**Application**

The MF4E-60430-100 35 lb-in. (4 N-m) and MF4E-60830-100 70 lb-in. (8 N-m) non-spring return, direct-coupled actuators provide affordable floating control for dampers and rotary valves. They are suitable for use with single pole, double throw (SPDT) floating thermostats or Direct Digital Control (DDC) systems. Refer to Figure-1, Figure-2, and Figure-3 for wiring diagrams of typical applications.

**Features**

- Visual position indicator
- Adjustable stroke limit in both clockwise (CW) and counterclockwise (CCW) directions
- Magnetic coupling prevents overload at any stroke
- 35 and 70 lb-in. (4 and 8 N-m) torque models
- Provides 95° rotation (stroke)
- Direct mount on 1/2” (12.7 mm) diameter shafts (3/8” (9.5 mm) shafts with use of an adapter)
- Manual override for free shaft rotation to any position, 0° to 95°
- Can be mounted in any position
- Plenum rated enclosure
- Rugged design for extended actuator life
- Integral strain relief for cable
- Synchronous motor provides consistent timing
- 10 foot (3.05 m) plenum rated cable for rapid installation
TAC MicroNet

Applicable Literature

<table>
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<tr>
<th>F-Number</th>
<th>Description</th>
<th>Audience</th>
<th>Purpose</th>
</tr>
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<tbody>
<tr>
<td>F-26080</td>
<td>EN-205 Water System Guidelines</td>
<td>– Application Engineers</td>
<td>Provides treatment guidelines for water and steam systems.</td>
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<td>– Installers</td>
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<td>– Start-up Technicians</td>
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<tr>
<td>F-13755</td>
<td>CA-28 Control Valve Sizing</td>
<td>– Sales Personnel</td>
<td>Provides features, specifications, mounting dimensions, and other criteria useful to the selection of ball valve assemblies.</td>
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<td>– Application Engineers</td>
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<tr>
<td>F-11080</td>
<td>Valve Selection Chart Water</td>
<td>– Sales Personnel</td>
<td>Provides information about the product that may be submitted with a quote.</td>
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<td>– Application Engineers</td>
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<tr>
<td>F-27087</td>
<td>Vx-2x13-5xx-9-xx Series Ball Valve Assemblies and VB-2x13-500-9-xx Ball Valve Body/Linkage Assemblies Installation Instructions</td>
<td>– Sales Personnel</td>
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<tr>
<td>F-27374</td>
<td>MF4E-60430-100 and MF4E-60830-100 Submittal Sheet</td>
<td>– Sales Personnel</td>
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<td></td>
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<td>– Application Engineers</td>
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</table>

**Note:**

- The MF4E-60830-100 70 lb-in (8 N-m) actuator is the standard model used on factory-assembled ball valve assemblies. The MF4E-60830-100 actuator may be installed on Ball Valve Body/Linkage Assemblies. F-27086 and F-27087, listed in the above table, provide additional information relative to the sizing, selection, and installation of these valve assemblies.
- Do not use an MF4E-60430-100 35 lb-in (4 N-m) actuator for ball valve applications because its torque output may not be sufficient to overcome the valve’s breakaway torque.

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**SPECIFICATIONS**

**Actuator Inputs**

**Control Signal:** Floating control, 24 Vac +20% / -15%.

**Power Input:** See Table-1. All 24 Vac circuits are Class 2.

**Electrical Connections:** Nominal 10 foot (3.05 m) plenum rated cable with strain relief.

**Actuator Outputs**

**Mechanical:**

- **Stroke,** 95° of rotation. Stroke limit is adjustable 0° to 95° in both clockwise (CW) and counterclockwise (CCW) directions.
- **Manual Override,** Allows free shaft rotation to any position from 0° to 95°.
- **Mounting,** Mounts directly onto a 1/2" (12.7 mm) round shaft. Two mounting screws allows mounting onto the shaft in any position. Minimum 2" (51 mm) shaft length required. Mounting onto a 3/8" (9.5 mm) diameter shaft requires an AM-135 adapter kit.
- **Actuator Timing for 90° Stroke,** See Table-1.

**Torque Ratings,** See Table-1.

- **Position Indicator,** Visual indicator.
- **Nominal Damper Area,** Actuator sizing should be done in accordance with the damper manufacturer’s recommendations for the given flow condition.
- **Direction of Rotation,** Clockwise (CW) or counterclockwise (CCW) rotation, non-spring return.

**Environment**

- **Ambient Temperature Limits,**
  - **Shipping and Storage** -40 to 160 °F (-40 to 71 °C).
  - **Operating** -22 to 140 °F (-30 to 60 °C).
- **Humidity,** 5 to 95% RH, non-condensing. **Location,** NEMA 1 (IEC IP30).
Agency Listings
UL 873: Underwriters Laboratories (File # E9429 Category Temperature-Indicating and Regulating Equipment). Plenum rated.
CUL: UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.
European Community: EN 61326.
Australia: This product meets requirements to bear the C-Tick Mark.

Table-1 Model Chart.

<table>
<thead>
<tr>
<th>Model</th>
<th>Actuator Power Input</th>
<th>Typical Timing in Seconds for 90° Stroke at 70 °F (21 °C)(^a)</th>
<th>Output Torque Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Voltage</td>
<td>Running VA 50 Hz 60 Hz Watts</td>
<td>50 Hz</td>
</tr>
<tr>
<td>MF4E-60430-100</td>
<td>24 Vac +20% / -15%</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>MF4E-60830-100</td>
<td>70 (8)</td>
<td></td>
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</tbody>
</table>

\(^a\) Timing is measured with no load applied to the actuator.

ACCESSORIES
AM-135 3/8” (9.5 mm) shaft adapter.

TYPICAL APPLICATIONS (wiring diagrams)

The MF4E-60430-100 and MF4E-60830-100 actuators require the following connections:
- Power connection to a 24 Vac nominal Class 2 power source.

Caution: The MF4E-60430-100 and MF4E-60830-100 actuators are Class 2 only devices and must be connected to a Class 2 source. Class 2 circuits must not intermix with Class 1 circuits.

Figure-1 through Figure-3 illustrate typical wiring diagrams for floating actuators. See Table-1 for model selection.

Figure-1 Floating Point Control Wiring Diagram.
1. Provide overload protection and a disconnect as required.

2. Actuators may be wired in parallel only if they have the same rotational speed (stroke timing). When doing so, be sure to observe power consumption limits.

3. To increase actuator life, design the system with a time-out feature that removes power from the actuator between uses. For example, such a device may stop controller output after powering the actuator in one direction for 3 minutes or more.

Figure-2 Triac Source Wiring Diagram.

Figure-3 Triac Sink Wiring Diagram.
INSTALLATION

Inspection
Inspect the carton for possible damage. If damaged, notify the appropriate carrier immediately. Inspect the components for obvious damage. Return damaged products.

Requirements
- Job wiring diagrams.
- Tools (not provided):
  - 1/4" hex driver for the travel adjustment screws.
  - An 1/8" allen wrench for the output shaft set screws.
  - Appropriate screwdrivers for wiring terminals.
  - Pliers for turning damper shafts.
  - Digital Volt-ohm meter (DVM).
- AM-135, 3/8" (9.5 mm) shaft adapter, only needed if a 3/8" (9.5 mm) diameter damper shaft is used (not provided).
- One #8 (4 mm) sheet metal screw for the damper anti-rotation bracket (not provided).
- Class 2 power transformer (not provided) supplying a nominal 24 Vac (20.4 to 30 Vac) with a minimum rating of 5 VA at 50/60 Hz.
- Training: Installer must be a qualified, experienced technician.

Precautions

Warning:
- Electrical shock hazard! Disconnect the power supply (line power) before installation to prevent electrical shock and equipment damage.
- Make all connections in accordance with the electrical wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

Location

Caution:
- Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.
- Use plenum-rated cable when mounting the actuator inside a plenum.
- MF4E-60430-100 35 lb-in (4 N-m) and MF4E-60830-100 70 lb-in (8 N-m) actuators are intended for indoor use only. Locate where ambient temperatures do not exceed 140 °F (60 °C) or fall below –22 °F (-30 °C) and relative humidity does not exceed 95% or fall below 5%, non-condensing.

Mounting

Mount the actuator directly on the valve or damper shaft, in locations that clear the maximum dimensions of the actuator case and allow the actuator to be mounted perpendicular to the shaft. Mounting dimensions are shown in Figure-6.

Shaft Requirements — Dampers and Valves
As shipped from the factory, the actuator can be mounted on 1/2" (12.7 mm) diameter shafts that extend a minimum of 2" (51 mm). To mount the actuator on smaller, 3/8" (9.5 mm) diameter shafts, use the AM-135 shaft adapter.

Damper Sizing
Correct sizing of the actuator is necessary for proper control of dampers. The size of the damper area that can be controlled by a given actuator is dependent upon the type of damper, the quality of the damper, the pressure drop across the damper in the closed position, and the velocity of the air flow through the damper. To obtain actual damper torque requirements, contact the damper manufacturer.
**Damper Mounting**

Direct-mount the actuator onto a damper according to Figure-4, below.

**Caution:** Mounting adjustments must be made with power removed.

1. Press the manual override button and turn the output shaft to the full CCW position. If necessary, rotate the output shaft slightly to return the button to the fully extended position.
   
   **For CW (closed) position,** turn the output shaft fully CW.

2. Mount the actuator to the damper as shown, referring to notes 1 through 4.

- Check that the position selected for the mounting hole does not interfere with the operation of the damper.
- If necessary, loosen and slide the CW travel adjustment screw to the desired position, and then tighten the screw.
  
  **For CW (closed) position,** reposition the CCW travel adjustment screw.

**Caution:** Use the anti-rotation bracket when direct-mounting the actuator onto a damper shaft. Do not rigidly mount the actuator to the damper. Position the anti-rotation bracket so that the actuator can float, to ensure that the actuator's output shaft can turn freely through its full stroke, without binding.

3. If preloading the damper for closed position is required, set the actuator as follows:
   
   a. Rotate the actuator CW approximately 3/16" (4 mm) off the centerline of the damper and then tighten the output shaft set screws 60-70 lb-in. (6.8-7.9 N-m), using a 1/8" allen wrench.
   
   **For CW (closed) position,** rotate the actuator CCW.

   b. Rotate the actuator back into alignment with the centerline of the damper.
   
   This should ensure closure of the damper.

4. The anti-rotation bracket is pre-installed in the actuator slot when shipped.

5. When finished, verify free movement of the damper as follows:
   
   a. Press and hold the manual override button.
   
   b. Verify that the damper can be freely positioned between full open and full closed. There must be no binding between the actuator and damper, and the damper must be free of obstructions that may hinder its operation.
   
   c. Release the manual override button. If the button does not fully extend, it will do so automatically once power is applied to the actuator. The button may also be made to fully extend by rotating the output shaft slightly.

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**Figure-4 Actuator Mounting on Damper.**
Ball Valve Mounting

Mount the actuator onto a VB-2x13-500-9-xx body/linkage assembly according to Figure-5, below.

Note:
- Refer to the Ball Valve Assembly Installation Instructions, F-27087, for mounting and piping guidelines and additional valve mounting options.
- The MF4E-60830-100 70 lb-in (8 N-m) actuator is the standard model for use with ball valves. Do not use an MF4E-60430-100 35 lb-in (4 N-m) actuator for ball valve applications because its torque output may not be sufficient to overcome the valve’s breakaway torque.

Caution: Mounting adjustments must be made with power removed.

1. Verify that the valve is in the desired position (fully CW or CCW). The position of the ball opening is indicated by the index mark on top of the shaft:

   Flats on Sides of Shaft

2. Remove the anti-rotation bracket, shipped with the actuator, from the slot in the actuator housing. This bracket is not needed for ball valve applications.

3. Select the correct anti-rotation clip (NYBA-205, provided with valve body/linkage assembly).

4. Slide the actuator straight down over the valve shaft and onto the mounting plate, so that the slot in the actuator housing slides over the anti-rotation clip.

5. Tighten the wing nut finger tight to secure the anti-rotation clip in place. Be careful not to over-tighten the wing nut.

6. If necessary, press and hold the manual override button, and then rotate the actuator's output shaft to the desired position (fully CW or CCW). Release the button to re-engage the gears. If alternate actuator orientation is desired, consult F-27087.

7. Tighten the two set screws 60 - 70 lb-in. (6.8 - 7.9 N-m), using an 1/8" allen wrench.

Caution: Use the anti-rotation clip when mounting the actuator. Do not rigidly mount the actuator. Position the anti-rotation clip so that the actuator can float, to ensure that the actuator's output shaft can turn freely through its full stroke, without binding.

Figure-5 Actuator Mounting on Ball Valve Body/Linkage Assembly.
CHECKOUT

1. Before applying power to the system, press and hold the actuator’s manual override button and rotate the shaft to manually verify that the damper or valve moves freely and fully opens and closes.

2. Using power, cycle the control system to drive the actuator one complete cycle, open and closed. Check for correct operation of the damper or valve while the actuator is being stroked.

3. Remove power from the actuator. The actuator and damper or valve should remain at their current position.

Go, No Go Test

1. Disconnect the control leads from the controller.

2. Connect 24 Vac between the black and blue wires. The actuator should drive clockwise.

3. Connect 24 Vac between the black and yellow/black wires. The actuator should drive counterclockwise.

4. Check for proper operation of the damper or valve as the actuator is stroked.

5. Reconnect the control wiring.

THEORY OF OPERATION

The actuator is mounted directly onto a damper or valve shaft, using set screws. When power is applied by the controller between the black and blue wires, the actuator rotates clockwise. When power is applied by the controller between the black and yellow/black wires, the actuator rotates counterclockwise. When no power is applied to either the blue or yellow/black leads, the actuator remains at its current position. The actuator utilizes a synchronous motor for consistent stroke timing.

The MF4E-60430-100 and MF4E-60830-100 actuators are equipped with a manual override mechanism. This allows the actuator to be manually positioned at any point between 0° and 95° rotation. The actuator’s stroke can be limited by setting the travel adjustment screw positions (Figure-4).

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. The MF4E-60430-100 and MF4E-60830-100 actuators are maintenance free.

FIELD REPAIR

None. For replacement, contact your TAC representative and specify the desired model number. See the actuator label or Table-1 to identify this model number.

DIMENSIONAL DATA

Figure-6 Actuator Mounting Dimensions.