Factor

Static Pressure, in. w.g. (kPa)	1 (0.25)	2 (0.50)	3 (0.75)	4 (1.0)	5 (1.25)	6 (1.50)	7 (1.75)	8 (2.0)	9 (2.25)	10 (2.50)
Correction Factor	1.0	1.4	1.7	2.0	2.2	2.4	2.6	2.8	3.0	3.2

**RL-1000 10-Gauge Round Control Damper (Continued)**

Performance curves (see Pressure Drop) based on AMCA Standard 500 using test setup apparatus figure 5.3 (damper installed with duct upstream and downstream). Static pressure and CFM are corrected to .075 lb/cu ft air density.



FK:dampr\_press\_drp

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2013 Johnson Controls, Inc. [www.johnsoncontrols.com](http://www.johnsoncontrols.com)

# RI-1000 10-Gauge Round Industrial Damper

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including Industrial-style dampers in our product offering.

RI-1000 dampers are available in sizes up to 72 inches (182 cm) in diameter with galvanized steel or 304 stainless steel frames with no seals, neoprene seals, or silicone seals.

Refer to the *RI-1000 10-Gauge Round Industrial Damper Product Bulletin (LIT-12011352)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship

- 15 to 25 Working-Day Standard Shipping after Order Entry

## Applications

RI-1000 dampers are heavy duty control dampers that offer accurate control within round duct work with pressure differentials of 13 inches (33 cm) or more. The solid steel construction and an all-welded frame effectively perform under the most demanding conditions found in industrial Heating, Ventilating, and Air Conditioning (HVAC) or process systems. These dampers are available with blade seals for low leakage applications.



RI-1000 Damper

## Repair Information

If the RI-1000 Damper fails to operate within its specifications, replace the unit. For a replacement RI-1000 Damper, contact the nearest Johnson Controls® representative.

## Selection Chart

	Code Number	FIELD					
		1	2	3	4	5	6
Product Family	R = Round Dampers	R	I	G	d	d	X
Application	I = Industrial						
Shroud/Seal	B = Galvanized/No Seals N = Galvanized/Neoprene Seals G = Galvanized/Silicone Seals S = 304 Stainless Steel/Silicone Seals						
dd = Diameter	04 in. through 72 in. in increments of 1 in.						
Actuator	M = Manual Locking Quadrant N = None						

## Performance Data

To determine leakage at static pressure differentials higher than 1 inch water gage, multiply leakage at 1 inch (determined from the Damper Leakage Table) by correction factor for higher static pressure (determined from the Correction Factor Table).

Leakage ratings are based on AMCA Standard 500 using Test Setup Apparatus Figure 5.5. Torque applied holding damper closed at 10 lb-in./sq. ft (0.1216 kPa) of damper with minimum of 20 lb-in (2.26 N·m).

Dampers may tolerate higher pressures and velocities than those listed here. Conservative ratings are presented intentionally in an effort to avoid misapplication. Consult Johnson Controls when damper is to be applied in conditions exceeding recommended maximums.

Damper Width	Maximum System Pressure, in. w.g. (kPa)	Maximum System Velocity	Leakage with Seals <sup>1</sup>		Leakage without Seals <sup>1</sup>	
			% of Maximum Flow	Total cfm (lps)	% of Maximum Flow	Total cfm (lps)
72 in. (1,829 mm)	13.0 (3.25)	6,000 feet per minute (30.48 meters per second)	0.035	60 (28)	0.162	275 (130)
60 in. (1,524 mm)	13.0 (3.25)		0.038	45 (21)	0.191	225 (106)
48 in. (1,219 mm)	13.0 (3.25)		0.046	35 (16.5)	0.232	175 (82.5)
36 in. (914 mm)	14.0 (3.50)		0.066	28 (13)	0.294	125 (59)
24 in. (610 mm)	15.0 (3.75)		0.132	25 (11.7)	0.451	85 (40)
12 in. (305 mm)	17.0 (4.25)		0.318	15 (7)	1.060	50 (23.6)

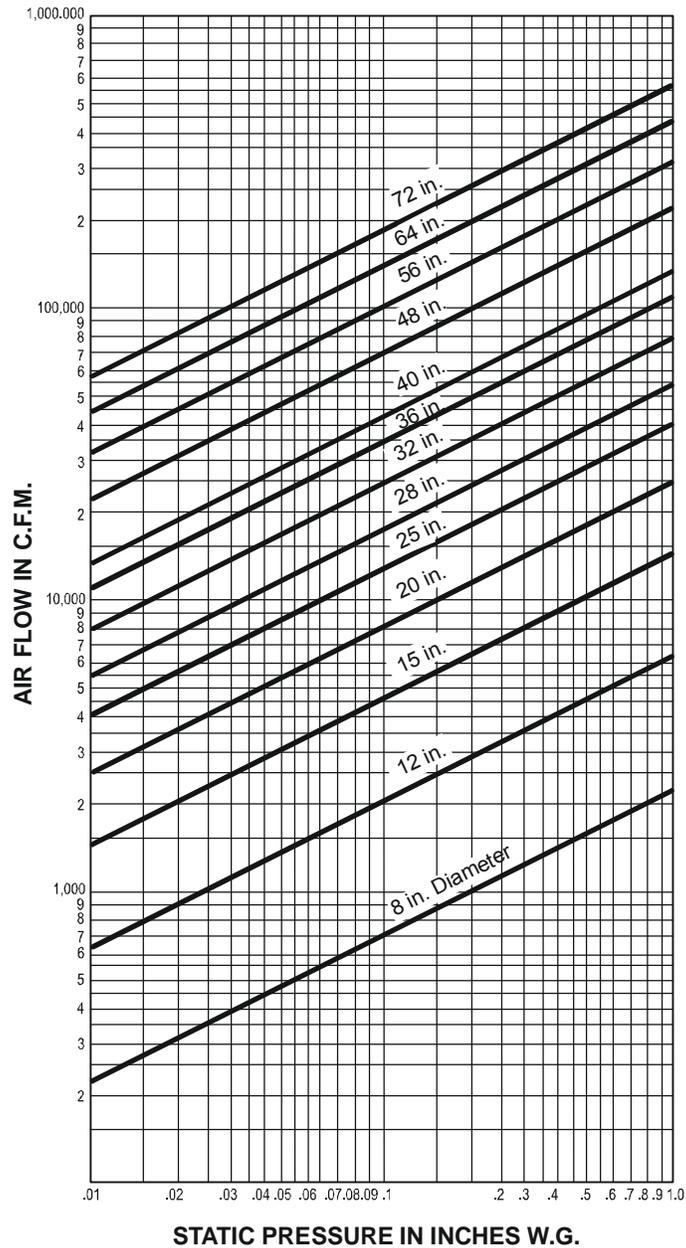
1. Leakage information based on pressure differential of 1 inch w.g. (0.25 kPa).

### RI-1000 10-Gauge Round Industrial Damper (Continued)

Performance curves are based on AMCA Standard 500 using test setup apparatus figure 5.3 (damper installed with duct upstream and downstream). Static pressure and cfm (lps) are corrected to 0.075 lb/cubic ft (1.2 kg/cubic meter) air density.

**Correction Factor**

Static Pressure, in. w.g. (kPa)	Correction Factor
1 (.25)	1.0
2 (.50)	1.4
3 (.75)	1.7
4 (1.0)	2.0
5 (1.25)	2.2
6 (1.5)	2.4
7 (1.75)	2.6
8 (2.0)	2.8
9 (2.25)	3.0
10 (2.50)	3.2
11 (2.75)	3.3
12 (3.0)	3.5
13 (3.25)	3.6
14 (3.50)	3.7
15 (3.75)	3.9
16 (4.0)	4.0
17 (4.25)	4.1



Damper Pressure Drop

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# LV-1250 and LV-1800 Stationary Louvers

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including louvers in our product offering:

- LV-1250 louvers feature a stationary aluminum J-style blade with a 4 inch (10 cm) or 6 inch (15 cm) deep aluminum frame.
- LV-1800 louvers feature a stationary galvanized steel J-style blade with a 4 inch (10 cm) deep galvanized steel frame.

LV-1250 stationary louvers are designed to meet heavy duty application and environmental requirements. Drainable heads channel water to the side frames, which channel through vertical downspouts and out the bottom of the louver at the sill. These models are efficient at minimizing water penetration with low resistance to airflow.

LV-1800 stationary louvers are designed to protect air intake and exhaust openings in exterior walls of buildings. Drainable heads channel water to the side frames, which channel through vertical downspouts and out the bottom of the louver at the sill. These models are efficient at minimizing water penetration.

Refer to the *LC-1250, LM-1250, LV-1250, and LV-1800 Louvers Product Bulletin (LIT-12011469)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship
- 15 to 25 Working Day Standard Shipping after Order Entry

## Selection Chart

### Stationary Louver (LV-1250 and LV-1800) Selector<sup>1</sup>

	Code Number	L	F		N	-	w	w	w	x	h	h	h			
Application	L = Louver															
Blade Operation	F = Fixed															
Blade	J = J-style aluminum blade L = L-style aluminum blade M = M-style aluminum blade															
Frame	D = 4-inch deep aluminum F = 6-inch deep aluminum															
Actuator	N = None															
Width <sup>2</sup>	LV-1250 – 012 to 120 inches, 1 in. increments LV-1800 – 012 to 090 inches, 1 in. increments															
Height <sup>2</sup>	012 to 096 inches, 1 in. increments															
Options (limit two)	See <i>Factory Options</i> for descriptions and combinations.															

1. Not all combinations are available, check the selector tool for valid combinations.
2. Actual louver size is 1/4 inch (0.55 mm) less than nominal.

## Factory Options

Ordering Code	Factory Option
B	Baked enamel
C	Color match
E	Exact size
F	Filter racks
H	Hinged frame
K	Kynar <sup>®1</sup> finish
R	Rear security bars
S	Security bars, front
L	Extended sill



LV-1250 and LV-1800 Stationary Louvers

- 45% or Greater Free Area
- Hidden Vertical Support Blade
- Extruded 60635 T5 Aluminum Construction

## Repair Information

If the LV-1250 or LV-1800 Louvers fail to operate within their specifications, replace the units. For a replacement louver, contact the nearest Johnson Controls® representative.

1. KYNAR® is a type of Polyvinylidene Difluoride (PVDF), which is a highly non-reactive and pure thermoplastic fluoropolymer used in applications requiring the highest purity, strength, and resistance to solvents, acids, bases and heat and low smoke generation during a fire event. A fine powder grade PVDF is used as the principal ingredient of high-end paints for metals, which have extremely good gloss and color retention. These paints are on many prominent buildings around the world, as well as on commercial and residential metal roofing.

**LV-1250 and LV-1800 Stationary Louvers (Continued)**

**Technical Specifications**

**Single-Panel Size Limits (All Models)**

LV-1250 and LV-1800 Louvers	
Width	12 to 60 in. (305 x 1,530 mm)
Height	12 to 96 in. (305 x 2,438 mm)
Size Increment	1-inch (13 mm) increments

**Materials and Dimensions - Stationary Louvers**

Component	LV-1250 Louvers	LV-1800 Louvers
Frame	4 or 6 in. (102 or 152 mm) deep, 6063T5 Aluminum; 0.081 in. (2.1 mm) or 0.125 in. (3.2 mm) nominal wall thickness	4 in. (102 mm) deep, 18 ga. (1.3 mm) galvanized steel
Blades	6063T5 Aluminum, 0.081 or 0.125 in. (2.1 or 3.2 mm) nominal wall thickness	20 ga. (1.0 mm) galvanized steel, J-style; positioned at 45 degree angle and spaced 5 in. (127 mm) center-to-center
Screen	0.75 x 0.051 in. (19 x 1.3 mm) expanded flattened aluminum bird screen in removable frame (adds 0.5 in [13 mm] to depth).	0.5 in x 19 ga. (13 x 1.1 mm) galvanized steel in removable frame; (adds 0.5 in. [13 mm] to depth)
Finish	mill	mill
Minimum Size	12 x 12 in. (305 x 305 mm)	12 x 12 in. (305 x 305 mm)
Maximum Factory Assembly Size	75 sq ft (75 sq m), not to exceed 120 x 90 in. (3,048 x 2,286 mm)	64 sq ft (6 sq m), not to exceed 120 x 90 in. (3,048 x 2,286 mm)
Shipping Weight	4 or 6 lb/sq. ft (19.5 or 29.3 kg/sq. m)	5 lb/sq. ft (2.4 kg/sq. m)

# LC-1250 and LM-1250 Adjustable Louvers

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including louvers in our product offering:

- LC-1250 louvers feature an adjustable aluminum L-style blade with an aluminum damper in a 6 inch (15 cm) deep aluminum frame.
- LM-1250 louvers feature an adjustable aluminum L-style blade with a 6 inch (15 cm) deep aluminum frame.

LC-1250 adjustable louvers are integral louvers and dampers. They are designed for very tight closure against wind and weather. Drainable heads channel water to the side frames, which channel through vertical downspouts and out the bottom of the louver at the sill. These models are efficient at minimizing water penetration.

LM-1250 adjustable louvers are designed for tight closure. Drainable heads channel water to the side frames, which channel through vertical downspouts and out the bottom of the louver at the sill. These models are efficient at minimizing water penetration.

Refer to the *LC-1250, LM-1250, LV-1250, and LV-1800 Louvers Product Bulletin (LIT-12011469)* for important product information.

## Features

- 3-Year Warranty on Materials and Workmanship
- 15 to 25 Working Day Standard Shipping after Order Entry

## Selection Chart

### Adjustable Louver (LC-1250 and LM-1250) Selector<sup>1</sup>

Code Number		L	M	N	F	-	w	w	w	x	h	h	h			
Application	L = Louver															
Blade Operation	M = Modulating															
Blade	C = Combination Louver/Damper N = L-style aluminum blade															
Frame	F = 6-inch deep aluminum															
Actuator	A = 24 V Two-position Spring Return B = Modulating Spring Return F = Incremental Non-Spring Return G = Modulating Non-Spring Return N = None															
Width <sup>2</sup>	LM-1250 – 012 to 060 inches, 1 in. increments LC-1250 – 012 to 120 inches, 1 in. increments															
Height <sup>Table 2</sup>	012 to 096 inches, 1 in. increments															
Options (limit two)	See <i>Factory Options</i> for descriptions and combinations.															

1. Not all combinations are available, check the selector tool for valid combinations.
2. Actual louver size is 1/4 inch (0.55 mm) less than nominal.

## Factory Options

Ordering Code	Factory Option
B	Baked enamel
C	Color match
E	Exact size
F	Filter racks
H	Hinged frame
K	Kynar® <sup>1</sup> finish
R	Rear security bars
S	Security bars, front
L	Extended sill

1. KYNAR® is a type of Polyvinylidene Difluoride (PVDF), which is a highly non-reactive and pure thermoplastic fluoropolymer used in applications requiring the highest purity, strength, and resistance to solvents, acids, bases and heat and low smoke generation during a fire event. A fine powder grade PVDF is used as the principal ingredient of high-end paints for metals, which have extremely good gloss and color retention. These paints are in use on many prominent buildings around the world, as well as on commercial and residential metal roofing.



LC-1250 and LM-1250 Adjustable Louvers

- 45% or Greater Free Area
- Hidden Vertical Support Blade
- Extruded 60635 T5 Aluminum Construction

## Repair Information

If the LC-1250 or LM-1250 Louvers fail to operate within their specifications, replace the units. For a replacement louver, contact the nearest Johnson Controls® representative.

## LC-1250 and LM-1250 Adjustable Louvers (Continued)

### Technical Specifications

#### Single-Panel Size Limits (All Models)

LC-1250 and LM-1250 Louvers	
Width	12 to 60 in. (305 x 1,530 mm)
Height	12 to 96 in. (305 x 2,438 mm)
Size Increment	1-inch (13 mm) increments

#### Construction - Adjustable Louvers

Part	LC-1250 Louvers	LM-1250 Louvers
Frame	6 in. (152 mm) deep, 6063T5 Aluminum; 0.125 in. (3.2 mm) nominal wall thickness	6 in. (152 mm) deep, 6063T5 Aluminum; .081 in. (2.1 mm) nominal wall thickness
Blades	6063T5 Aluminum, .081 in. (2.1 mm) or 0.140 in. (3.6 mm) nominal wall thickness	6063T5 Aluminum, .081 in. (2.1 mm) nominal wall thickness
Screen	0.75 x 0.051 in. (19 x 1.3 mm) expanded flattened aluminum bird screen in removable frame (adds 0.5 in [13 mm] to depth).	0.75 x 0.051 in. (19 x 1.3 mm) expanded flattened aluminum bird screen in removable frame (adds 0.5 in [13 mm] to depth).
Finish	mill	mill
Minimum Size	12 x 12 in. (305 x 305 mm)	12 x 12 in. (305 x 305 mm)
Maximum Factory Assembly Size	120 x 90 in. (3,048 x 2,286 mm) with standard frame; 120 x 93 in. (3,048 x 2,362 mm) with integral flange frame; maximum operating section width is 60 in. (1,524 mm).	60 x 96 in. (1,524 x 2,438 mm) without seals; 48 x 96 in. (1,219 x 2,438 mm) with seals
Shipping Weight	8 lb/sq. ft (39.1 kg/ sq. m)	3.5 lb/sq. ft (12.1 kg /sq. m)

## AL3 and AL6 Airflow Measuring Stationary Louvers

### Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now we are including airflow measuring louvers in our product offering:

- AL3 airflow measuring louvers feature stationary aluminum blades with aluminum sensor blades in a 3 in. (7.5 cm) deep aluminum frame.
- AL6 airflow measuring louvers feature stationary aluminum blades with aluminum sensor blades in a 6 in. (15 cm) deep aluminum frame.

Refer to the *AL3 and AL6 Airflow Measuring Stationary Louvers Product Bulletin (LIT-12011834)* for important product information.

### Features and Benefits

- Three-year warranty on materials and workmanship provides confidence in product and reliability.
- Extruded 60635 T5 aluminum construction offers the optimal balance of strength, durability and cost-effectiveness; resists corrosion while requiring little maintenance.
- Pressure transducer provided (shipped loose) matches components for effective application.
- Excellent pressure drop performance allows maximum air penetration while keeping water out.
- Closely spaced vertical blades prevent the penetration of wind-driven rain, reducing damage and additional operating expenses.

### Application

The patented AL3 airflow measuring louver combines the functions of an outside air intake louver and an airflow measuring station in one assembly. Its 4 in. (102 mm) nominal depth requires less installation space than separate louvers and air measurement devices. The AL3 features a wind-driven-rain-resistant louver that allows high airflow with minimal water penetration and pressure drop. It is particularly well suited for applications in air handling units as well as air plenum wall installations.

The AL6 airflow measuring louver combines the functions of an outside air intake louver and an airflow measuring station in one assembly. Its 7 in. (178 mm) nominal depth requires less installation space than separate louvers and air measurement devices. The AL6 features a wind-driven-rain-resistant louver that allows high airflow with minimal water penetration and pressure drop. It is particularly well suited for applications in air handling units as well as air plenum wall installations. The AL6 has been tested to Air Movement and Control Association International, Inc. (AMCA) Standard 611-95.

### Sample Specifications (AL3 Louver)

Furnish and install louvers as hereinafter specified where shown on plans or as described in schedules.

Louvers shall possess stationary vertical blades designed to prevent the penetration of wind-driven rain.

Louver blades shall be contained within a 3 in. (76 mm) or 6 in. (152 mm) frame.

Louver components (heads, jambs, sill and blades) shall be factory assembled by the louver manufacturer.

Louvers shall be provided with a pressure transducer conforming to Electromagnetic Compatibility (EMC) standards EN50082-1/EN5014/EN60730-1.



AML3 Airflow Measuring Louver

Transducer shall be capable of using field-selectable pressure ranges of 0 to 0.1, 0 to 0.25, 0 to 0.50, 0 to 1, and 0 to 2.5 in. W.C. with accuracy within  $\pm 0.5$  in. W.C. ( $\pm 12.5$  Pa) and shall handle up to 10 PSID overpressure without zero shift.

Transducer output to be field-selectable: 4 to 20 mA 2-wire, 0 to 5 VDC, or 0 to 10 VDC.

Transducer shall incorporate glass-on-silicone (Gi-Si) capacitance sensor and shall be housed in a NEMA 4 enclosure.

Louver sizes too large for shipping shall be built up by the contractor from factory-assembled louver sections to provide overall sizes required.

Louver design shall limit sizes of shipped single sections to 48 x 96 in. (1,219 x 2,438 mm) and shall withstand a wind load of 20 lb per sq. ft. (0.96 kPa) (equivalent of a 90 mph [145 kph] wind - specifier may substitute any loading required).

Louver shall have extruded 6063T5 aluminum alloy construction.

### Construction

Part	AL3	AL6
Frame <sup>1</sup>	0.062 in. (1.6 mm) wall thickness	0.125 in. (3.2 mm) wall thickness
Blade	0.040 in. (1 mm) wall thickness, installed vertically on approximately 0.75 in. (19 mm) centers	0.081 in. (2.1 mm) wall thickness, installed vertically on approximately 1.5 in. (38 mm) centers

1. Caulking surfaces provided

## AL3 and AL6 Airflow Measuring Stationary Louvers (Continued)

### Technical Specifications

Specification	AL3	AL6
Frame	3 in. (76 mm) deep, 6063T5 extruded aluminum with 0.062 in. (1.6 mm) nominal wall thickness	6 in. (152 mm) deep, 6063T5 extruded aluminum with 0.125 in. (3.2 mm) nominal wall thickness
Airflow Measurement Pickups	adds 1 in. (25.4 mm) depth to the louver's frame	
Blades <sup>1</sup>	6063T5 extruded aluminum with 0.040 in. (1 mm) nominal wall thickness.	6063T5 extruded aluminum with 0.081 in. (2.1 mm) nominal wall thickness.
Sensor Blade	6063T5 extruded aluminum, clear anodized finish	
Sensor Port Fittings	brass	
Pressure Transducer	DMPR-RA001, 4 to 20 mA 2-wire, 0 to 5 VDC, or 0 to 10 VDC output (field selectable). Output signal is proportional to CFM.	
Extended Sill	0.081 in. (2.1 mm) formed aluminum with end dams	
Finish	Mill	
Minimum Size	12 in. w x 12 in. h (305 mm x 305 mm).	
Maximum Size	48 in. w x 72 in. h (1,219 mm x 1,829 mm). Maximum ship section size is 48 in. w x 96 in. h (1,219 mm X 2,438 mm). Lifting lugs provided on louvers 48 in. x 72 in. and larger. Louvers larger than the maximum factory assembly size require field assembly of smaller sections.	48 in. w x 72 in. h (1,219 mm X 1,829 mm). Maximum ship section size is 72 in. w x 72 in. h (1,829 mm X 1,829 mm). Lifting lugs provided on louvers 48 in. x 72 in. and larger. Louvers larger than the maximum factory assembly size require field assembly of smaller sections.
Free Area Velocity Requirements	Minimum 275 FPM (1.4 m/s) Maximum 2,024 FPM (10.28 m/s)	Minimum 345 FPM (1.8 m/s) Maximum 2,175 FPM (11.05 m/s)
Approximate Shipping Weight	5 lb/sq. ft. (24 kg/m <sup>2</sup> )	12 lb/sq. ft. (58.6 kg/m <sup>2</sup> ).
Operating Temperature	-22 to 150°F (-30 to 60°C)	-22 to 150°F (-30 to 60°C)

1. Blades are mounted vertically and spaced approximately 1-1/2 in. (38 mm) center to center.

### Selection

#### Airflow Measuring Louver Ordering Information

Product	Description
AFEDN	AL3 Louver
AFEFN	AL6 Louver

### Repair Information

If an AL3 or AL6 airflow measuring louver fails to operate within its specifications, replace the unit. For a replacement AL3 or AL6 airflow measuring louver, contact the nearest Johnson Controls® representative.

All Johnson Controls® AL3 or AL6 airflow measuring louvers are built to order and cannot be returned due to ordering errors. All AL3 or AL6 airflow measuring louvers are backed by a 3-year warranty, which covers defects in materials or workmanship. Refer to terms and conditions of sale for specifics.

# LH-1250 Wind-Driven-Rain-Resistant Stationary Louver (Miami-Dade Approved)

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest quality control dampers that fit your application and size requirements. Now, we are including louvers in our product offering.

LH-1250 louvers feature:

- a vertical 0.081 in. (2.1 mm) nominal wall thickness aluminum blade.
- 1/8 in. (3 mm) thick formed aluminum Universal Installation Channels
- 1/2 in. mesh bird screen in a removable frame

Refer to the *LH-1250 Wind-Driven-Rain-Resistant Stationary Louver (Miami-Dade Approved) Product Bulletin (LIT-12011823)* for important product information.

## Features

- Large Missile Impact Resistance per Miami-Dade PA-201 Test Protocol (Miami-Dade County, Florida Notice of Acceptance Number: 12-1115.05 [Expires 1/28/2017]) provides ability to resist flying objects during a hurricane
- Approved for use in open structures with provisions to manage weather infiltration (Wet Rooms) allows use in multiple applications

- Maximum windload +160 PSF (7.66 KPa), -140 PSF (-6.70 KPa) resists effects of high-velocity winds

## Applications

LH-1250 Wind-Driven-Rain-Resistant Stationary Louvers are designed to meet heavy duty application and environmental requirements meeting the Miami-Dade County Florida PA-201 Missile Impact Resistant Test Protocol:

**Miami-Dade Approved  
Miami-Dade County, Florida  
Notice of Acceptance Number: 12-1115.05  
(Expires 1/28/2017)**

Published free area and pressure drop performance ratings are based on testing in accordance with AMCA Publication 500-L.

## Suggested Specifications

Furnish and install louvers as specified here where shown on plans or described in schedules.

Louvers shall be stationary aluminum vertical blades with a maximum windload of +160 PSF (7.66 KPa), -140 PSF (-6.70 KPa).

Louvers shall have a minimum of 42% free area, based on a 48 x 48 in. (1,219 x 1,219 mm) size.

Blades shall be contained within a 6 in. (152 mm) deep, aluminum frame.



**LH-1250 Wind-Driven-Rain-Resistant Stationary Louver**

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

## Repair Information

If the LH-1250 Louver fails to operate within specifications, replace the unit. For a replacement louver, contact the nearest Johnson Controls® representative.

## Selection Chart

### LH-1250 Wind-Driven-Rain-Resistant Louver Selector<sup>1</sup>

	Ordering Code Number	L	F	H	N	N	-	w	w	w	x	h	h	h		
Product Type	L = Louver															
Operation	F = Fixed Blade															
Rating	H = Hurricane Rating															
Seals/Bearings	N = None															
Actuators	N = None															
Separator	Not Applicable															
Width <sup>2</sup>	012 to 999															
Separator	Not Applicable															
Height <sup>2</sup>	012 to 096															
Options	B = Baked Enamel C = Color Match E = Exact Size K = Kynar <sup>®3</sup> Finish R = Rear Security Bars S = Security Bars, Front															

1. Not all combinations are available. Check the selector tool for valid combinations.  
 2. Actual louver size is 3/4-inch (19 mm) less than nominal.  
 3. Kynar<sup>®</sup> is a type of polyvinylidene difluoride (PVDF), a highly non-reactive and pure thermoplastic fluoropolymer used in applications requiring the highest purity, strength, and resistance to solvents, acids, bases and heat, as well as in applications requiring low smoke generation during a fire event. A fine powder grade PVDF is used as the principal ingredient of high-end paints for metals. These paints have extremely good gloss and color retention. These paints are in use on many prominent buildings around the world, as well as on commercial and residential metal roofing.

**LH-1250 Wind-Driven-Rain-Resistant Stationary Louver (Miami-Dade Approved)  
(Continued)**

**Technical Specifications**

LH-1250 Wind-Driven-Rain-Resistant Stationary Louver	
Louver Material	Extruded aluminum
Louver Blades	6063T5 extruded aluminum 0.081 in. (2.1 mm) nominal wall thickness
Bird Screen	1/2 x 0.063 in. (13 x 1.6 mm) square mesh aluminum bird screen in a removable frame
Minimum Single Section Size	12 in. w x 12 in. h (305 mm w x 305 mm h)
Maximum Single Section Size	48 in. w x 96 in. h (1,219 mm w x 2,438 mm h)
Maximum Overall Field-Assembled Size	999 in. w x 96 in. h (2,5375 mm w x 2,286 mm h)
Weight	12 lb/sq. ft. (58.6 kg/m <sup>2</sup> )

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

# LS-1250 Snow Stopper Louver

## Description

Since 1905, Johnson Controls has developed and refined air control products by providing the highest-quality control dampers that fit your application and size requirements. Now we are including snow stopper louvers in our product offering.

The LS-1250 Snow Stopper Louvers feature:

- a stationary, drainable aluminum louver (J-style blade) with an aluminum damper in a 4 in. (14 cm) aluminum frame
- a stainless steel snow mesh
- a formed aluminum sleeve

The LS-1250 Snow Stopper Louver reduces snow infiltration by capturing snow in a fine stainless steel mesh. A heat trace in the snow mesh melts a sufficient amount of the snow to allow airflow with relatively low pressure drop.

The snow mesh is factory-mounted to the louver in an aluminum sleeve. Each snow mesh panel is provided with a pigtail for field cutting and wiring into the power supply. Controls, sensors, electrical terminations, and conduit are provided by others.

Refer to the *LS-1250 Snow Stopper Louver Product Bulletin (LIT-12011822)* for important product information.

## Features

- 3-Year warranty on materials and workmanship provides confidence in product and reliability
- Extruded 60635-T6 aluminum construction offers optimal balance of strength, durability, and cost-effectiveness
- 45% or greater free area provides better airflow performance than competitive models

## Selection

### LS-1250 Snow Stopper Louver Selector<sup>1</sup>

	Code Number	L	F	H	N	N	-	w	w	w	x	h	h	h		
Product Type	L = Louver															
Operation	F = Fixed Blade															
Rating	S = Snow Stop															
Seals/Bearings	N = None															
Actuators	N = None															
Width <sup>2</sup>	012 to 999															
Height <sup>2</sup>	018 to 090															
Options	B = Baked Enamel C = Color Match E = Exact Size F = Front Flange G = Rear Flange K = Kynar <sup>®3</sup> Finish															

1. Not all combinations are available. Check the selector tool for valid combinations.
2. Actual louver size is 1/4-inch (6 mm) less than nominal.
3. Kynar<sup>®</sup> is a type of polyvinylidene difluoride (PVDF), a highly non-reactive and pure thermoplastic fluoropolymer used in applications requiring the highest purity, strength, and resistance to solvents, acids, bases and heat, as well as in applications requiring low smoke generation during a fire event. A fine powder grade PVDF is used as the principal ingredient of high-end paints for metals. These paints have extremely good gloss and color retention. These paints are in use on many prominent buildings around the world, as well as on commercial and residential metal roofing.

- Stainless steel mesh with heating element reduces snow infiltration

## Applications

Drainable heads channel water to the side frames, which channel through vertical downspouts and out the bottom of the louver at the sill. These models are efficient at minimizing water penetration with low resistance to airflow.

The LS-1250 Snow Stopper Louver reduces snow infiltration beyond by capturing snow in a fine stainless steel mesh. A heat trace in the snow mesh melts a sufficient amount of the snow to allow airflow with relatively low pressure drop.

The snow mesh is factory-mounted to the louver in an aluminum sleeve. Each snow mesh panel is provided with a pigtail for field cutting and wiring into the power supply. Controls, sensors, electrical terminations, and conduit are provided by others.

## Sample Specification

Furnish and install Johnson Controls<sup>®</sup> LS-1250 Snow Stopper Louver as specified where shown on plans or as described in schedules.

- Heated mesh to be factory installed to louvers in aluminum sleeve.
- Mesh and framing shall be manufactured of 304 Stainless Steel.
- Mesh panels to utilize a metal-sheathed cable heat trace as the heating element.
- The conductor shall be electrically insulated from the metal sheath with magnesium oxide (MgO).



LS-1250 Snow Stopper Louver

- Mineral-insulated cable to be a series resistance heater that generates heat by passing current through the electrical conductor.
- Outer sheath construction to be Alloy 825 Inconel<sup>®</sup>.

## Repair Information

If the LS-1250 Louver fails to operate within specifications, replace the unit. For a replacement louver, contact the nearest Johnson Controls representative.

## Maintenance

Johnson Controls LS-1250 Louvers have no components that require routine scheduled maintenance.

**LS-1250 Snow Stopper Louver (Continued)**

**Technical Specifications**

<b>LS-1250 Snow Stopper Louver</b>	
<b>Louver Material</b>	Extruded 60635-T6 aluminum
<b>Sleeve Material</b>	Formed aluminum
<b>Snow Mesh and Frame Material</b>	304 stainless steel
<b>Trace Heater Material</b>	Inconel®
<b>Minimum Single Section Size</b>	12 in. w x 18 in. h (305 mm w x 457 mm h)
<b>Maximum Single Section Size</b>	48 in. w x 90 in. h (1,219 mm w x 2,286 mm h)
<b>Maximum Snow Mesh Size</b>	48 in. x 48 in. (1,219 mm x 1,219 mm)
<b>Maximum Overall Field-Assembled Size</b>	Unlimited width x 90 in. (2,286 mm) high
<b>Airflow Range</b>	0 to 350 fpm (0 to 1.8 m/s) face area velocity
<b>Air Temperature Operating Range</b>	-40 to 32°F (-40 to 0°C)
<b>Power Requirements</b>	208/240/277 VAC For temperatures above -20°F (-29°C): 60 watts/square foot For temperatures -40 to -20°F (-40 to -29°C): 180 watts/square foot
<b>Surface Temperature of Heat Trace</b>	60 watts/square foot: 133°F (56°C) 180 watts/square foot: 400°F (204°C)

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

## D-3062 Pneumatic Piston Damper Actuator

### Description

The D-3062 Pneumatic Actuator is a multipurpose positioning device used to accurately position small dampers primarily on Variable Air Volume (VAV), terminal units and small ventilating dampers in response to output signals of a pneumatic controller or electro-pneumatic transducer.

The actuator is also recommended for use on other air flow control dampers, in interior locations, with a up to a maximum area of 4 square feet for proportional volume control and 6.25 square feet for two position actuation provided that the torque requirements are compatible with the specific application.

The D-3062 is UL component recognized for use on UL Classified 555/555S smoke and combination fire/smoke dampers, which have been tested and approved to a degradation temperature of 250°F (121°C).

Refer to *D-3062 Pneumatic Actuator Product Bulletin (LIT-2681051P)* for important product information.

### Features

- high power to size ratio for locations in confined spaces
- all-aluminum housing which is lightweight and non-combustible
- telescoping linkage for fast and flexible installation
- front or rear mounting options for flexible mounting configurations
- optional mounting kits to cover any application and replacement of obsolete units

### Selection Charts

#### D3062 Pneumatic Piston Damper Actuators

Code Number	Nominal Spring Range, psig (kPa)
D-3062-1	3-7 (21-49)
D-3062-2	5-10 (35-70)
D-3062-3	8-13 (56-91)
D-3062-4	11-15 (77-105)
D-3062-41	8-13 (56-91) with Universal Mounting Kit

#### Mounting Kits<sup>1</sup> for D-3062 Damper Actuators

Code Number	Description	Weight, lb (Kg)
D-3062-100	Universal Mounting Kit for Type "W" (N.O. or N.C.) and Type "F" (N.C. only). The D-3062-100 mounting kit contains all parts required for the actuator to be mounted inside or outside the duct for use with D-1300 series dampers.	3.5 (1.59)
D-3062-101	Auxiliary Mounting Kit for multi-position swivel mounting.	0.8 (0.36)
DMPR-KR001	RD-2000 - 9 to 16 in. round damper mounting kit	1.0 (0.45)

1. Mounting kits include bracket, linkage, and all necessary mounting hardware.

### Applications

When used with proportional control, the damper size is limited to 4 square feet maximum.

As a 2-position control, damper size is limited to 6.25 square feet. As determined by testing using Johnson Controls® D-1300 dampers, width and height are limited to 30 inches maximum.

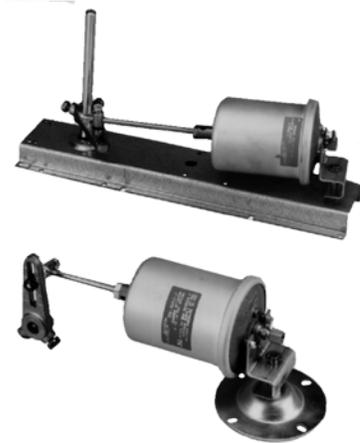
Four nominal spring ranges are available: 3-7 psi (D-3062-1), 5-10 psi (D-3062-2), 8-13 psi (D-3062-3), and 11-15 psi (D-3062-4).

The control air pressure for normal HVAC operation is 0-20 psig. The minimum control pressure for safety damper ventilation mode is 20 psi with the maximum pressure of 30 psi. When used for both proportional and smoke applications, a separate air signal should be provided to override normal HVAC operations and enact safety damper functions.

**Note:** The D-3062 is not able to be configured for frame mounting in power fail open damper applications.

### Repair Information

The D-3062 Damper Actuator has a sealed body, so field repairs cannot be made. If it fails to operate within its specifications, replace the unit. For a replacement damper actuator, contact the nearest Johnson Controls representative.



D-3062 Pneumatic Piston Damper Actuators

#### Accessories for D-3062 Damper Actuators

Code Number	Description	Weight, lb (Kg)
DMPR-KC050	Crank Arm: 7/16 in. adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC051	Crank Arm: 3/8 in. adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC053	Crank Arm: 1/2 in. adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC300	Swivel Ball Joint	0.5 (0.23)
D-9999-152	Clevis Pin No. 6	0.5 (0.23)
D-9999-153	Twist Lock, Pin No. A	0.5 (0.23)
D-3062-104	Clevis - fork type	0.5 (0.23)
D-3062-106	Rod - 1/4-20 threaded one end	0.5 (0.23)
D-3062-108	Rod - spade end	0.5 (0.23)
D-3073-604	Ball Joint - weather resistant	0.5 (0.23)

**D-3062 Pneumatic Piston Damper Actuator (Continued)**

**Technical Specifications**

D-3062 Pneumatic Actuators	
<b>Stroke</b>	2 inches (51 mm)
<b>Control Air Pressure</b>	0-20 psig for HVAC 20 psig (137 kPa) minimum for safety damper functions 30 psig (205 kPa) maximum
<b>Air Connections</b>	1/8 in. NPT straight barbed fitting for 5/32 or 1/4 in. O.D. polytubing (furnished). Compression fitting for 1/4 in. O.D. copper tubing (F-200-3, order separately).
<b>Ambient Operating Conditions (HVAC)</b>	-20 to 150°F (-29 to 66°C)
<b>Effective Diaphragm Area</b>	6.6 in. <sup>2</sup> (43 cm <sup>2</sup> )
<b>Materials</b>	Body - Aluminum, Diaphragm - Synthetic elastomer
<b>Dimensions</b>	3-3/16 in. diameter x 6-13/16 in. long
<b>Shipping Weight, lb (Kg)</b>	1.2 (0.54)
<b>Agency Listing</b>	UL Recognized component to 250°F (121°C) with compression fitting for copper tubing File no. R15581

**Maximum Actuator Force at 20 psig (140 kPa)**

Nominal Spring Range psig (kPa)	Stroke	Force lb (Newton)	Torque Output for 90° Rotation	D-3062-Suffix
3 to 7 (21 to 49)	Power	85.8 (382)	85.8 lb·in (9.69 N·m)	-1
	Return	19.8 (88)	19.8 lb·in (2.24 N·m)	
5 to 10 (35 to 70)	Power	66 (294)	66 lb·in (7.45 N·m)	-2
	Return	33 (147)	33 lb·in (3.73 N·m)	
8 to 13 (56 to 91)	Power	46.2 (206)	46.2 lb·in (5.22 N·m)	-3
	Return	52.8 (235)	52.8 lb·in (5.96 N·m)	
11 to 15 (77 to 105)	Power	33 (147)	33 lb·in (3.73 N·m)	-4
	Return	72.6 (323)	72.6 lb·in (8.20 N·m)	

**Note:** Force calculated using 6.6 lb/psig available actuator force.

## D-3153 Series Pneumatic Actuator

### Description

The D-3153 Pneumatic Actuator is a multipurpose positioning device used primarily for operating ventilating dampers in response to the output signals of a pneumatic controller or electro-pneumatic transducer.

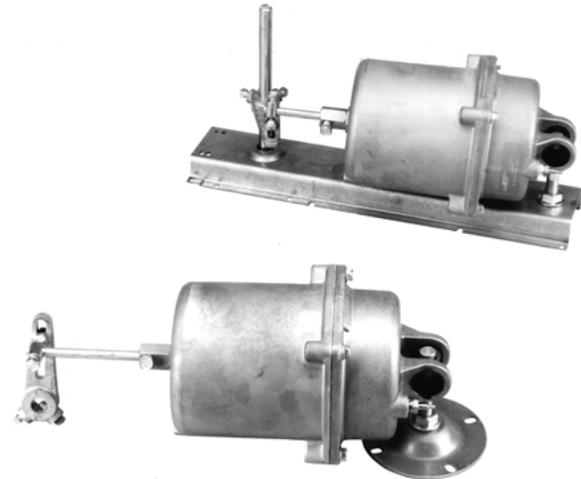
The D-3153 Pneumatic Actuator is used with dampers up to a maximum area of 16 ft<sup>2</sup> (1.5 m<sup>2</sup>) for proportional volume control, and 25 ft<sup>2</sup> (2.3 m<sup>2</sup>) for 2-position actuation (provided that the torque requirements are compatible with the specific application).

The D-3153 Pneumatic Actuator component is recognized by Underwriters Laboratories Inc. ® (UL) for use on UL classified 555/555S smoke and combination fire/smoke dampers which have been tested and approved to a degradation temperature of 250°F (121°C).

Refer to the *D-3153 Pneumatic Actuator Product Bulletin (LIT-2681054P)* for important product application information.

### Features

- all-aluminum housing – creates a lightweight, non-combustible actuator
- telescoping linkage – provides fast, flexible installation
- long life and reliable design – places over a million actuators now in service
- 2-way swivel head – ensures full power delivery
- agency recognition – provides a UL recognized component for fire and smoke applications to 250°F (121°C)



D-3153 Pneumatic Actuator

### Repair Information

Do not make field repairs. If the D-3153 Pneumatic Actuator fails to operate within its specifications, replace the unit. For a replacement D-3153 Actuator, contact the nearest Johnson Controls® representative.

### Selection Charts

#### Ordering Information for D-3153 Series

Nominal Spring Range, psig (kPa)	With Universal Mounting Bracket	With Auxiliary Mounting Bracket	Body Only
8 to 13 (56 to 91)	D-3153-2	D-3153-5	D-3153-6003
8 to 13 (56 to 91) with D-9502	D-3153-1	D-3153-4	–
0 to 3 (0 to 21) and 9 to 13 (63 to 91) with 2-stage Pilot	–	D-3153-18	–
5 to 10 (35 to 70)	D-3153-3	D-3153-6	D-3153-6002
3 to 7 (21 to 49)	–	D-3153-7	D-3153-6001

#### Accessories (Order Separately)

Description	Shipping Weight, lb (kg)	Code Number
Rubber Boot Kit	0.2 (0.09)	D-3073-100
Ball Joint, weather resistant	0.3 (0.11)	D-3073-604
Blade Arm Kit	1.0 (0.45)	D-9999-100
Crank Arm, 1/2 in. adjustable to 2-3/4 in. radius	0.5 (0.23)	D-3153-101
Crank Arm, 3/8 in. adjustable to 2-3/4 in. radius	0.5 (0.23)	D-3153-108
Crank Arm, 7/16 in. adjustable to 2-3/4 in. radius	0.5 (0.23)	D-3153-109
Linkage Rod, 4 ft (122 cm)	2.0 (0.91)	D-3153-102
Linkage Rod, replacement	1.0 (0.45)	D-3153-103
Stop Screw Kit, 1/4 – 24 x 3 in.	0.5 (0.23)	D-3153-104
Proportional Pilot Positioner Kit <sup>1</sup>	2.0 (0.91)	D-9502-8
Ball Joint	0.5 (0.23)	D-9999-104
Pivot Post, 5 per kit	0.5 (0.23)	D-3153-110
E-rings for Pivot Post, 10 per kit	0.5 (0.23)	D-3153-111
Mounting Nuts for Pivot Post, 10 per kit	0.5 (0.23)	D-3153-112
Universal Mounting Bracket	3.5 (1.13)	D-3153-105
Auxiliary Mounting Bracket	1.0 (0.45)	D-3153-106
2-stage Positioner Kit <sup>1</sup>	2.0 (0.91)	D-9502-9

1. Positioner kit includes positioner, mounting plate, spring, and mounting hardware.

**D-3153 Series Pneumatic Actuator (Continued)**

**Technical Specifications**

<b>D-3153 Pneumatic Actuators</b>	
<b>Stroke</b>	3 in. (76 mm)
<b>Control Air Pressure</b>	0-20 psig (0-138 kPa) for Heating, Ventilating, and Air Conditioning (HVAC) 20 psig (138 kPa) minimum for safety damper functions 30 psig (207 kPa) maximum without pilot
<b>Air Connections</b>	1/8 in. NPT straight barbed fitting for 5/32 in. or 1/4 in. O.D. polytubing (furnished) compression fitting for 1/4 in. O.D. copper tubing (optional)
<b>Ambient Operating Conditions</b>	-20 to 150°F (-29 to 66°C)
<b>Effective Diaphragm Area</b>	15 in. <sup>2</sup> (97 cm <sup>2</sup> )
<b>Materials</b>	Body: Die-cast Aluminum; Diaphragm: Synthetic elastomer
<b>Dimensions (H x W x D)</b>	Refer to the <i>D-3153 Pneumatic Actuator Product Bulletin (LIT-2681054P)</i> Figure 2, Figure 3, and Figure 4.
<b>Shipping Weight, lb (Kg)</b>	<b>D-3153-1</b> 11.5 (5.2) <b>D-3153-3</b> 10.0 (4.5) <b>D-3153-5</b> 8.5 (3.9) <b>D-3153-7</b> 8.5 (3.9) <b>D-3153-2</b> 10.0 (4.5) <b>D-3153-4</b> 10.5 (4.8) <b>D-3153-6</b> 8.5 (3.9) <b>D-3153-18</b> 10.5 (4.8)
<b>Compliance</b>	UL recognized component to 250°F (121°C) with compression fitting for copper tubing. File No. R15581, D-3153-42 and D-3153-43 ULC Listed

# D-4070 Pneumatic Piston Damper Actuator

## Description

The D-4070 Two Stage Pneumatic Actuator is a multipurpose positioning device used to accurately position small dampers primarily on unit ventilators, Variable Air Volumes (VAVs), terminal units, and small ventilating dampers in response to output signals of a pneumatic controller or electro-pneumatic transducer.

The D-4070 was specifically designed to provide ASHRAE Cycle II and W control of unit ventilators where a minimum of outdoor air (15 to 50%) is admitted during the heating and ventilating stage and gradually increased to 100%, if needed, during the cooling and ventilating stage.

The D-4070 is a direct replacement for existing D-3070 actuators and a functional replacement for older D-255 actuators.

Refer to *D-4070 Two Stage Pneumatic Actuator Product Bulletin (LIT-2681082)* for important product information.

## Features

- 2-way swivel connection ensures non-binding movement and full power delivery
- glass reinforced polymer housing which is lightweight, corrosion and chemical resistant

- telescoping linkage for fast and flexible installation
- economical because has 2 springs for two stage operation which functions as two separate actuators
- designed to provide ASHRAE Cycle 11 and W controls of unit ventilators

## Applications

The D-4070 has a first stage nominal spring range of 3 to 6 psig (21 to 42 kPa) and can be furnished with a second stage spring range of either 9 to 12 psig (63 to 84 kPa) or 11 to 14 psig (77 to 98 kPa). The control air pressure for normal HVAC operation is 0-20 psig. The total stroke of the D-4070 is 2-3/4 inch (70 mm) and is adjustable from 0 to 50% during the first stage of operation.

The D-4070 incorporates several internal and external features that add functional flexibility. A 2-way swivel connection on the actuator cylinder head provides nonbinding movement. All actuators have a telescoping piston rod for easy linkage of the damper for attachment points up to 8-3/4 inches (214 mm) away from the face of the actuator. A swivel ball joint and slotted crank arm connector are furnished on all actuators for optional methods of linkage to the damper.



**D-4070 Pneumatic Piston Damper Actuator**

When used with proportional control, the damper size is limited by the torque requirement.

## Repair Information

If the D-4070 Pneumatic Piston Damper Actuator fails to operate within its specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls® representative.

## Selection Charts

### D-4070 Pneumatic Piston Damper Actuator<sup>1</sup>

Code Number	Nominal Spring Range, psig (kPa)
D-4070-1	3-6 (21-42) First Stage, 9-12 (63-84) Second Stage with Auxiliary Mounting Bracket
D-4070-2	3-6 (21-42) First Stage, 11-14 (35-70) Second Stage with Auxiliary Mounting Bracket
D-4070-6001	3-6 (21-42) First Stage, 9-12 (63-84) Second Stage body only
D-4070-6002	3-6 (21-42) First Stage, 11-14 (35-70) Second Stage body only

1. Check your UV standard equipment sheets for the various models for the unit ventilator manufacturers. When a unit ventilator manufacturer specifies a D-4070, be sure to select the one that is designed for that unit.

## Technical Specifications

D-4070 2-stage Pneumatic Actuator	
Stroke	2-3/4 in. (70 mm)
Control Air Pressure	0 - 20 psig for HVAC, 25 psig (171 kPa) Maximum
Air Connections	1/8 in. NPT straight barbed fitting for 1/4 in. O.D. polytubing (furnished)
Ambient Storage Condition	-20 to 150°F (-29 to 66°C)
Ambient Operating Conditions	35 to 150°F (2 to 66°C)
Effective Diaphragm Area	6.7 in <sup>2</sup> (45 cm <sup>2</sup> )
Housing Material	Glass reinforced polymer, UL 94 HB flame class rating
Diaphragm Material	Synthetic elastomer
Dimensions	3-7/8 in. diameter x 9-15/16 in. long
Shipping Weight	3.5 lb (1.6 kg)

### Accessories for D-4070 Damper Actuator

Code Number	Description	Weight, lb (Kg)
D-3073-105	Mounting Post Kit, 5 per kit	0.5 (0.23)
D-3073-604	Ball Joint - weather resistant	0.5 (0.23)
D-3153-103	Rod - 8-3/4 in. (222 mm) replacement	1.0 (0.45)
D-3153-106	Auxiliary Mounting Bracket	1.0 (0.45)
D-3153-111	E-rings for Pivot Post, 10 per kit	0.5 (0.23)
D-3153-112	Mounting Nuts for Pivot Post, 10 per kit	0.5 (0.23)
DMPR-KC050	Crank Arm: 7/16 in. shaft radius adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC051	Crank Arm: 3/8 in. shaft radius adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC053	Crank Arm: 1/2 in. shaft radius adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC054	Blade Arm Kit	1.3 (0.59)
DMPR-KC102	Rod - 4 ft (122 cm)	2.0 (0.91)
DMPR-KC251	Universal Mounting Bracket	3.5 (1.13)
DMPR-KC300	Swivel Ball Joint, 10 per kit	0.5 (0.23)

### Maximum Force<sup>1</sup> Values at 20 psig (140 kPa) Supply

First Stage Spring Range, psig (kPa)	Second Stage Spring Range, psig (kPa)	Stroke	Force, lb (Newtons)	Torque Output for 90° Rotation
3 to 6 (21 to 42)	9 to 12 (63 to 84)	Power	53.6 (239)	73.7 in-lb (8.4 N·m)
		Return	20.1 (89)	27.6 in-lb (3.1 N·m)
3 to 6 (21 to 42)	11 to 14 (77 to 98)	Power	40.2 (179)	55.3 in-lb (6.3 N·m)
		Return	20.1 (89)	27.6 in-lb (3.1 N·m)

1. Force calculated using 6.7 lb/psig available actuator force.

## D-4073 Pneumatic Piston Damper Actuator

### Description

The D-4073 Pneumatic Actuator is a multipurpose positioning device used to accurately position small dampers primarily on unit ventilator, Variable Air Volume (VAV), terminal units, and small ventilating dampers in response to output signals of a pneumatic controller or electro-pneumatic transducer.

The actuator is also recommended for use on other air flow control dampers, in interior locations, up to a maximum area of 6.75 sq. ft for proportional volume control and 11.7 sq. ft for two position actuation provided that the torque requirements are compatible with the specific application.

The D-4073 is a direct replacement for existing D-3073 actuators and a functional replacement for former D-251 actuators.

Refer to *D-4073 Pneumatic Actuator (LIT-2681074)* for important product information.

### Features

- 2-way swivel connection ensures non-binding movement and full power delivery
- glass reinforced polymer housing which is lightweight, corrosion and chemical resistant
- telescoping linkage for fast and flexible installation

### Applications

When an 8 to 13 psig spring range is used with proportional control, the damper size is limited to 6.75 square feet maximum. As a two position control, damper size is limited to 11.7 sq. ft.

Three nominal spring ranges are available: 3 to 7 psi, 5 to 10 psi, and 8 to 13 psi. The control air pressure for normal HVAC operation is 0-20 psig.

The D-4073 incorporates several internal and external features that add functional flexibility. A 2-way swivel connection on the actuator cylinder head provides non-binding movement. All actuators have a telescoping piston rod for easy linkage of the damper for attachment points up to 8-3/4 inches (222 mm) away from the face of the actuator. A swivel ball joint and slotted crank arm connector are furnished on all actuators for optional methods of linkage to the damper.

A stop screw kit is available for special applications to limit the power stroke of the actuator when required. A 4 foot (122 cm) linkage rod is also available for special applications to reach extended linkage when required.



**D-4073 Pneumatic Piston Damper Actuator**

Where precision sequential operation is desired, or additional positioning power is necessary, use a D-9502 pilot positioner. Up to four more D-4073 actuators may be slaved from one pilot positioner for coupled dampers.

### Repair Information

If the D-4173 Pneumatic Piston Damper Actuator fails to operate within its specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls® representative.

## Selection Charts

### D-4073 Pneumatic Piston Damper Actuator

Code Number	Nominal Spring Range, psig (kPa)
D-4073-1	8-13 (56-91) with D-9502 and Universal Mounting Bracket
D-4073-2	8-13 (56-91) with Universal Mounting Bracket
D-4073-3	5-10 (35-70) with Universal Mounting Bracket
D-4073-4	8-13 (56-91) with D-9502 and Auxiliary Mounting Bracket
D-4073-5	8-13 (56-91) with Auxiliary Mounting Bracket
D-4073-6	5-10 (35-70) with Auxiliary Mounting Bracket
D-4073-7	3-7 (21-49) with Auxiliary Mounting Bracket
D-4073-6001	3-7 (21-49) body only
D-4073-6002	5-10 (35-70) body only
D-4073-6003	8-13 (56-91) body only

### Accessories for D-4073 Damper Actuator

Code Number	Description	Weight, lb (Kg)
D-3073-100	Rubber Boot Kit (includes ball joint and cover)	0.2 (0.10)
D-3153-104	Stop Screw Kit	0.5 (0.23)
D-3073-105	Mounting Post Kit, 5 per kit	0.5 (0.23)
D-3073-604	Ball Joint - weather resistant	0.5 (0.23)
D-3153-103	Rod - 8-3/4 in. (222 mm) replacement	1.0 (0.45)
D-3153-106	Auxiliary Mounting Bracket	1.0 (0.45)
D-3153-111	E-rings for Pivot Post, 10 per kit	0.5 (0.23)
D-3153-112	Mounting Nuts for Pivot Post, 10 per kit	0.5 (0.23)
DMPR-KC050	Crank Arm: 7/16 in. shaft radius adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC051	Crank Arm: 3/8 in. shaft radius adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC053	Crank Arm: 1/2 in. shaft radius adjustable to 2-3/4 in. radius	0.5 (0.23)
DMPR-KC054	Blade Arm Kit	1.3 (0.59)
DMPR-KC102	Rod - 4 feet (122 cm)	2.0 (0.91)
DMPR-KC251	Universal Mounting Bracket	3.5 (1.13)
DMPR-KC300	Swivel Ball Joint	0.5 (0.23)
D-9502-12	Proportional Pilot Positioner Kit	2.0 (0.91)

**Note:** Refer to reference bulletins in the *Pneumatic Control Manual (FAN 717.1)* for models applying to unit ventilators and other types of units.

**D-4073 Pneumatic Piston Damper Actuator (Continued)**

**Technical Specifications**

D-4073 Pneumatic Actuator	
Stroke	3 in. (76 mm)
Control Air Pressure	0-20 psig for HVAC 25 psig (175 kPa) Maximum
Air Connections	1/8 in. NPT straight barbed fitting for 5/32 or 1/4 in. O.D. polytubing (furnished)
Ambient Operating Conditions	-20 to 150°F (-29 to 66°C)
Effective Diaphragm Area	6.7 in <sup>2</sup> (45 cm <sup>2</sup> )
Housing Material	Glass reinforced polymer, UL 94 HB flame class rating
Dimensions (H x W x D)	3-7/8 in. diameter x 11 in. long
Shipping Weight, lb (Kg)	D-4073-1 7.9 (3.6)    D-4073-3 6.4 (2.9)    D-4073-5 4.9 (2.2)    D-4073-7 4.9 (2.2) D-4073-2 6.4 (2.9)    D-4073-4 6.4 (2.9)    D-4073-6 4.9 (2.2)

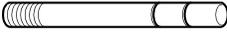
**Maximum Force<sup>1</sup> Values at 20 PSIG (140 kPa) Supply**

Spring Range, psig (kPa)	Stroke	Force, lb (Newtons)	Torque Output for 90° Rotation
8 to 13 (56 to 91)	Power	47 (209)	71 lb·in (8.0 N·m)
	Return	54 (240)	81 lb·in (9.1 N·m)
5 to 10 (35 to 70)	Power	67 (298)	101 lb·in (11.3 N·m)
	Return	34 (151)	51 lb·in (5.8 N·m)
3 to 7 (21 to 49)	Power	87 (388)	131 lb·in (14.8 N·m)
	Return	20 (89)	30 lb·in (3.4 N·m)

1. Force calculated using 6.7 lb/psig available actuator force.

## Hardware for Pneumatic Damper Actuators

### Selection Chart

Figure	Code Number	Description and Use
	D-3073-101  D-3153-104	Stop Screw Kit for D-4073 Actuator, kit includes two No. 10-24 x 3 in. stop screws and two 10-24 nuts  Stop Screw Kit for D-3153 Actuator, kit includes two 1/4-20 x 3 in. stop screws and two 1/4-20 nuts.
	D-3153-103 DMPR-KC102	Linkage Rod Replacement for D-3070, D-3073, D-3153, D-4070 or D-4073 Actuators 8 in., 5/16 in. diameter 48 in., 5/16 in. diameter
	D-3153-106	4 in. Auxiliary Mounting Bracket for D-3070, D-3073, D-3153, D-4070 or D-4074 Actuators
	D-3073-105 D-3153-110	Pivot Post Kit for D-4073, 5 per kit Pivot Post Kit for D-3153, 5 per kit
	D-3153-111	E-Rings for Pivot Post 10 per kit
	D-3153-112	Mounting Nuts for Pivot Post 10 per kit
	D-265-602 D-9502-5 D-9502-8 D-9502-9 D-9502-5 <sup>1</sup> D-9502-12	Positioner Kit For Field Mounting on Damper Actuators Kit includes: Positioner, Mounting Plate, Spring, and Mounting Hardware. Kit does not include Tubing. Kit for: Spring for No. 4, package of 6 No. 5 or D-3244 Actuator D-3153 Actuator D-3153 Two-Stage D-3246 D-3073, D-4073
	D-3000-1077  D-251-705	Connection Head, 5/16-30 Thd, for upgrading No. 2 D-251 and D-3000 actuators to ball joint linkage. Connection Head, 3/8-20 Thd, for upgrading No. 3 D-251 to ball joint linkage.
 DMPRKC050    DMPRKC052	DMPR-KC050 DMPR-KC051 DMPR-KC052 DMPR-KC053	Crankarm (Slotted) for D-3070, D-3073, D-3153, D-4070 or D-4073 Actuators. For 7/16 in. shaft, radius adjustable to 2-3/4 in. For 3/8 in. shaft, radius adjustable to 2-3/4 in. For 1/2 in. shaft, radius adjustable to 1-11/16 in. For 1/2 in. shaft, radius adjustable to 2-3/4 in.
	DMPR-KC251	Universal Mounting Bracket for D-3070, D-3073, D-3153, D-4073 or D-4074 Actuators
	D-3153-608	Actuator Swivel Bearing Kit for D-3070, D-3073, D-3153, D-4070 or D-4073 Actuators 5 per kit
<b>Replacement Diaphragms for discontinued actuators</b>	D-251-6000 D-251-6002 D-251-6003 D-251-6004	Diaphragm for No. 3, package of 25 Diaphragm for No. 2, package of 12 Diaphragm for No. 4, package of 12 Diaphragm for No. 6, package of 6
 D-9999-152    D-9999-153	D-9999-152 D-9999-153	Clevis Pin Kit, 10 per kit Twist Lock Clip Kit, 100 per kit

1. Also order spring number D-9502-612 and Pilot Spring Bracket number D-9502-100.

## VD-1300 Control Dampers

### Description

Since 1905, Johnson Controls has provided the highest quality control dampers that fit your application and size requirements.

- VD-1330 - Airfoil-shaped aluminum blades/galvanized frame
- VD-1320 - Double-piece blades/galvanized frame
- VD-1310 - 16-gauge blades/galvanized frame (Not for outdoor air applications)

The VD-1300 dampers are designed to control the flow of air in Heating, Ventilating, and Air Conditioning (HVAC) systems, and to meet different application and environmental requirements. These applications include, but are not limited to:

- volume (air) control applications, which regulate the flow of air
- temperature control applications, which maintain a constant temperature
- pressure control applications, which maintain a constant pressure

Dampers are tested at an Air Movement Control Association (AMCA) Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, and Shutters. The VD-1300 Series includes Class IA, I, and III leakage-rated dampers, available in 1-inch increments.

### Features

- tested to over 100,000 cycles assures long damper life.
- 3-year warranty on materials and workmanship provides confidence of company standing behind product.
- 3-working-day standard shipping after order entry results in fast response for short lead time projects.
- 1-working-day Fast Track shipping provides Fast Track at a cost premium.
- factory-installed actuator reduces installation and commissioning time.
- factory-installed jackshaft reduces installation and commissioning time.

### VD-1310 Class III Dampers (Not for Outdoor Air Applications) Submittal Specifications

Furnish and install Johnson Controls® VD-1310 Class III volume control dampers.

**Frames** are to be constructed of formed 13-gauge galvanized sheet steel, mechanically joined with linkage concealed in the side channels to eliminate noise and friction. Compressible spring stainless steel side seals and self-lubricating bearings shall also be provided.

**Blades** are to be constructed with formed 16-gauge galvanized steel. Damper blade width shall not exceed 8 inches and shall have seals. Blade rotation is to be parallel or opposed as shown on the schedules.

**Performance** shall be designed for normal shutoff in return air applications and tested in accordance with AMCA Standard 500. Leakage resistance for a 48-inch x 48-inch damper with seals shall not exceed 17 cfm per square foot at a 1-inch pressure differential, 45 cfm per square foot at a 4-inch pressure differential. Damper operating force at a 4-inch differential shall not exceed 6 lb-in/sq ft. The damper must be rated to operate over a temperature range of -40 to 200°F (-40 to 93°C) standard and -40 to 250°F (-40 to 121°C) high temperature.

**Sizing** shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance.

### VD-1320 Class I or VD-1330 Class IA Dampers Submittal Specifications

Furnish and install Johnson Controls VD-1320 Class I or VD-1330 Class IA volume control dampers.

**Frames** are to be constructed of formed 13-gauge galvanized sheet steel, mechanically joined with linkage concealed in the side channel to eliminate noise and friction. Compressible spring stainless steel side seals and self-lubricating bearings shall also be provided.

**Blades** are to be constructed with 1/16-inch extruded aluminum in an airfoil shape. Damper blade width shall not exceed 8 inches and shall have seals. Blade rotation is to be parallel or opposed as shown on the schedules.

**Performance** shall be designed for very tight shutoff and tested in accordance with AMCA Standard 500. Leakage resistance for a 48-inch x 48-inch damper with seals shall not exceed 2.2 cfm per square foot at a 1-inch pressure differential, 3.7 cfm per square foot at a 4-inch pressure differential. Damper sealing force at a 4-inch differential shall not exceed 6 lb-in/sq ft. The damper must be rated to operate over a temperature range of -40 to 200°F (-40 to 93°C) standard and -40 to 250°F (-40 to 121°C) high temperature.

**Sizing** shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance.



VD-1300 Control Dampers

### Repair Information

Johnson Controls VD-1300 dampers have no components that require routine scheduled maintenance.

If the VD-1300 Volume Control Damper fails to operate within its specifications, replace the unit. For a replacement VD-1300 damper, contact the nearest Johnson Controls representative.

Refer to the *VD-1300 Volume Control Dampers Product Bulletin (LIT-1201635)* for important product application information and a list of repair parts available.

**VD-1300 Control Dampers (Continued)**

**Factory Options**

Description	
E	Exact whole inch size, no undercut
F	1.5 in. L flange air entering side (cannot be used with option G or H)
G	1.5 in. L flange air leaving side (cannot be used with option F or H)
H	Double flange (cannot be used with option F or G)
I	Indicator switch (DMPR-KC014)
J	Jackshaft (field installed) (factory assembles and breaks down for shipping)
M	Jackshaft (factory installed and assembled)
Q	Internal mount actuator

**Accessories**

Description <sup>1</sup>	Code Number
Blade Pin Extension Support Bracket	DMPR-KC001
3-1/4 in. Blade Pin Extension	DMPR-KC002
15 in. Blade Pin Extension	DMPR-KC004
Blade Pin Extension Coupler	DMPR-KC006
5 in. Blade Pin Extension	DMPR-KC007
Crank Arm, 7/16 in. Shaft, Adjustable 1 to 2-3/4 in. Radius	DMPR-KC050
Blade Arm	DMPR-KC054
Internal Vertical Blade-to-Blade Linkage	DMPR-KC100
External Vertical Pin-to-Pin Linkage	DMPR-KC101
Linkage Rod, 4 ft	DMPR-KC102
Horizontal Face/Bypass Bracket	DMPR-KC150
Horizontal Blade-to-Blade Bracket	DMPR-KC151
90° Blade-to-Blade Linkage	DMPR-KC152
Support Bar	DMPR-KC200
Damper Fastener	DMPR-KC201
Pin-to-Pin Coupling	DMPR-KC202
Drive Arm and U-Bolt	DMPR-KC203
Manual Locking Quadrant	DMPR-KC250

1. For complete listing and pictures, refer to the *Damper Accessory Kits and Replacement Parts Product Bulletin (LIT-2681100)*.

**Selection Chart**

	Code Number <sup>1</sup>	V					-	w	w	w	x	h	h	h		
<b>Application</b>	V = Volume Control															
<b>Blade Operation</b>	O = Opposed P = Parallel															
<b>Blade/Frame</b>	A = Aluminum Airfoil/13-gauge Galvanized P = Double-Piece/13-gauge Galvanized V = 16-gauge/13-gauge Galvanized															
<b>Bearing/Seal</b>	S = Standard (Acetal/Santoprene) E = Extended (Bronze/Santoprene) H = High (Bronze/Silicone)															
<b>Actuator</b>	A = M9208-AGB or M9220-AGC B = M9208-GGB or M9220-HGC C = M9208-BAB or M9220-BAC D = M9208-BGB or M9220-BGC F = M91xx-AGC-2 G = M91xx-xGC-2 N = None P = Pneumatic 8 – 13 lb spring range															
<b>Width</b>	VD-1310: 008 to 108 inches, 1 in. increments VD-1320/VD-1330: 008 to 192 inches, 1 in. increments															
<b>Height</b>	VD-1310: 006 to 076 inches, 1 in. increments VD-1320/VD-1330: 006 to 228 inches, 1 in. increments															
<b>Options (limit two)</b>	See <i>Factory Options</i> for descriptions and combinations.															

1. Not all combinations are available; check selector tool for valid combinations.

**VD-1300 Control Dampers (Continued)**
**Technical Specifications**

VD-1300 Series Control Dampers <sup>1</sup>					
Leakage Resistance	VD-1310	17 cfm/sq. ft maximum at 1 in. static pressure 45 cfm/sq. ft maximum at 4 in. static pressure			
	VD-1320	3.4 cfm/sq. ft maximum at 1 in. static pressure 6.0 cfm/sq. ft maximum at 4 in. static pressure			
	VD-1330	2.2 cfm/sq. ft maximum at 1 in. static pressure 3.7 cfm/sq. ft maximum at 4 in. static pressure			
Operating Torque	0.5 in. static pressure and 100 fpm fully open approach velocity 1 in. static pressure and 1,000 fpm fully open approach velocity			4.5 lb-in/sq. ft 5.5 lb-in/sq. ft	
Pressure Drop (inches WG) - Fully Open	Size (in.)	Approach Velocity (fpm)			
		1,000	2,000	3,000	4,000
	12 x 12	0.16	0.42	--	--
	24 x 24	0.05	0.20	0.42	0.57
	48 x 48	0.03	0.10	0.25	0.45
Velocity Requirements		Width (in.)			
		12	24	36	48
	VD-1310	6,000 fpm at 6 in. static	4,500 fpm at 6 in. static	3,000 fpm at 4.5 in. static	1,500 fpm at 3 in. static
	VD-1320	8,000 fpm at 8 in. static	6,000 fpm at 8 in. static	4,000 fpm at 6 in. static	2,000 fpm at 4 in. static
	VD-1330	8,000 fpm at 12 in. static	8,000 fpm at 10 in. static	6,000 fpm at 10 in. static	4,000 fpm at 4 in. static
Temperature Rating	Normal and Extended Operating Conditions		-40 to 200°F (-40 to 93°C)		
	High (with Bronze Bearings and Silicone Seals)		-40 to 250°F (-40 to 121°C)		
	Actuator		-4 to 122°F (-20 to 50°C)		
Approximate Weight	Damper	5 lb/sq. ft (2.7 kg/sq. ft)			
	Actuator	2.9 lb (1.6 kg) per actuator			

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

## VD-1620 Galvanized Steel Damper

### Description

The VD-1600 Series Steel Control Damper offers sturdy construction using 16-gauge frames. Combinations include: galvanized triple-V blade with galvanized frame, galvanized airfoil blade with galvanized frame, and stainless steel triple-V blade with stainless steel frame.

The damper is tested in accordance with AMCA standard 500. It exhibits low leakage rates that meet frequently specified 10 cfm/sq ft at 4 inch w.g. level.

For more information on the VD-1620 Galvanized Steel Damper, refer to the *VD-1600 Volume Control Dampers Product Bulletin (LIT-1201735)*.

### Features

- 5 inch x 1 inch hat channel frame reinforced with corner braces
- three-year warranty on materials and workmanship

### Factory Options

E = Exact whole inch size, no undercut

F = 1.5 inch L flange air entering side (Cannot be used with option G or H)

G = 1.5 inch L flange air leaving side (Cannot be used with option F or H)

H = Double flange (Cannot be used with option F or G)

I = Indicator Switch

J = Jackshaft (field installed)

Q = Internal Mount Actuator (minimum 14 x 13)

**Note:** Limit of two factory-installed options.

### Repair Information

If the VD-1620 Galvanized Steel Damper fails to operate within its specifications, replace the unit. For a replacement VD-1620, contact the nearest Johnson Controls® representative.



VD-1620 Galvanized Steel Damper

### VD-1620 Galvanized Steel Control Damper Selection Chart

	Code Number	V	W	-	w	w	w	x	h	h	h		
<b>Application</b>	V = Volume Control												
<b>Blade Operation</b>	O = Opposed P = Parallel												
<b>Blade/Frame</b>	W = Triple-V/ Galvanized												
<b>Bearing/Seal Type</b>	E = Extended (Bronze/Santoprene) H = High (Bronze/Silicone) S = Standard (Stainless/Neoprene)												
<b>Actuator</b>	A = M9208-AGB or M9220-AGC B = M9208-GGB or M9220-HGC C = M9208-BAB or M9220-BAC D = M9208-BGB or M9220-BGC F = M91xx-AGC-2 G = M91xx-HGC-2 N = None P = Pneumatic 8-13 lb Spring Range												
<b>Width Dimensions</b>	008 to 192 inches, 1 in. increments <sup>1</sup>												
<b>Height Dimensions</b>	006 to 228 inches, 1 in. increments <sup>2</sup>												
<b>Options (limit two)</b>	See Factory Options list												

1. Maximum single panel size is 48 inches wide x 72 inches high.

2. Sizes less than 12 inches high are to be parallel operation only.

**Note:** Any damper that requires more than one panel (larger than 48 inches wide or 72 inches high) automatically includes the jackshaft. All jackshafts are factory installed.

## VD-1620 Galvanized Steel Damper (Continued)

### Performance Specifications

VD-1620 Galvanized Steel Damper		
<b>Leakage - Fully Closed (tested both directions)</b>	3.7 cfm/sq. ft maximum at 1 in. static pressure for 48 in. wide damper 7 cfm/sq. ft maximum at 1 in. static pressure for 12 in. wide damper	
<b>Operating Torque</b>	0.5-inch static pressure and 100 fpm fully open approach velocity: 3.25 lb·in/sq. ft 1-inch static pressure and 1,000 fpm fully open approach velocity: 4.25 lb·in/sq. ft	
<b>Pressure Drop (Inches WG) - Fully Open</b>		1,000 fpm      2,000 fpm
	<b>24 inches x 24 inches</b>	0.03              0.11
	<b>48 inches x 48 inches</b>	0.02              0.10
<b>Velocity and Pressure Limits</b> recommended to meet other performance specifications (not structural limits)	<b>Damper Width</b>	
	<b>12 inches</b>	1,500 fpm at 5 in. static
	<b>36 inches</b>	1,500 fpm at 4 in. static
<b>Temperature Rating</b>	<b>Damper</b>	-25°F to 180°F (-32°C to 83°C)
	<b>Actuator</b>	-4°F to 122°F (-20°C to 50°C)
<b>Approximate Weight</b>	<b>Damper</b>	5 lb/sq. ft (2.7 kg/sq. ft)
	<b>Actuator</b>	2.9 lb (1.6 kg) per actuator

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

### Construction

Part	Construction
<b>Frame</b>	5 inches x 1 inch x 16-gauge, steel, hat-channel shaped
<b>Blades</b>	6 inch wide triple-V shaped, 16-gauge galvanized steel; 6-inch nominal width
<b>Bearings</b>	Stainless steel
<b>Blade Seal</b>	PVC coated polyester fabric mechanically locked into blade edge, Silicone optional
<b>Linkage</b>	Concealed in end channel of frame
<b>Blade Pin</b>	1/2 inch plated steel hex
<b>Side Seal</b>	Self-compensating stainless steel

### Submittal Specifications

Furnish and install Johnson Controls VD-1620 Class II volume dampers.

Frames are to be constructed of formed 16-gauge (1.6) galvanized sheet steel, with linkage concealed in the side channels to eliminate noise and friction. Compressible metal side seals and self-lubricating bearings shall also be provided.

Blades are to be constructed with formed 16-gauge galvanized steel. Damper blade width shall not exceed 8 inches and shall have seals. Blade rotation is to be parallel or opposed as shown on the schedules.

Performance shall be designed for tight shutoff and tested in accordance with AMCA Standard 500. Leakage resistance for a 48 inch x 48 inch damper with seals shall not exceed 3.7 cfm maximum per square foot at a 1 inch pressure differential. Damper operating force at 1 inch differential shall not exceed 4.25 lb·in/sq. ft. The damper must be rated to operate over a temperature range of -25 to 180°F (-32 to 83°C) standard.

**Sizing** shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance.

## VD-1630 Galvanized Steel Damper

### Description

The VD-1600 Series Steel Control Damper offers sturdy construction using 16-gauge frames. Combinations include: galvanized triple-V blade with galvanized frame, galvanized airfoil blade with galvanized frame, and stainless steel triple-V blade with stainless steel frame.

The damper is tested in accordance with AMCA standard 500. It exhibits low leakage rates that meet frequently specified 10 cfm/sq ft at 4 inch w.g. level.

For more information on the VD-1630 Galvanized Steel Damper, refer to the *VD-1600 Volume Control Dampers Product Bulletin (LIT-1201735)*.

### Features

- 5 inches x 1 inch hat channel frame reinforced with corner braces
- three-year warranty on materials and workmanship

### Factory Options

E = Exact whole inch size, no undercut

F = 1.5 inch L flange air entering side (Cannot be used with option G or H)

G = 1.5 inch L flange air leaving side (Cannot be used with option F or H)

H = Double flange (Cannot be used with option F or G)

I = Indicator Switch

J = Jackshaft (field installed)

Q = Internal Mount Actuator (minimum 14 x 13)

**Note:** Limit of two factory-installed options.

### Repair Information

If the VD-1630 Galvanized Steel Damper fails to operate within its specifications, replace the unit. For a replacement VD-1630, contact the nearest Johnson Controls® representative.



VD-1630 Galvanized Steel Damper

### VD-1630 Galvanized Steel Control Damper Selection Chart

	Code Number	V	G	S	-	w	w	w	x	h	h	h		
<b>Application</b>	V = Volume Control													
<b>Blade Operation</b>	O = Opposed P = Parallel													
<b>Blade/Frame</b>	G = Galvanized Airfoil/Galvanized Steel													
<b>Bearing/Seal Type</b>	S = Standard (Stainless/Ruskiprene) T = Thrust Bearing (vertical airfoil blade)													
<b>Actuator</b>	A = M9208-AGB or M9220-AGC B = M9208-GGB or M9220-HGC C = M9208-BAB or M9220-BAC D = M9208-BGB or M9220-BGC F = M91xx-AGC-2 G = M91xx-HGC-2 N = None P = Pneumatic 8-13 lb Spring Range													
<b>Width Dimensions</b>	8 to 192 inches, 1 in. increments <sup>1</sup>													
<b>Height Dimensions</b>	6 to 228 inches, 1 in. increments <sup>2</sup>													
<b>Options (limit two)</b>	See Factory Options list													

1. Maximum single panel size is 48 inches wide x 72 inches high.

2. Sizes less than 12 inches high are to be parallel operation only.

**Note:** Any damper that requires more than one panel (larger than 48 inches wide or 72 inches high) automatically includes the jackshaft. All jackshafts are factory installed.

## VD-1630 Galvanized Steel Damper (Continued)

### Performance Specifications

VD-1630 Galvanized Steel Damper				
<b>Leakage - Fully Closed</b>	4 cfm/sq. ft maximum at 1 in. static pressure for 48 x 48 in. damper 8 cfm/sq. ft maximum at 4 in. static pressure for 48 x 48 in. damper			
<b>Operating Torque</b>	0.5 in. static pressure and 100 fpm fully open approach velocity: 3.25 lb·in/sq. ft 1 in. static pressure and 1,000 fpm fully open approach velocity: 4.25 lb·in/sq. ft			
<b>Pressure Drop (Inches WG) - Fully Open</b>		<b>1,000 fpm</b>	<b>2,000 fpm</b>	<b>3,000 fpm</b>
	<b>24 inches x 24 inches</b>	0.025	0.10	0.25
	<b>48 inches x 48 inches</b>	0.015	0.06	0.14
<b>Velocity and Pressure Limits</b> recommended to meet other performance specifications (not structural limits)	<b>Damper Width</b>			
	<b>12 inches</b>	6,000 fpm at 11 in. static		
	<b>36 inches</b>	3,000 fpm at 7 in. static		
	<b>48 inches</b>	1,500 fpm at 5 in. static		
<b>Temperature Rating</b>	<b>Damper Actuator</b>	-72°F to 275°F (-60°C to 135°C) -4°F to 122°F (-20°C to 50°C)		
<b>Approximate Weight</b>	<b>Damper</b>	5 lb/sq. ft (2.7 kg/sq. ft)		
	<b>Actuator</b>	2.9 lb (1.6 kg) per actuator		

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

### Construction

Part	Construction
<b>Frame</b>	5-inch x 1-inch x 16-gauge, steel, hat channel shaped reinforced with corner braces
<b>Blades</b>	14-gauge, galvanized steel airfoil shaped double skin construction; 6-inch nominal width
<b>Bearings</b>	Synthetic
<b>Blade Seal</b>	Ruskiprene, Synthetic optional
<b>Linkage</b>	Concealed in end channel of frame
<b>Blade Pin</b>	1/2 in. plated steel hex
<b>Side Seal</b>	Self-compensating stainless steel

### Submittal Specifications

Furnish and install Johnson Controls VD-1630 Class I volume dampers.

Frames are to be constructed of formed 16-gauge galvanized sheet steel, with linkage concealed in the side channels to eliminate noise and friction. Compressible spring stainless steel side seals and self-lubricating bearings shall also be provided.

Blades are to be constructed with formed 16-gauge galvanized steel in an airfoil shape. Damper blade width shall not exceed 8 inches and shall have seals. Blade rotation is to be parallel or opposed as shown on the schedules.

Performance shall be designed for very tight shutoff and tested in accordance with AMCA Standard 500. Leakage resistance for a 48 inch x 48 inch damper with seals shall not exceed 4 cfm per square foot at a 1 inch pressure differential, 8 cfm per square foot at a 4 inch pressure differential. Damper sealing force at 1 inch differential shall not exceed 4.25 lb·in/sq ft. The damper must be rated to operate over a temperature range of -40 to 200°F (-40 to 93°C) standard and -40 to 250°F (-40 to 121°C) extended temperature.

Sizing shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance.

## VD-1640 Stainless Steel Damper

### Description

The VD-1600 Series Steel Control Damper offers sturdy construction using 16-gauge frames. Combinations include: galvanized triple-V blade with galvanized frame, galvanized airfoil blade with galvanized frame, and stainless steel triple-V blade with stainless steel frame.

The damper is tested in accordance with AMCA standard 500. It exhibits low leakage rates that meet frequently specified 10 cfm/sq ft at 4 inch w.g. level.

For more information on the VD 1640 Stainless Steel Damper, refer to the *VD-1600 Volume Control Dampers Product Bulletin (LIT-1201735)*.

### Features

- 5 inch x 1 inch hat channel frame reinforced with corner braces
- three-year warranty on materials and workmanship

### Factory Options

E = Exact whole inch size, no undercut

F = 1.5 inch L flange air entering side (Cannot be used with option G or H)

G = 1.5 inch L flange air leaving side (Cannot be used with option F or H)

H = Double flange (Cannot be used with option F or G)

I = Indicator Switch

J = Jackshaft (field installed)

Q = Internal Mount Actuator (minimum 14 x 13)

**Note:** Limit of two factory-installed options.

### Repair Information

If the VD-1640 Stainless Steel Damper fails to operate within its specifications, replace the unit. For a replacement VD-1640, contact the nearest Johnson Controls® representative.



VD-1640 Stainless Steel Damper

### VD-1640 Stainless Steel Control Damper Selection Chart

	Code Number	V	S	S	-	w	w	w	x	h	h	h		
<b>Application</b>	V = Volume Control													
<b>Blade Operation</b>	O = Opposed P = Parallel													
<b>Blade/Frame</b>	S = 304 Stainless Steel													
<b>Bearing/Seal Type</b>	E = Extended (Stainless Steel/Silicone) S = Standard (Stainless/PVC coated)													
<b>Actuator</b>	A = M9208-AGB or M9220-AGC B = M9208-GGB or M9220-HGC C = M9208-BAB or M9220-BAC D = M9208-BGB or M9220-BGC F = M91xx-AGC-2 G = M91xx-HGC-2 N = None P = Pneumatic 8-13 lb Spring Range													
<b>Width Dimensions</b>	008 to 192 inches, 1 in. increments <sup>1</sup>													
<b>Height Dimensions</b>	006 to 228 inches, 1 in. increments <sup>2</sup>													
<b>Options (limit two)</b>	See Factory Options list													

1. Maximum single panel size is 48 inches wide x 72 inches high.
2. Sizes less than 12 inches high are to be parallel operation only.

**Note:** Any damper that requires more than one panel (larger than 48 inches wide or 72 inches high) automatically includes the jackshaft. All jackshafts are factory installed.

## VD-1640 Stainless Steel Damper (Continued)

### Performance Specifications

VD-1640 Stainless Steel Damper					
<b>Leakage - Fully Closed</b>	3.7 cfm/sq. ft maximum at 1 in. static pressure for 48 in. wide damper				
	7.0 cfm/sq. ft maximum at 1 in. static pressure for 12 in. wide damper				
<b>Operating Torque</b>	0.5 in. static pressure and 100 fpm fully open approach velocity: 5 lb-in/sq. ft				
	1 in. static pressure and 1000 fpm fully open approach velocity: 5 lb-in/sq. ft				
	10 in. static pressure and 2500 fpm fully open approach velocity: 7 lb-in/sq. ft				
<b>Pressure Drop (Inches WG) - Fully Open</b>		1000 fpm	2000 fpm	3000 fpm	4000 fpm
	<b>24 inches x 24 inches</b>	0.01	0.01	0.15	0.31
	<b>48 inches x 48 inches</b>	0.01	0.01	0.01	0.01
<b>Velocity and Pressure Limits</b> recommended to meet other performance specifications (not structural limits)	<b>Damper Width</b>				
	<b>12 inches</b>	1500 fpm at 5 in. static			
	<b>24 inches</b>	1500 fpm at 4 in. static			
	<b>36 inches</b>	1500 fpm at 4 in. static			
	<b>48 inches</b>	1500 fpm at 2.5 in. static			
<b>Temperature Rating</b>	-25°F to 180°F (-32°C to 83°C)				
<b>Approximate Weight</b>	<b>Damper</b>	7 lb/sq. ft (3.2 kg/sq. ft)			
	<b>Actuator</b>	2.9 lb (1.6 kg) per actuator			

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

### Construction

Part	Construction
<b>Frame</b>	5 inch x 1 inch x 16-gauge, 304 stainless steel, U-channel shaped
<b>Blades</b>	6 inch wide, 16-gauge, 304 stainless steel; 6 inch nominal width
<b>Bearings</b>	Stainless steel
<b>Blade Seal</b>	PVC coated polyester fabric mechanically locked into blade edge, Silicone optional
<b>Linkage</b>	Concealed in end channel of frame
<b>Blade Pin</b>	1/2 inch plated steel hex
<b>Side Seal</b>	Self-compensating stainless steel

### Submittal Specifications

Furnish and install Johnson Controls VD-1640 low leakage stainless steel volume control dampers.

**Frames** are to be constructed of formed 304 stainless steel with linkage concealed in the side channel to eliminate noise and friction. Compressible spring stainless steel side seals and stainless steel bearings shall also be provided.

**Blades** are to be triple-V constructed with 304 stainless steel. Damper blade width shall not exceed 8 inches and shall have seals. Blade pins shall be 1/2 inch plated steel hex. Blade operation is to be parallel or opposed as shown on the schedules.

**Performance** shall be designed for tight shutoff and tested in accordance with AMCA Standard 500. Leakage for a 48 inch wide damper with seals shall not exceed 3.7cfm per square foot at a 1inch pressure differential. The damper must be rated to operate over a temperature range of -25 to 180°F (-32 to 83°C).

**Sizing** shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance. Blank off-plates and duct-to-damper transitions may be required.

## VD-125x Series Aluminum Control Damper

### Description

Since 1905, Johnson Controls has provided the highest quality control dampers that fit your application and size requirements.

- VD-1250 - Aluminum blades/frame
- VD-1251 - Aluminum blades/frame Thermal isolated aluminum blade
- VD-1252 - Aluminum blades/frame Thermal isolated aluminum blade/frame

VD-1250 dampers offer sturdy construction of both frame and airfoil shaped blades of aluminum, and are designed to meet different application and environmental requirements. These applications include, but are not limited to:

- VD-1250 - All aluminum dampers for use in harsh environments not suitable for galvanized steel
- VD-1251 - Thermal isolated dampers rated for low temperature applications
- VD-1252 - Thermal broken blade and frame dampers for low temperature applications that also require isolation breaks filled with polyurethane and are debridged

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

Johnson Controls has determined the thermal transmission properties at controlled laboratory conditions of 70°F (21°C) and 50% relative humidity, in accordance with the American Society for Testing and Materials standard test methods ASTM C 976-90 (Reapproved 1996), Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box, and ASTM C 1199-97, Measuring the Steady Rate Thermal Transmittance of Fenestration Systems Using Hot Box Methods.

- VD-1250 with no insulation, R value = 0.043
- VD-1251 with thermally broken insulated blades, R value = 0.235
- VD-1252 with thermally broken blades and frames, R value = 0.549

### Features

- 3-year warranty on materials and workmanship provides confidence of company standing behind product.
- 15-working-day standard shipping after order entry results in fast response for short lead time projects.
- 5-working-day Fast Track shipping (VD-1250 model only) provides Fast Track at a cost premium.

- self-compensating side seals minimize leakage between the blades and the damper frame.

Refer to the *VD-1250 Volume Control Dampers Product Bulletin (LIT-1201740)* for important product application information.

### VD-1250 Aluminum Damper Submittal Specifications

Furnish and install Johnson Controls® VD-1250 low leakage all aluminum volume control dampers.

**Frames** are to be constructed of formed extruded aluminum with linkage concealed in the side channel to eliminate noise and friction. Compressible spring stainless steel side seals and self-lubricating bearings shall also be provided.

**Blades** are to be constructed with extruded aluminum in airfoil shape. Damper blade width shall not exceed 8 inches and shall have seals. Blade pins shall be 1/2 inch plated steel hex. Blade operation is to be parallel or opposed as shown on the schedules.

**Performance** shall be designed for tight shutoff and tested in accordance with AMCA Standard 500. Leakage for a damper with seals shall not exceed 4 cfm per square foot at a 2.5-inch pressure differential. The damper must be rated to operate over a temperature range of -50 to 250°F (-46 to 121°C).

**Sizing** shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance. Blank off-plates and duct-to-damper transitions may be required.

### VD-1251/1252 Thermal Isolated Control Damper Submittal Specifications

Furnish and install Johnson Controls VD-1251 or VD 1252 low leakage thermal isolated volume control dampers.

**Frames** are to be constructed of formed extruded aluminum with linkage concealed in the side channel to eliminate noise and friction. Polycarbonate side seals and low temperature bearings shall also be provided. Thermal breaks added to the frame for additional isolation.

**Blades** are to be constructed with extruded aluminum in airfoil shape thermal isolation gap and with insulation injected within the blades for an R value of 0.549. Damper blade width shall not exceed 8 in. and shall have seals. Blade pins shall be 1/2 inch plated steel hex. Blade operation is to be parallel or opposed as shown on the schedules.



Aluminum Control Damper

**Performance** shall be designed for tight shutoff and tested in accordance with AMCA Standard 500. Leakage for a 48-inch x 48-inch damper with seals shall not exceed 1.7 cfm per square foot at -40°F (-40°C). The damper must be rated to operate over a temperature range of -70 to 200°F (-57 to 93°C).

**Sizing** shall be determined by the designer in accordance with accepted industry practices to ensure proper system performance. Blank off-plates and duct-to-damper transitions may be required.

### Repair Information

Johnson Controls VD-1250 dampers have no components that require routine scheduled maintenance.

If the VD-1250 Volume Control Damper fails to operate within its specifications, replace the unit. For a replacement VD-1250 damper, contact the nearest Johnson Controls representative.

### Factory Options

Description	
<b>E</b>	Exact whole inch size, no undercut
<b>F</b>	1.5 in. L flange air entering side (cannot be used with option G)
<b>G</b>	1.5 in. L flange air leaving side (cannot be used with option F)
<b>I</b>	Indicator switch
<b>J</b>	Field-installed jackshaft on single panel (multiple section units broken down and shipped in sections)
<b>K</b>	KYNAR® coating
<b>M</b>	Factory-installed jackshaft on single panel units
<b>Q</b>	Internal mount actuator
<b>S</b>	Steel frame
<b>T</b>	Insulated blade

### VD-125x Series Aluminum Control Damper (Continued)

#### Selection Chart

	Code Number <sup>1</sup>	V					-	w	w	w	x	h	h	h		
<b>Application</b>	V = Volume Control															
<b>Blade Operation</b>	O = Opposed (greater than 12 in. high) P = Parallel															
<b>Blade/Frame</b>	E = Extruded Aluminum Blade/Frame B = Thermal Isolated Blade/Frame T = Thermal Isolated Aluminum Blade/Aluminum Frame															
<b>Bearing/Seal</b>	S = Standard (Synthetic/Vinyl on E) S = Standard (Low Temp LEXAN®/Santoprene® II on B and T) E = Extended (Stainless Steel/Vinyl on E) T = Thrust/Santoprene (Use with Blade/Frame E only)															
<b>Actuator<sup>2</sup></b>	A = M9208-AGB or M9220-AGC B = M9208-GGB or M9220-HGC C = M9208-BAB or M9220-BAC D = M9208-BGB or M9220-BGC F = M91xx-AGC-2 G = M91xx-xGC-2 N = None P = Pneumatic 8 – 13 lb spring range															
<b>Width</b>	006 to 999 inches, 1 in. increments															
<b>Height</b>	VD-1250/VD-1251: 005 to 999 inches, 1 in. increments VD-1252: 007 to 999 inches, 1 in. increments															
<b>Options (limit two)</b>	See <i>Factory Options</i> for descriptions and combinations.															

1. Not all combinations are available; check selector tool for valid combinations.
2. Actuators may restrict maximum sizes; check selector tool for valid maximum sizes.

#### Technical Specifications

VD-1250 Volume Control Dampers <sup>1</sup>						
<b>Leakage Resistance</b>	<b>VD-1250</b>		3 cfm/sq. ft maximum at 1 in. static pressure 8 cfm/sq. ft maximum at 4 in. static pressure 11 cfm/sq. ft maximum at 8 in. static pressure up to 48 in. wide			
	<b>VD-1251 and VD-1252</b>		2 cfm/sq. ft maximum at 1 in. static pressure 4 cfm/sq. ft maximum at 4 in. static pressure 1.7 cfm/sq. ft maximum at -40°F			
<b>Operating Torque</b>	<b>VD-1250</b>		0.5 in. static pressure, 100 fpm fully open approach velocity 1 in. static pressure, 1,000 fpm fully open approach velocity 10 in. static pressure, 2,500 fpm fully open approach velocity			7 lb-in/sq. ft 7 lb-in/sq. ft 9 lb-in/sq. ft
	<b>VD-1251 and VD-1252</b>		0.5 in. static pressure, 100 fpm fully open approach velocity 1 in. static pressure, 1,000 fpm fully open approach velocity 10 in. static pressure, 2,500 fpm fully open approach velocity			11 lb-in/sq. ft 11 lb-in/sq. ft 13 lb-in/sq. ft
<b>Pressure Drop (inches WG) - Fully Open</b>	<b>Size (in.)</b>		<b>Approach Velocity (fpm)</b>			
			<b>1,000</b>	<b>2,000</b>	<b>3,000</b>	<b>4,000</b>
	<b>VD-1250</b>	<b>24 x 24</b>	0.02	0.08	0.17	0.3
		<b>36 x 36</b>	0.02	0.04	0.10	0.2
	<b>VD-1251</b>	<b>24 x 24</b>	0.09	0.20	0.42	--
<b>36 x 36</b>		0.08	0.3	0.4	--	
<b>Velocity Requirements</b>			<b>Width (in.)</b>			
			<b>12</b>	<b>24</b>	<b>36</b>	<b>48</b>
	<b>VD-1250</b>		6,000 fpm at 13 in. static	5,000 fpm at 10.8 in. static	4,000 fpm at 8.5 in. static	4,000 fpm at 6.0 in. static
	<b>VD-1251 and VD-1252</b>		6,000 fpm at 16 in. static	5,000 fpm at 13.5 in. static	4,000 fpm at 11 in. static	4,000 fpm at 8.5 in. static
<b>Temperature Rating</b>	<b>Standard and Extended Operating Conditions</b>		<b>VD-1250</b>		-50 to 250°F (-46 to 121°C)	
			<b>VD-1251 and VD-1252</b>		-72 to 200°F (-58 to 93°C)	
	<b>Actuator</b>		-4 to 122°F (-20 to 50°C)			
<b>Approximate Weight</b>	<b>VD-1250</b>		7 lb/sq. ft (3.2 kg/sq. ft)			
	<b>VD-1251 and VD-1252</b>		9 lb/sq. ft (4.1 kg/sq. ft)			
	<b>Actuator</b>		2.9 lb (1.6 kg) per actuator			

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

# VD-1240 Thin Line Control and VD-1241 Low Leakage Insulating Control Dampers

## Description

The VD-1240 and VD-1241 Thin Line Control Dampers come in the standard design as well as variations to the standard design, at an additional cost. The variations include:

- Kynar® finishes
- factory-installed, pneumatic and electric actuators (specific information required with order)
- frame-mounting bracket for simple field installation of most actuators
- Switch Package to remotely indicate damper bade position (DMPR-KCO14)
- front or rear flange frame
- double flange frame (VD-1240 only)

Refer to the *VD-1240 Thin Line Control and VD-1241 Low Leakage Insulating Control Dampers Product Bulletin (LIT-12011818)* for important product application information.

## Features

- Air Movement and Control Association (AMCA) Class 1A Tested Damper provides tight seal for outdoor air applications based on AMCA regulations
- available flanged or slip fit provides easy installation
- available insulated blades provide resistance to thermal penetration
- aluminum airfoil blades lower pressure drop and create less noise
- optional factory-installed actuator reduces installation and commissioning time



**VD-1240 Thin Line Control and VD-1241 Low Leakage Insulating Control Dampers**

## Repair Information

If the VD-1240 or VD-1241 damper fails to operate within its specifications, replace the unit. For a replacement valve, contact the nearest Johnson Controls® representative.

## Dimensions

All Johnson Controls height and width dimensions are from the outside edges of the frame. Actual damper size is 1/4 in. less than nominal.

Size Limits	Width x Height, in. (mm)
Minimum Single Panel	6 x 6 (152 x 152)
Maximum Single Panel	60 x 72 (1,524 x 1,829)
Maximum Multiple Panel	999 x 999 (25,375 x 25,375)
Size Increment	1 in. increments

Note: Actual size is 1/4 in. (6 mm) less than nominal.

## Performance Data

### VD-1240 Thin Line Control Damper Performance Data

Damper Width	Maximum System Pressure	Maximum System Velocity	Leakage	
			% of Maximum Flow	CFM/sq. ft
60 in. (1,524 mm)	3.0 in. w.g.	3,000 fpm	.08%	2.5
48 in. (1,219 mm)	6.0 in. w.g.	4,000 fpm	.07%	2.7
36 in. (914 mm)	8.5 in. w.g.	4,000 fpm	.08%	3.5
24 in. (610 mm)	10.8 in. w.g.	5,000 fpm	.07%	3.5
12 in. (305 mm)	13.0 in. w.g.	6,000 fpm	.08%	5.0

### VD-1241 Low Leakage Insulating Control Performance Data

Damper Width	Maximum System Pressure	Maximum System Velocity	Leakage	
			% of Maximum Flow	CFM/sq. ft.
60 in. (1,524 mm)	3.0 in. w.g.	3,000 fpm	.08%	2.5
48 in. (1,219 mm)	6.0 in. w.g.	4,000 fpm	.07%	2.7
36 in. (914 mm)	9.0 in. w.g.	4,000 fpm	.08%	3.2
24 in. (610 mm)	11.0 in. w.g.	5,000 fpm	.07%	3.5
12 in. (305 mm)	13.0 in. w.g.	6,000 fpm	.08%	5.0

**VD-1240 Thin Line Control and VD-1241 Low Leakage Insulating Control Dampers (Continued)**

**Selection Information**

**Damper Selector**

Ordering Code Number						-	w	w	w	x	h	h	h
<b>Application</b>	V=Volume Control Damper												
<b>Blade Operation</b>	O=Opposed P=Parallel												
<b>Blade/Frame</b>	D=Double Frame L=Low Profile 4 in. Deep Frame												
<b>Bearing/Seal</b>	S=Standard (Acetal/Santoprene)												
<b>Actuator</b>	A=M9203-AGC, M9208-AGC, M9220-AGC B=M9203-GGC, M9208-GGC, M9220-GGC C=M9203-BUB, M9208-BAC, M9220-BAC D=M9203-BGC, M9208-BGC, M9220-BGC F=M9106-AGC G=M91xx-xGC-2 N=None P=D-3062, D-3153												
<b>Width</b>	006 – 999 in., 1 in. increments												
<b>Height</b>	006 – 999 in., 1 in. increments												
<b>Options (Limit Two)</b>	See Factory Options for descriptions and combinations												

**Technical Specifications**

VD-1240 Thin Line and VD-1241 Low Leakage Insulating Control Dampers	
<b>Leakage Resistance - Fully Closed</b>	6 cfm/sq. ft maximum at 4 in. static pressure
<b>Pressure Drop (inches WG) - Fully Open</b>	1 in. static pressure and 1,000 fpm fully open approach velocity
<b>Operating Torque</b>	VD-1240: 7 lb·in./sq. ft VD-1241: 14 lb·in./sq. ft based on 2.5 in. static pressure and 1,000 fpm fully open approach velocity
<b>Temperature Rating</b>	Standard Operating Conditions: -72 to +275°F (-58 to +135°C) Actuator: -4 to 122°F (-20 to 50°C)
<b>Approximate Weight</b>	VD-1240 Damper: 7 lb/sq. ft (3.2 kg/sq. m) VD-1241 Damper: 15 lb/sq. ft (6.8 kg/sq. m) Actuator: 2.9 lb (1.32 kg) Pneumatic D-306: 1.2 lb (0.54 kg) Pneumatic D-3153: 10.0 lb (4.5 kg)

# RB-2000 Round Balancing Damper

## Description

Johnson Controls provides top quality round dampers to control air flow in Heating, Ventilating, and Air Conditioning (HVAC) systems that fit standard round ducts.

The round damper is available with seals for a low leakage control damper. The damper is easily installed in round ducts.

The round damper is available with or without a factory installed actuator.

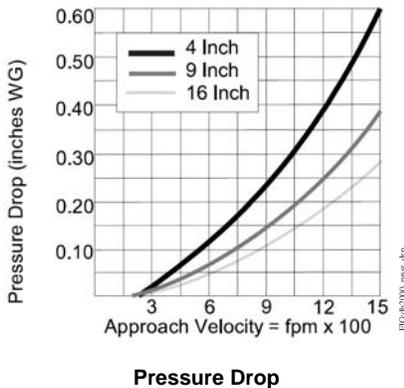
Johnson Controls® round dampers have no components that require routine scheduled maintenance.

## Applications

Refer to standard control damper for type selected.

## To Order

Specify the code number from the selection chart.



Refer to the *Round Balancing Damper Product Bulletin (LIT-2681220)* for important product information.

## Features

- 20-gauge galvanized sheet steel shroud
- 16-gauge and 20-gauge blades, based on diameter
- seals to reduce leakage
- formed shroud which allows easy insertion into duct work
- one-piece construction that increases rigidity and strength
- optional factory-installed actuators that reduce installation time



RB-2000 Round Damper

## Performance Specifications:

Round Balancing Damper	
Temperature Limits	-20 to 200°F (-29 to 93°C)
Approximate Weight	Size, inch (mm) lb (kg)
	4 (102) 1.1 (0.5)
	8 (204) 2.9 (1.32)
	12 (305) 8.0 (3.63)
16 (406) 14.0 (6.35)	

## Submittal Specifications

Furnish and install round balancing dampers manufactured by Johnson Controls.

**Damper shrouds** are to be constructed of formed 20-gauge G90 galvanized sheet steel or 304 stainless steel, mechanically joined.

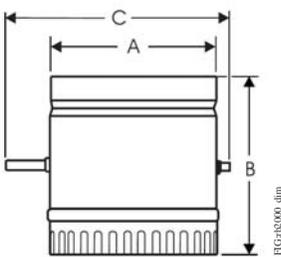
**Damper blades** are to be constructed with single-piece galvanized steel or 304 stainless steel based on shroud material.

**Damper performance** shall not require tight shutoff. The damper must be rated to operate over a temperature range of -20 to 200°F (-29 to 93°C) or 20 to 350°F (-29 to 177°C), to be determined by the material.

**Damper sizing** shall be by the designer in accordance with accepted industry practices to insure proper system performance.

## Construction

Part	Construction
Shroud	20-gauge galvanized sheet steel
Blade	4 - 8 in. (102 - 204 mm) diameter; 16-gauge galvanized steel, single-piece 9 - 22 in. (229 - 406 mm) diameter; 12-gauge galvanized steel, single-piece
Shaft	4-8 in. diameter; 5/16 in. (8 mm) diameter steel or galvanized wire (1/2 in. adaptor provided when ordered without actuator) 9-22 in. diameter; 1/2 in. (13 mm) diameter aluminum
Washer	Nylon
Seal	Closed-cell polyurethane foam tape



RB-2000 Dimensions

## Dimensions, in. (mm)

A	B	C
4 (102)	6 (152)	5.63 (143)
5 (127)	6 (152)	6.63 (168)
6 (152)	6 (152)	7.63 (194)
7 (178)	6.75 (171)	8.63 (219)
8 (204)	7.75 (197)	9.63 (244)
9 (229)	9.75 (248)	11.69 (297)
10 (254)	9.75 (248)	12.69 (322)
12 (305)	11.75 (298)	14.69 (373)
14 (356)	14 (356)	16.69 (424)
16 (406)	16 (406)	18.69 (475)

## RB-2000 Round Balancing Damper Selection Chart

	Code Number	Damper		Actuator	
		R	B	d	d
Product Family	R = Round Dampers				
Application	B = Balancing - without seals				
Material	G = Galvanized S = Stainless Steel				
Diameter	04 to 22 - 1 Inch Increments				
Actuator	B = Bracket with no Actuator M = Manual Locking Quadrant N = None				

**Note:** Factory-installed actuators on control dampers only.

# RD-2000 Round Control Dampers

## Description

Johnson Controls provides top-quality, low-leakage RD-2000 Round Control Dampers for use in Heating, Ventilating, and Air Conditioning (HVAC) systems that fit your size and application requirements. Round dampers are available with seals for low-leakage control dampers and are easily installed in round ducts. Round dampers are available with or without a factory-installed actuator.

Refer to the *RD-2000 Round Control Dampers Product Bulletin (LIT-2681045)* for important information.

## Features

- Formed shroud
- Available factory-installed actuator
- One-piece construction

## Applications

Furnish and install round control dampers manufactured by Johnson Controls.

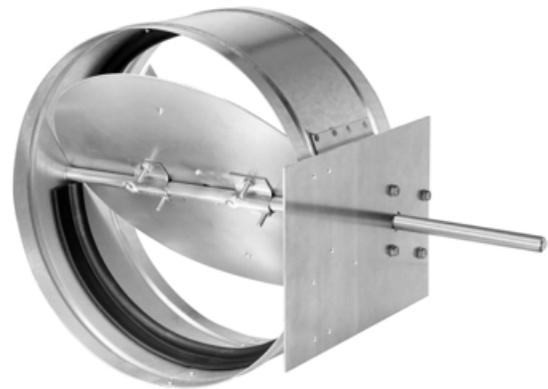
Damper shrouds are to be constructed of formed 20-gauge galvanized steel, mechanically joined. Blade rotation shall not exceed 80 degrees.

Damper blades are to be constructed with 1-piece or 2-piece 16-gauge or 20-gauge galvanized steel, determined by size.

Damper performance shall be designed for tight shutoff. Leakage rating at 4 inches. Water Gauge (w.g.) differential pressure with 5 lb·in./sq ft closing torque shall not exceed 10 cfm per square foot. Dampers without actuators must be rated to operate over a temperature range of -20 to 200°F (-29 to 93°C).

Damper sizing shall be by the designer in accordance with accepted industry practices to ensure proper system performance.

Factory-installed electric and pneumatic actuators are available.



RD-2000 Round Control Dampers

## Repair Information

If the RD-2000 Round Control Damper fails to operate within its specifications, replace the unit. For a replacement RD-2000 Damper, contact the nearest Johnson Controls® representative.

## Selection Chart

**Note:** Not all combinations are available; check the selector tool software application for valid combinations.

	Code Number	R	C	G	d	d			NC
<b>Product Family</b>	R = Round dampers								
<b>Application</b>	B = Balancing (no seals) C = Control (Class II) L = Low Leakage Control (Class I)								
<b>Shroud Type</b>	A = Aluminum (Class I only) G = Galvanized steel S = Stainless steel (304)								
<b>Diameter</b>	4 to 24 in., 1 in. increments								
<b>Actuator<sup>1</sup></b>	B = Bracket with no actuator E = Electric non-spring return M = Manual locking quadrant N = None P = Pneumatic, D-3062 S = Spring return electric								
<b>Control Signal</b>	B = Floating with two Single-Pole Double-throw (SPDT) auxiliary switches E = Proportional with two SPDT auxiliary switches P = 8-13 lb spring range								
<b>Operation</b>	NC = Normally Closed NO = Normally Open								

1. Based on torque requirements, RCG construction dampers use M9106 or M9206 actuators on all sizes, and RLG construction dampers use M9210 and M9220 actuators on all sizes.

**RD-2000 Round Control Dampers (Continued)**

**Technical Specifications**

RD-2000 Round Control Dampers <sup>1</sup>			
		RCG Construction	RLA, RLG, and RLS Construction
Leakage per in. diameter	1 in. static pressure	0.41	0.079
	2 in. static pressure	0.55	0.12
	4 in. static pressure	0.82	0.15
Pressure Drop (in. w.g. at 1,000 fpm)	8 in. diameter damper	0.12	
	12 in. diameter damper	0.012	
	16 in. diameter damper	0.001	
	20 in. diameter damper	0.001	
Actuator Torque Required for Closing at 1,500 fpm Velocity	4 to 8 in. diameter damper	52 lb·in maximum	
	9 to 16 in. diameter damper	84 lb·in maximum	
	17 to 22 in. diameter damper	116 lb·in maximum	
Leakage	Class I	RLG Construction	
	Class II	RCG Construction	
	Not Rated	RBG Construction	
Electric Actuator	M9106 and M9206: Running and breakaway torque 53 lb·in (6 N·m) M9116 and M9220: Running and breakaway torque 140 lb·in (16 N·m)		
Pneumatic Actuator	Maximum control pressure: 25 psig (172 kPa)		
Temperature Limits	without actuator	-20 to 200°F (-29 to 93°C)	
	with electric actuator	35 to 125°F (2 to 52°C)	
	with pneumatic actuator	-20 to 150°F (-29 to 66°C)	

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

# BD-1300 Balancing Damper

## Description

The BD-1300 balancing damper is designed for manual or automated balancing of airflow in heating, ventilating, and air conditioning systems. The BD-1300 is not a leakage-rated damper. It is available in 1-inch increments.

The rigid frames are constructed of formed 13-gauge galvanized sheet steel, mechanically joined with linkage concealed in the side channel to eliminate noise and friction. Self-lubricating acetal or bronze bearings are available.

Johnson Controls® BD-1300 dampers have no components that require routine scheduled maintenance.

Refer to the *BD-1300 Balancing Dampers Product Bulletin (LIT-2681015)* for important product information.

## Features

- three working day standard shipping, next working day shipping available at a cost premium
- three year warranty on materials and workmanship

## Applications

- manual or variable volume control only
- must not be used for positive shut off

## Accessories

Refer to *Damper Accessory Kits (LIT-1923185)* and *Damper Replacement Parts (LIT-1923190)*.

## To Order

Specify the code number from the selection chart. BD-1300 balancing dampers are available in 1 inch increments. Actual damper size is 1/4 in. less than nominal. All Johnson Controls damper dimensions are from the outside edges of the damper frame.

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



BD-1300 Balancing Damper

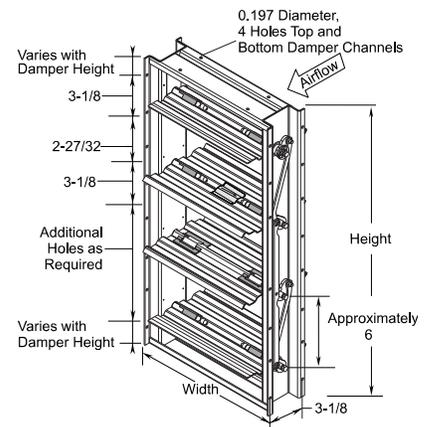
## Selection Chart

	Code Number	B	V	-	0	w	x	0	h	h
Application	B = Balancing									
Blade Operation	O = Opposed P = Parallel									
Blade Type	V = 16-gauge									
Bearing/Seal Type	S = Standard (Acetal/None) H = High (Bronze/None)									
Actuator <sup>1</sup>	A = M92xx-AGC-2 B = M92xx-HGC-2 C = M92xx-BAx-2 D = M92xx-BGC-2 F = M91xx-AGC-2 <sup>2</sup> G = M91xx-HGC-2 <sup>2</sup> N = No Actuator									
Width Dim.	008 to 096 inches, 1-inch increments									
Height Dim.	006 to 076 inches, 1-inch increments									
Options	C = Cover on actuator E = Exact whole inch size, no undercut									

1. Standard factory mounting of actuators are on the outside air stream, on a side plate. Actuators are selected by the factory for best performance at 5.5 lb-in/sq ft.
2. Available only with electric nonspring return actuators

## Construction

Part	Construction
Frame	13-gauge galvanized steel, mechanically joined
Blades	16-gauge galvanized steel, 6 inch nominal width, 8 in. maximum width
Linkage	1/8 in. rolled steel, zinc plated, concealed in one end channel of frame
Blade Pin	3/8 in. square steel, zinc plated
Bearings	Self-lubricating acetal or bronze
Side Seal	None
Blade Seal	None



BD-1300 Dimensions, in.

**BD-1300 Balancing Damper (Continued)**

**Performance Specifications**

BD-1300 Balancing Damper				
<b>Leakage Resistance - Fully Closed</b>	Not Rated for positive shut off			
<b>Pressure Drop - Fully Open (in WG)</b>	<b>1,000 FPM</b>	<b>2,000 FPM</b>	<b>3,000 FPM</b>	<b>4,000 FPM</b>
24 x 24 in.	0.05	0.20	0.42	0.77
48 x 48 in.	0.03	0.10	0.25	0.45
<b>Operating Torque</b>	0.5 in. static pressure and 100 FPM fully open approach velocity: 3.10 lb-in/sq. ft 1 in. static pressure and 1000 FPM fully open approach velocity: 3.50 lb-in/sq. ft			
<b>Velocity and Pressure Limits recommended to meet other performance specifications (not structural limits):</b>	<b>12 in. wide damper</b>		6,000 fpm at 6 in. static	
	<b>24 in. wide damper</b>		4,500 fpm at 6 in. static	
	<b>36 in. wide damper</b>		3,000 fpm at 4.5 in. static	
	<b>48 in. wide damper</b>		1,500 fpm at 3 in. static	
<b>Mounting</b>	Vertical or Horizontal Airflow			
<b>Temperature Rating</b>	-40°F to 250°F (-40°C to 121°C) Standard -65°F to 350°F (-54°C to 177°C) Extended			
<b>Approximate Weight</b>	<b>Minimum</b>	8 x 6 in.	5 lb (2.27 kg)	
	<b>Maximum</b>	30 x 30 in.	108 lb (48.99 kg)	

**Note:** The preceding data was compiled from test data, corrected to standard temperature and pressure conditions, determined using instrumentation and procedures in accordance with AMCA Standard for Test Methods for Louvers, Dampers, and Shutters No. 500.

**Submittal Specifications**

Damper frames are to be constructed of formed 13-gauge galvanized sheet steel, mechanically joined. Linkage is concealed in the right side channel when facing airflow to eliminate noise and friction. Self-lubricating bearings shall be provided.

Damper blade width shall not exceed 8 inches nominal. Blade rotation is to be parallel or opposed as shown on the schedules.

The damper must be rated to operate over a temperature range of -40 to 200°F (-40 to 93°C) standard or -40 to 350°F (-40 to 177°C) extended temperature.

Damper sizing shall be by the designer in accordance with accepted industry practices to ensure proper system performance. Blank off plates and duct-to-damper transitions may be required.

## ZP-2000 Rectangular and RZ-2001 Round Electronic Zone Pulse Dampers

### Description

ZP-2000 Rectangular and RZ-2001 Round Electronic Zone Pulse Dampers meet the industry requirements for a remote-powered, manual balancing damper used in finished-ceiling and difficult-access applications.

The ZP-2000 and RZ-2050 dampers offer an easily-installed, maintenance-free damper solution that interfaces with an optional remote motor control.

The optional remote motor control is equipped with an integral 9-volt power supply that operates the damper motor by means of an RJ11 cable terminating at an RJ11 connector, located at the motor, diffuser, or wall box.

Refer to the *ZP-2000 Rectangular and RZ-2001 Round Electronic Zone Pulse Dampers Product Bulletin (LIT-12011821)* for important application information.

### Features

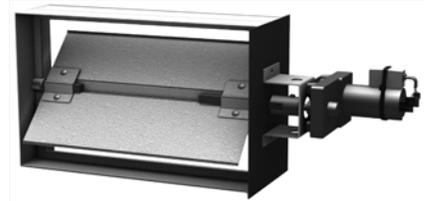
- No field power wiring required — lowers installation cost
- Heavy duty construction — allows use in multiple applications
- Factory wired RJ11 connector at actuator — lowers installation cost

### Applications

The zone pulse damper is a modulating-to-position damper used for balancing airflow to zones. It is suitable for dormitories and buildings where occupancy changes require adjusting zones but that prohibit manual adjustment or running wires to control the damper movement.

Furnish and install the rectangular (or round) remote control operated zone control dampers at locations shown on plans or as in accordance with schedules while meeting the following specifications:

- Dampers shall be of the butterfly type, consisting of a single blade, fastened to a 3/8 in. (10 mm) mild steel square shaft.
- Frame shall be minimum 20 gage (1.0 mm) G60 galvanized steel and include full circumference rolled stiffener beads for added strength.
- Blade shall be of the same material as the frame.
- Bearing shall be molded Lexan®, and shall be formed to the shape of the axle, reducing leakage around shaft penetration points.
- A 9 volt DC operated damper motor shall be factory installed and commissioned prior to shipping to the job site.
- Actuator shall include a factory-wired RJ11 connector. Damper shall be installed with plenum rated RJ11 cable terminating at the RJ11 damper motor connector on one end and an RJ11 connector located in a wallbox or diffuser on the other end.
- The damper assembly shall be powered by a remote 9 volt battery-operated controller that is plugged into the RJ11 connector located in the wallbox or diffuser.



ZP-2000 Rectangular (top) and RZ-2001 Round (bottom) Electronic Zone Pulse Dampers

### Repair Information

If the ZP-2000 Rectangular or RZ-2001 Round Electronic Zone Pulse Damper fails to operate within its specifications, replace the unit. For a replacement damper, contact the nearest Johnson Controls® representative.

### Selection

#### ZP-2000 Rectangular Electronic Zone Pulse Damper

	Code Number	Z	P	G	N	E	w	w	w	x	h	h	h		
Application	Z = Zone														
Blade Operation	P = Parallel														
Rating	G = Galvanized														
Seals/Bearings	N = No Seals, Lexan Bearings														
Actuator	E = Electric Pulse														
Width	006 to 034														
Height	006 to 014														
Option 1	N = None W = Wallbox														
Option 2	C = Remote Motor Control O = 20 ft Wallbox Cable P = 50 ft Wallbox Cable Q = 20 ft Diffuser Cable V = Wallbox - 1 Port W = Wallbox - 2 Port X = Wallbox - 3 Port Y = Wallbox - 4 Port Z = Wallbox - 6 Port														

**ZP-2000 Rectangular and RZ-2001 Round Electronic Zone Pulse Dampers (Continued)**

**RZ-2001 Round Electronic Zone Pulse Damper**

	Code Number	R	Z	B	d	d	
Style	R = Round						
Application	Z = Zone						
Shroud/Type	B = Pulse Control						
Diameter	dd = 4 to 20						
Option	C = Remote Motor Control O = 20 ft Wallbox Cable P = 50 ft Wallbox Cable Q = 20 ft Diffuser Cable V = Wallbox - 1 Port Cover W = Wallbox - 2 Port Cover X = Wallbox - 3 Port Cover Y = Wallbox - 4 Port Cover Z = Wallbox - 6 Port Cover						

**Accessories**

Code Number	Description
DMPR-ZP000	Remote Motor Control

**Technical Specifications**

ZP-2000 Rectangular and RZ-2001 Round Electronic Zone Pulse Damper	
Frame	<b>ZP-2000 Damper:</b> 3 in. (76 mm) x 20 gage (1.0 mm) galvanized steel, with 5 in. (127 mm) side plate <b>RZ-2001 Damper:</b> 20 gage (1.0 mm) gage galvanized steel, 6 in. (152 mm)
Blade	20 gage (1 mm) galvanized steel
Axle	3/8 in. (10 mm) square axle shaft
Bearings	Molded Lexan
Maximum Static Pressure	2 in. (51 mm) water column
Maximum System Velocity	2,000 fpm (10.2 m/s)
Actuator	Gear drive, fail-in-place motor
Power Requirements	9 volt DC, Powered by optional remote motor control
Operating Temperature	35 to 120°F (2 to 49°C)



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