Retrofit and Replacement

How to Select an Actuator for Damper Retrofit

BELIMO®

The "10 questions" method for sizing and selection shown below is recommended as the best method for your actuation requirements. Use the "Application Data" column in this chart as a worksheet to help in the selection process. This data, along with the "Actuator Product Range" charts in Sections 1 thru 3 allow for the best selection of a Belimo actuator.

APPLICATION INFO		APPLICATION DATA
1 What is the total area of the damper?	Combine the areas	_____ **sq.ft.**
2 Opposed blade or Parallel blade control construction?	L" x W" = Total sq inches/144 = total sq feet **Opposed Blade w/o seals 3 in-lb/sq feet*** **Opposed Blade w/ seals 5 in-lb/sq feet** **Parallel Blade w/o seals 4 in-lb/sq feet** **Parallel Blade w/ seals 7 in-lb/sq feet** ***Less than 1,000 feet per minute**	❏ **Opposed Blade** ❏ **Parallel Blade**
3 Are there blade and edge seals on the damper?	This will impact the proper selection as the seals add resistance requiring more torque. If unknown, use a worst case scenario, parallel blade with seals. Edge seals. Blade seals	❏ **Yes** ❏ **No**
4 For the damper in question, what does the manufacturer specify as the torque rating?	If this information is not available refer to the "typical damper requirements and sizing" chart below.	_____ **in-lb/sq.ft.**
5 What is the air velocity, static pressure, or design CFM?	Systems above 1,000 FPM require additional actuator torque	_____ **W.G.** _____ **CFM** _____ **FPM**

ACTUATOR REQUIREMENTS		APPLICATION DATA
6 Is fail-safe actuation required?	Consider the application. Is the actuator and/or damper exposed to outside air? If yes, use spring return.	❏ **Yes** ❏ **No**
7 What is the supply voltage to the actuator? • 24 VAC/DC • 120 VAC • 230 VAC single phase	Do you need a step down transformer? If replacing an oil immersed gear train actuator, is the transformer in the defective actuator? You may need to purchase one.	❏ **24 VAC** ❏ **120 VAC** ❏ **230 VAC**
8 What is the control signal to the actuator?	• 2 position • Floating point • Modulating • Sequencing • "Non-standard" voltage signals Controller This will be a critical component to the selection of an actuator. Consider the …MFT actuator product range and the flexibility of its application.	❏ **On/Off** ❏ **Floating Point** ❏ **2-10 VDC** ❏ **0-10 VDC** ❏ **4-20 mA** ❏ **PWM_____ range** ❏ **Other (MFT)**
9 Can you direct couple to a damper shaft?	Direct-coupling has become the industry standard. Some retrofit applications do not allow direct coupling. Refer to the Belimo "Mounting & Methods Guide" for application details. Jackshaft mounted	❏ **Yes** ❏ **No, see accessories page**
10 Are there additional accessories required?	K4-2 US KH-AF US KH-AF-1 US PA... SA... For example, some applications require the addition of an auxiliary switch for proof of position; a retrofit application may require an additional mounting bracket and linkage kit. We advise that you identify these needs prior to leaving the job site or ordering products.	❏ **No** ❏ **Yes, see accessories section or actuator series for details**

TYPICAL DAMPER REQUIREMENTS AND SIZING

Square Damper (with square shape): $ft^2 = h \times w /144$; (h= height, w= width, in inches)

EXAMPLE: Damper Area (8 ft^2) x Rated Torque Loading of Damper (4 in-lb/ft^2) = Total in-lb Required (32 in-lb) **Belimo LF 35 in-lb/ LM 45 in-lb actuators**

	Torque Loading in-lb/ft²		
Damper Blade Type	**< 1000 FPM**	**1000-2500 FPM**	**2500-3500 FPM**
Parallel blade/edge seals	**7 (Typical)**	10.5	14
Opposed blade/edge seals	**5 (Typical)**	7.5	10
Parallel blade/no edge seals	4	6	8
Opposed blade/no edge seals	3	4.5	6
Round	10	14	20

RETROFIT SOLUTIONS

SQUARE

800-543-9038 USA	**866-805-7089** CANADA	**203-791-8396** LATIN AMERICA

TYPICAL DAMPER REQUIREMENTS AND SIZING EXAMPLE:

APPPLICATION REQUIREMENTS	SQUARE DAMPER	ROUND DAMPER
Damper Length	24"	
Damper Width	12"	
Damper (Round)		12"
Blade Type	Opposed	Round
Edge Seals	Edge Seals	
Design CFM	1800 CFM	700 CFM
Fail Safe	Yes	Yes
Supply Voltage	24 Volt	24 Volt
Control Signal	2-10 VDC	2-10 VDC
CALCULATIONS		
Damper Area (sq inches)	24" x 12" = 288 in^2	πr^2 = 113.04 in^2
Damper Area (sq feet)*	288 in^2 x 1ft/12 in x 1ft/12 in = 2 ft^2	113.04 in^2 / 1ft/12in x 1ft/12in = .785 ft^2
Velocity	1800 ft^3/min / 2 ft^2 = 900 ft/min	700 ft^3/min / .785 ft^2 = 892 ft/min
	See chart under <1000 FPM (ft/min)	See chart under <1000 FPM (ft/min)
Rated Torque Loading (in-lb/ft^2)**	Select 5 in-lbs/ft^2 for Opposed Blade/Edge Seals	Select 10 in-lbs/ft^2 for Round Damper
EXAMPLE EQUATION	*Damper Area (sq ft) x **Rated Torque Loading of Damper (in-lbs/ft^2) = Total in-lb Required	
	2 ft^2 x 5 in-lbs/ft^2 = 10 in-lbs Belimo LF24-SR US @ 35 in-lbs	.785 ft^2 x 10 in-lbs/ft^2 = 7.85 in-lbs Belimo LF24-SR US @ 35 in-lbs

CONTROL SIGNAL OVERVIEW

Belimo actuators are compatible with many control inputs and all direct digital control (DDC) systems. There are many signals to select from with today's controllers.

What does 'on/off', 'open-close', '3-point', 'tri-state', 'floating point', 'proportional modulation', 'phase cut', 'PWM' or 'MFT' mean?

Belimo will help you understand more on this control signal jungle with a quick overview:

On/Off or Open-Close: The actuator is able to drive either to its full open position, or to its full closed position. The same indication is used for spring return type actuators. Where the actuator will drive to its full open position and spring return to its zero position. This can also be reversed.

3-point, Tri-State, Floating Point: The actuator has both clockwise (CW) and counter-clockwise (CCW) control inputs. One drives the actuator to its open, the other to its close position. If there is no signal (Null point) on either input the actuator simply stays in its last position.

Proportional Control: The actuator drives proportional to its control input and modulates throughout its angle of rotation. This control type is usually a variation of VDC. Common values are:

0-10 VDC   2-10 VDC

It is common to also have a 0-20/4-20 mA output from a controller. This can be very easily converted to 0-10 VDC or 2-10 VDC with a 500 Ω resistor.

Pulse Width Modulation (PWM): The actuator drives to a specified position according to a pulse duration, the "length" of signal. The pulse can originate from a dry contact closure or a triac sink or source controller. An example of PWM control:

Time base: 0 to 10 seconds

Output pulse: 5 seconds

Actuator position: 50%

Phasecut: An actuator drives depending on the power result of a remaining wave. This signal type cuts the amplitude of the wave and the actuator recognizes this signal as a proportional movement.
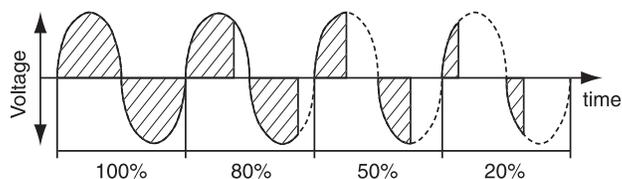
Multi-Functional Technology (MFT): This technology was developed by Belimo for incorporation into our damper and valve actuator. MFT provides the ability to program characteristics of the actuator. Some of the key characteristics to change are:

CONTROL INPUT
selectable On/Off, VDC, PWM or Floating point

MOTION VALUES
selectable Running time adjustment

FEEDBACK
selectable feedback values

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