

# ENGINEERING and TECHNICAL

## Damper Actuator Sizing

### Introduction

The size and quantity of actuators required depends on several damper torque factors:

- Type of damper seals (Standard, low or very low leakage)
- Quality of damper installation
- Number of damper sections
- Approach air velocity
- Static pressure

The following procedures can be used to determine the damper torque, actuator size, and quantity of actuators required to operate a damper.

### Damper Torque

1. From the damper manufacturer get the Damper Torque Rating (DTR) for the damper at the most severe operating conditions.

If the damper torque rating is not available, Table 1 can be used for estimating purposes only on an interim basis. However, it is very important to get the damper torque rating from the manufacturer as soon as possible to assure accurate torque calculations.

2. Calculate the damper area (DA) in square feet from the damper dimensions.
3. Calculate the Total Damper Torque (TDT) in lb-in using the following formula.

$$TDT = DTR \times DA$$

4. If the damper torque rating is not available, use a torque wrench on the damper shaft to measure the TDT.

### Actuator Size

1. From the actuator literature select the actuator type and size whose actuator torque rating (ATR) in lb-in is most appropriate for the application.
2. The ATR is normally based on 90° rotation of the damper. For torque ratings of other than 90° rotation, use the following formula:

$$ATR @ X^\circ \text{ rotation} =$$

$$ATR @ 90^\circ \text{ rotation} \times \left( \frac{\text{Crank Radius @ } X^\circ}{\text{Crank Radius @ } 90^\circ} \right)$$

3. If the actuator is rated in pounds of thrust, it can be converted to torque using the following formula:

$$\text{Torque} = (*\text{Crank arm length} \times 0.707) \times \text{Thrust}$$

\* The crank arm length is for 90° shaft rotation at nominal actuator stroke.

### Quantity of Actuators

1. Calculate the number of actuators required using the following formula:

$$\text{Number of actuators} = \frac{\text{Total Damper Torque}}{\text{SF} \times \text{Actuator Torque Rating}}$$

SF = Safety Factor: When calculating the number of actuators required, a safety factor should be included for unaccountable variables such as slight misalignments, aging of the damper, etc. A suggested safety factor is 0.8 (or 80% of the rated torque.)

2. If the number of actuators calculated is too large to be practical, select a more powerful actuator or consider using a positioning relay if it is a pneumatic actuator.

Contact your local **CAPP/USA™** representative for additional application assistance when specific damper factors are known, or the factory direct.

**Table 1. Damper Torque Rating for Estimating Purpose only.**

Damper Type	Damper Leakage at 1" H <sub>2</sub> O Static Pressure Drop	Damper Torque for Approach Air Velocities of 1200 Ft/min or less
Standard Leakage	More than 10 cfm/ft <sup>2</sup>	2.5 lb-in/ft <sup>2</sup>
Low Leakage	5 to 10 cfm/ft <sup>2</sup>	5.0 lb-in/ft <sup>2</sup>
Very Low leakage	Less than 5 cfm/ft <sup>2</sup>	7.0 lb-in/ft <sup>2</sup>