Actuator Selection

Deciding what actuator will best fit your damper needs can seem like a difficult task. However, these quick steps will help you find the actuator you need quickly and effectively.

Use the procedure detailed below to find the total torque requirements in pound-inches (lb-in.) and then proceed to the following pages for simple questions to help select the proper model to best suit your application.

STANDARD ACTUATOR SIZING

1. Determine the Rated Torque Loading (lb-in. per sq ft):
   a. If the manufacturer-specified rated torque loading is known, enter that in Table 2.
   b. If the manufacturer-specified rated torque loading is unknown, use Table 1.
2. Enter this value in Table 2.
3. Determine Damper Area (sq ft):
   a. For round dampers, use the equation: $\frac{\pi \times r^2}{144}$
   b. For rectangular dampers use the equation: $\frac{(\text{length} \times \text{width})}{144}$

   NOTE: 144 sq in. = 1 sq ft

	x		/	144	=	

4. Enter the damper area value in Table 2.

Table 1. Rated Torque Loading Determination.

	Rated Torque (lb-in. per sq ft)				
Air Velocity feet per minute (fpm)[a]	Parallel Blades		Opposed Blades		Round Damper
	With Seals	Without Seals	With Seals	Without Seals	
up to 1000	7	4	5	3	10
1000-2500	10.5	6	7.5	4.5	14
2500-3500	14	8	10	6	20

[a] Assumes pressure differential of less than or equal to 2 in. w.c. For larger differentials, consult the damper manufacturer.

Table 2. Torque Requirements Calculation.

Rated Torque Loading	lb-in. per sq ft	x	Damper Area	sq ft	=	
	NOTE: Honeywell recommends adding 20 percent safety factors					x 1.20
			Total Required Torque (lb-in.)		=	

ASKING THE RIGHT QUESTIONS ABOUT YOUR ACTUATOR

Table 3 provides questions to address before selecting your actuator.

Table 3. Actuator Selection Checklist.

1.	Is Fail Safe Required?	
	Yes ❑ Spring Return	No ❑ Non-spring Return
2.	What torque rating is needed for this application? (See Table 2.)	
	❑ 44 lb-in.	❑ 35 lb-in.
	❑ 88 lb-in.	❑ 70 lb-in.
	❑ 175 lb-in.	❑ 175 lb-in.
	❑ 350 lb-in.	❑ 300 lb-in.
3.	What control signal is needed for this application?	
	❑ 24 Vac, 2 Position	❑ 24 Vac, 2 Position and Floating
	❑ 24 Vac, 2 Position with Auxiliary Switches	❑ 24 Vac, Proportional
	❑ 24 Vac, Floating and Proportional	❑ 24 Vac, 2 Position and Floating with Auxiliary Switches
	❑ 24 Vac, Floating and Proportional with Auxiliary Switches	❑ 24 Vac, Proportional with Auxiliary Switches
	❑ 24 Vac, Floating and Proportional with Auxiliary Switches and Adjustable Zero and Span	
	❑ 120 Vac, 2 Position	
	❑ 120 Vac, 2 Position with Auxiliary Switches	

Table 4. Fire and Smoke Actuator Selection Checklist.

	Fast-Acting Two-Position Actuators		
1.	**Required torque rating (see Table 2).**		
	❑ 30 lb-in. (3.4 N•m)		
	❑ 80 lb-in. (9 N•m)		
	❑ 175 lb-in. (20 N•m)		
2.	**Required voltage**		
	❑ 24 Vac	❑ 120 Vac	❑ 230 Vac
3.	**Required control signal for the application.**		
	❑ Two-Position (NOTE: All Fast-Acting Two-Position Actuators are Two-Position)		
4.	**Required actuator spring direction**		
	❑ Clockwise Rotation		
	❑ Counterclockwise Rotation		
	❑ Rotation By Orientation		

IMPORTANT

- *— Always use a torque rating equal to or greater than the calculated need.*
- *— For Example: With a Total Required Torque (calculated from Table 2) of 158 lb-in., select an actuator rated for 175 lb-in.*
- *— Selecting a Fast-Acting Two-Position Actuator requires selecting a spring return direction (clockwise or counterclockwise).*

FIRE AND SMOKE APPLICATIONS

Table 5. Fire and Smoke Application Two-Position Actuators (Spring Return Fail-safe Mode).

Torque Rating in lb-in. (N•m)			Voltage (in Vac)			Rotation to Open			Internal Switches	Model Number	
30 (3.4)	80 (9)	175 (20)	24	120	230	CW	CCW	CW or CCW[a]			
X				X		X			[b]	ML4115A1009	
X				X			X		[b]	ML4115B1008	
X					X	X			[b]	ML4115C1007	
X					X		X		[b]	ML4115D1006	
X			X			X			[b]	ML8115A1005	
X			X				X		[b]	ML8115B1004	
	X			X			X		[b]	MS4209F1007	
	X			X		X			[b]	MS4309F1005	
	X				X		X		[b]	MS4709F1014	
	X				X	X			[b]	MS4809F1012	
	X		X				X		[b]	MS8209F1003	
	X		X			X			[b]	MS8309F1001	
		X		X				X	—	MS4120F1006	
		X		X				X	X	MS4120F1204	
		X			X			X	—	MS4620F1005	
		X			X			X	X	MS4620F1203	
		X	X					X	—	MS8120F1002	
		X	X					X	X	MS8120F1200	

[a] Depends on type of installation.

[b] 32003532-005 External Auxiliary Switch Package.

ACTUATOR FEATURES

Use Table 6 to determine what features best fit your actuator needs. For more information on actuators, see the Product Data or Specification Data literature for the corresponding actuator.

Table 6. Actuator Features.

Fail Safe Mode		Torque Rating						Voltage		Control Signal			Special Features				
Spring Return	Non-Spring Return	35 lb-in. (4 N•m)	44 lb-in. (5 N•m)	70 lb-in. (8 N•m)	88 lb-in. (10 N•m)	175 lb-in. (20 N•m)	300 lb-in. (34 N•m)	24 Vac	100-200 Vac	Two Position	Floating	Proportional	Switches	Adjustable Zero and Span	Model Number	Catalog Number	
X			X					X		X					MS8105A1008	S0524-2POS	
X			X						X	X					MS4105A1002	S05120-2POS	
X			X					X			X	X			MS7505A2008	S05010	
X					X			X		X					MS8110A1008	S1024-2POS	
X					X			X		X			X		MS8110A1206	S1024-2POS-SW2	
X					X				X	X					MS4110A1002	S10120-2POS	
X					X				X	X			X		MS4110A1200	S10120-2POS-SW2	
X					X			X			X	X			MS7510A2008	S10010	
X					X			X			X	X	X		MS7510A2206	S10010-SW2	
X					X			X			X	X		X	MS7510H2209	S10010-SER-SW2	
X						X		X		X					MS8120A1007	S2024-2POS	
X						X		X		X			X		MS8120A1205	S2024-2POS-SW2	
X						X			X	X					MS4120A1001	S20120-2POS	
X						X			X	X			X		MS4120A1209	S20120-2POS-SW2	
X						X		X			X	X			MS7520A2007	S20010	
X						X		X			X	X	X		MS7520A2205	S20010-SW2	
X						X		X			X	X	X		MS7520H2208	S20010-SER-SW2	
	X	X						X		X	X				ML6161B2024	ML6161B2024	
	X	X						X				X			ML7161A2008	ML7161A2008	
	X			X				X		X	X				ML6174B2019	ML6174B2019	
	X			X				X				X			ML7174A2001	ML7174A2201	
	X					X		X		X	X				MN6120A1002	N2024	
	X					X		X		X	X		X		MN6120A1200	N2024-SW2	
	X					X		X				X			MN7220A2007	N20010	
	X					X		X				X	X		MN7220A2205	N20010-SW2	
	X						X	X		X	X				MN6134A1003	N3424	
	X						X	X				X			MN7234A2008	N344010	

Crank Arm Linkages

APPLICATION

Some installations physically prohibit direct coupling the actuator to the damper shaft. Direct-coupled mounting is preferable. Remote mounting of Honeywell Direct Coupled Actuators (DCA) can be done using a damper linkage.

This section discusses damper linkage installations, how to install a damper linkage and explanations of special applications, including:

- Modification of damper linkages to achieve faster response times at the damper.
- Modification of damper linkages so that the angle of rotation can be limited.

Installation examples that can prohibit direct-coupled mounting:

- Dampers installed in a wall section.
- Dampers installed inside a roof-top unit with no room left outside the damper frame.
- Replacing foot-mounted motor(s).
- Dampers without provision for external damper shaft.

DAMPER LINKAGE

A basic damper linkage includes a damper shaft crankarm, an actuator crankarm, a pushrod, and ball joints. In addition, a DCA can require a remote mounting kit such as Honeywell's part number 50001194-001. This kit allows the actuator to be mounted to either the duct or the damper frame.

IMPORTANT

- *— The actuator crankarm must be able to complete its full stroke unobstructed.*
- *— The actuator travel limits must correspond to the damper full open or full closed position.*
- *— Short pushrods can be difficult to adjust.*
- *— Lengthy pushrods often lack rigidity, resulting in poor damper response.*

EXTERNAL VS. INTERNAL MOUNTING

Installation can require the actuator mounting to be either external or internal to the damper frame. In most cases, this corresponds to external or internal to the ductwork.

Damper Crankarms

External

External mounting requires fitting the damper shaft with a crankarm and a ball joint. One crankarm is Honeywell's part number 26026G.

Fig. 1. 26026G Crankarm.

Internal

Internal mounting requires fitting the damper blade with a damper blade lever. It is typical to order the damper with a factory-installed blade lever.

If the damper is not already fitted with a blade lever, use Honeywell part number 32007205-002 (for dampers less than 24 in. high) or 32007205-003 (for dampers greater than 24 in. high). See Fig. 2.

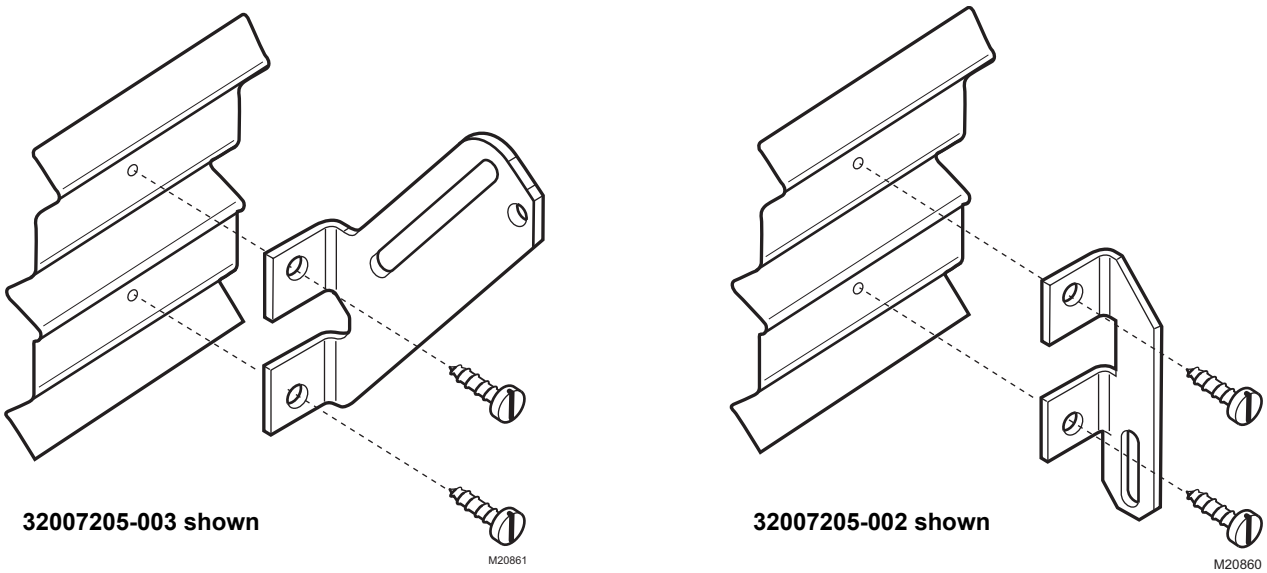

Fig. 2. Damper blade levers.

Actuator Crankarms

Depending upon the installation, the actuator crankarm might be part of a remote mounting kit, such as the 50001194-001. It can also be an independent part, such as the 205830A. In either case, fit the actuator with a crankarm and balljoint.

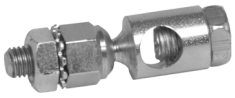

Fig. 3. 27518 Balljoint.

Ball Joints

Each crankarm requires a balljoint to facilitate connection between the damper and actuator. Honeywell part number 27518 is sized for 5/16 in. diameter pushrods and 103598 is sized for 1/4 in. diameter pushrods.

Pushrods

Connecting the damper shaft crankarm and the actuator crankarm requires a pushrod. The pushrod connects to the balljoint of each crankarm. Pushrods, such as Honeywell part number 25720, can be ordered in various lengths or cut to length by the installer. 25720 is a 5/16 in. diameter rod.

Table 7. Suggested Parts List

Mounting Type	External	Internal
Damper Crankarm	26026G	32007205-002 or -003
Ball Joints	27518 (5/16 in. diameter)	27518 (5/16 in. diameter)
Pushrod	25720x (5/16 in. diameter)	25720x (5/16 in. diameter)
Actuator Crankarm	50001194-001 Foot/Frame Mounting Kit, or see actuator accessories for appropriate crankarm	50001194-001 Foot/Frame Mounting Kit, or see actuator accessories for appropriate crankarm

TYPICAL INSTALLATIONS

The basic damper linkage installation addresses the need for damper remote operation through a 90 degree stroke using a DCA with a 90 degree stroke (nominal).

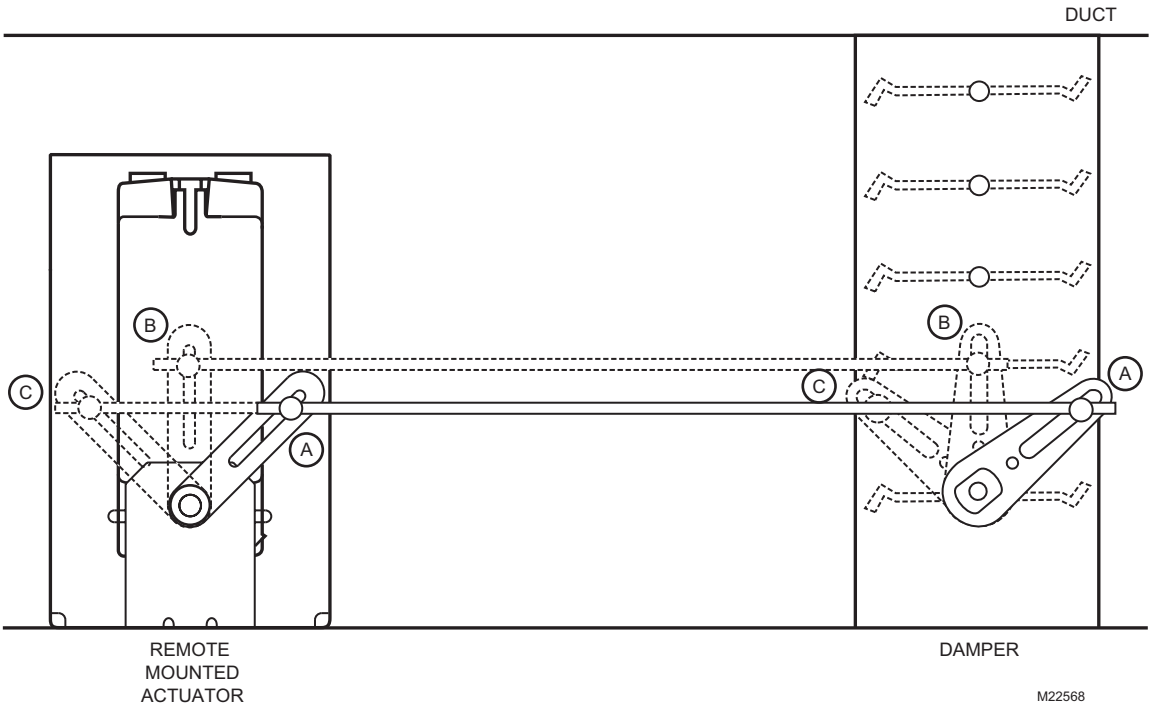

Fig. 4. Externally mounted actuator and linkage to a damper.

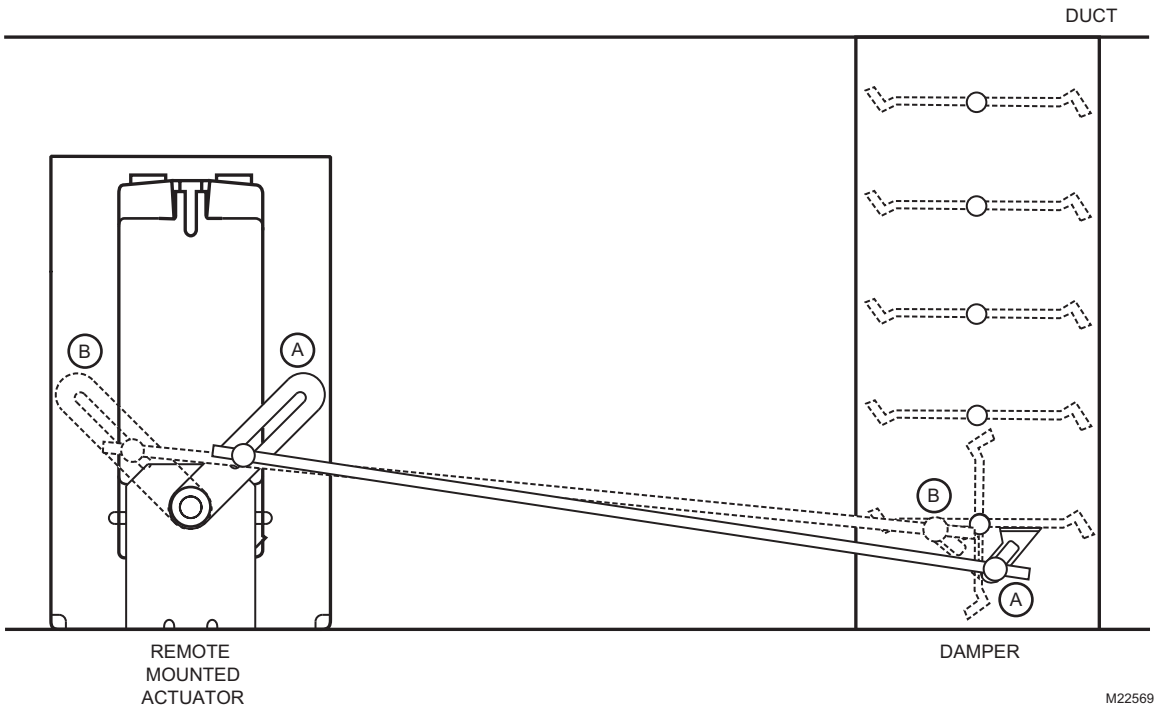

Fig. 5. Internally mounted actuator and linkage to a damper.

Standard Applications (90° actuator travel and 90° damper travel)

In order to achieve the same 90° of travel, special care should be taken in deciding the position of the two crankarms:

1. Position the damper blade at mid-position. See Fig. 6.
2. Position the actuator at mid-position (see Fig. 7):
   a. Non-spring return: Declutch the DCA.
   b. Spring return: Manually wind the DCA.
3. With the actuator mounted in place, create an imaginary line which connects the center of the damper crankarm and the center of the actuator crankarm. (See Fig. 8.)
4. Position each crankarm perpendicular to the imaginary line. (See Fig. 9.)

   NOTE: The crankarms will be parallel to each other.

5. Install a balljoint (finger-tight) on each crankarm.
6. Adjust the balljoints so that they are equidistant from the corresponding crankarm centers. (See Fig. 10.)
7. Install pushrod and tighten retaining screws.
8. Ensure tight damper closure by exercising the assembly through the entire travel:
   a. If damper closure is not tight, adjust the actuator crankarm balljoint to lengthen the effective length.
   b. If damper closes early, adjust the actuator crankarm balljoint to shorten the effective length.
9. Tighten all balljoints.

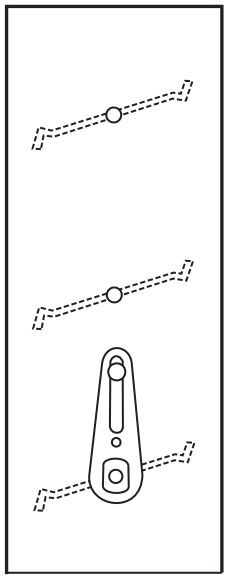

Fig. 6. Damper blade at mid-position.

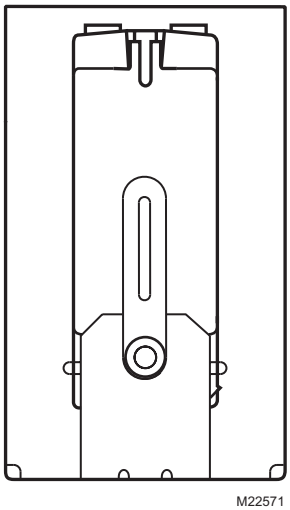

Fig. 7. Actuator at mid-position.

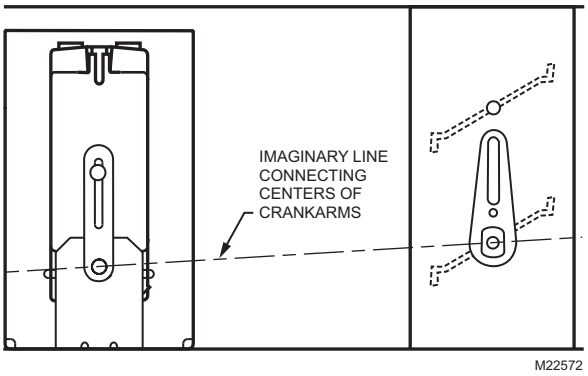

Fig. 8. Line connecting crankarm centers.

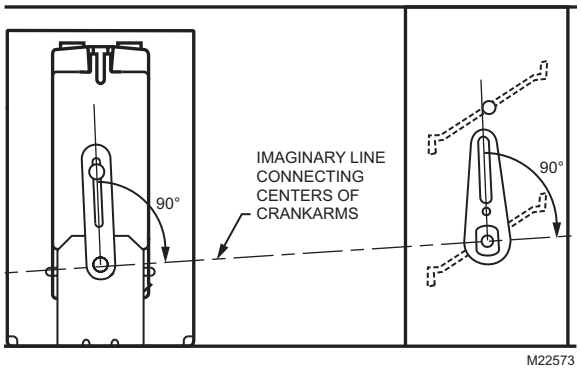

Fig. 9. Crankarm perpendicular positioning.

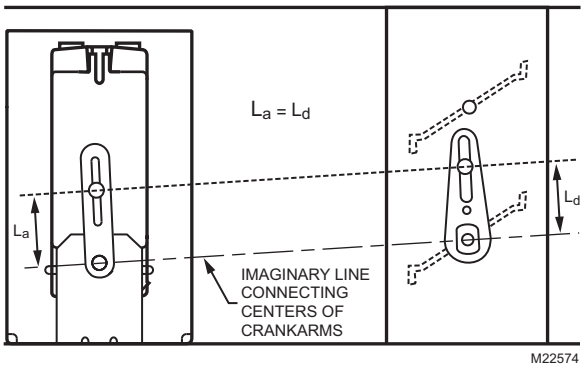

Fig. 10. Balljoint adjustment.

Non-Standard Applications

Faster Response Time

Some applications require faster than normal actuator response time. It is possible to configure a linkage to cause faster damper travel than actuator stroke.

Limited Damper Travel

Some applications require limiting damper travel (to less than 90 degrees). It is possible to configure a linkage to cause less damper travel than actuator stroke.

NOTE: With some actuators, travel limitation can be achieved using mechanical travel limits.

Non-Standard Application Setup

Setup is the same for both faster response time and limited damper travel. To accomplish either, the effective crankarm length must be adjusted. As with all crankarm applications the two variables, crankarm angle and length are critical.

NOTE: Faster damper timing setup limits DCA travel.

1. Follow standard application steps 1 through 5.
2. Adjust the crankarm effective lengths to achieve faster timing or limited travel.

NOTES:

— Many variations are possible using this basic guideline.

— Experimentation is typically necessary to achieve the required travel/timing.

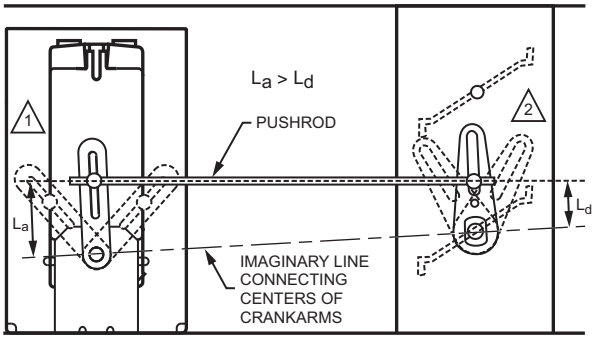

Fig. 11. Limited travel dynamics. (Shown with both actuator and damper at mid-position.)

With crankarms parallel at mid-position the difference in effective crankarm lengths is inversely proportional to:

— the difference in full rotation angles.

— the difference in timing.

EXAMPLE: L_a is twice the length of L_d. (See Fig. 11.)

— Travel of the damper is half that of the actuator.

— Control is more precise.

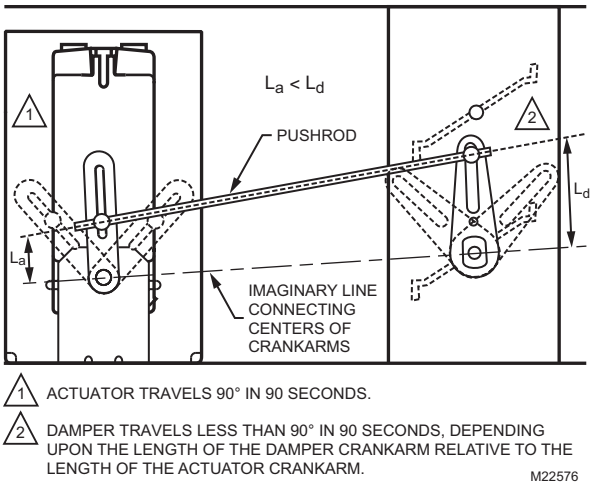

Fig. 12. Faster timing. (Shown with both actuator and damper at mid-position.)

EXAMPLE: L_a is half the length of L_d. (See Fig. 12.)

— Damper timing is half that of the actuator.

NOTES

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