ATP-2040 Electric Damper Actuator/Transmitter

Kit Includes

1. Actuator/Transmitter package: factory assembled Actuator (EDA-2040) and Transmitter (DPT-2000).

<table>
<thead>
<tr>
<th>Product Code Number</th>
<th>Coupler Size</th>
<th>Differential Pressure Range</th>
<th>Rotation Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATP-2040-111</td>
<td>1/2 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>1 Minute</td>
</tr>
<tr>
<td>ATP-2040-121</td>
<td>3/8 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>1 Minute</td>
</tr>
<tr>
<td>ATP-2040-112</td>
<td>1/2 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>1 Minute</td>
</tr>
<tr>
<td>ATP-2040-122</td>
<td>3/8 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>1 Minute</td>
</tr>
<tr>
<td>ATP-2040-211</td>
<td>1/2 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>2 Minutes</td>
</tr>
<tr>
<td>ATP-2040-221</td>
<td>3/8 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>2 Minutes</td>
</tr>
<tr>
<td>ATP-2040-212</td>
<td>1/2 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>2 Minutes</td>
</tr>
<tr>
<td>ATP-2040-222</td>
<td>3/8 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>2 Minutes</td>
</tr>
<tr>
<td>ATP-2040-611</td>
<td>1/2 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>5.5 Minutes</td>
</tr>
<tr>
<td>ATP-2040-612</td>
<td>3/8 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>5.5 Minutes</td>
</tr>
<tr>
<td>ATP-2040-621</td>
<td>1/2 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>5.5 Minutes</td>
</tr>
<tr>
<td>ATP-2040-622</td>
<td>3/8 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>5.5 Minutes</td>
</tr>
<tr>
<td>ATP-2040-1111</td>
<td>1/2 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>11 Minutes</td>
</tr>
<tr>
<td>ATP-2040-1121</td>
<td>3/8 in. Shaft</td>
<td>0 to 0.5 WG</td>
<td>11 Minutes</td>
</tr>
<tr>
<td>ATP-2040-1112</td>
<td>1/2 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>11 Minutes</td>
</tr>
<tr>
<td>ATP-2040-1122</td>
<td>3/8 in. Shaft</td>
<td>0 to 1.5 WG</td>
<td>11 Minutes</td>
</tr>
</tbody>
</table>

Note: For pressure independent systems, a two minute actuator or greater should be used. For pressure dependent systems, a five and one-half minute or greater actuator should be used.

2. One # 10 mounting screw.

3. CBL-2000 Wiring Harness (six female quick connects with attached cables)
Items Needed

- screwdriver, flat blade with 1/4 to 5/16 inch tip or 5/16 inch nut driver.
- Allen wrenches, 3/32 and 9/64 inch sizes
- pliers
- drill and 5/32 inch (4 mm) drill bit
- screwdriver, 0.1 inch flat blade or small Phillips-head
- power source, 24 VAC
- CBL-2000 wiring harness (provided with unit)

Components

**Figure 1: Shaft Couplers**

The shaft couplers have a rubber O-ring on one end for retention in the actuator body during installation and prior to tightening the set screws.

**Figure 2: ATP-2040 Actuator/Transmitter**
The EDA-2040 Electric Damper Actuator and DPT-2000 Differential Pressure Transmitter can be ordered and installed separately. However, they are usually used together for incremental damper control and transmission of differential pressure. When ordered as a package, the unit includes a wiring harness and is called the ATP-2040 Actuator/Transmitter Package. See Figure 1.

Installation

The ATP-2040 can be installed on any VAV box with a 3/8 inch (9.5 mm) square or round shaft or with a 1/2 inch (12.7 mm) round damper shaft. The actuator is not position sensitive and can be mounted in any convenient orientation. Wiring terminals must be accessible and protected from moisture and corrosive fumes. No extra mounting brackets, linkage or couplers are required.

Caution and Code Requirements

- Follow NEC and local electric codes.
- Disconnect all power supplies before wiring.

\[\text{CAUTION: Failure to disconnect all power supplies to the system before wiring the ATP-2040 could result in damage to equipment or possible electrical shock.}\]

- Connect the DPT-2000 to the VAV box flow pickups only. Do not connect to steam, gas, or water lines.

Pre-Mounting Set Up

1. Unpack the ATP-2040 and check for the proper contents. Refer to your order slip.

2. Prior to installation of the damper, make sure the damper blade is either accessible or its position is permanently marked on the end of the damper shaft. Manually position the VAV box damper in its full open position as shown in Figure 3 and note the orientation of the damper shaft.

Figure 3: Damper Position
3. Grasp the damper shaft firmly with a pliers and manually turn the damper in the direction of the desired close off. Consult the box manufacturer’s information. Note the rotation travel (30° to 90°) and direction of rotation (CW or CCW) required to close the damper.

Figure 4: Rotation Adjustment Scale

4. Locate the rotation adjustment scale as shown in Figure 4.

5. Use a 9/64 inch Allen wrench to loosen the rotation adjustment stop.

Note: Do not excessively loosen the adjustment stop screw as this may permanently disable the adjustable stop.

6. Position it at the degree of rotation (30° - 90°) determined in Step 3.

7. Torque the rotation adjustment stop screw between 20 to 25 in·lb.

8. With the shaft coupler inserted in the actuator, lift and hold the manual release lever on the side panel of the ATP-2040 and simultaneously turn the shaft coupler in the same direction as was determined in Step 3 until it contacts the mechanical stop which will be the fully closed position.

9. Depending on damper configuration, proceed to one of the following procedures:

   • If the damper shaft is longer than 2-1/4 inches, use the standard mounting procedures in the Standard Mounting section.

   • If the damper shaft is shorter than 2-1/4 inch, use the flush mounting procedures in the Flush Mounting section.

   • If mounting to a D-1300 damper use the mounting procedures in the Mounting to D-1300 Damper Option section.
1. Manually rotate the damper shaft to gently close the damper blade.

![Diagram of Standard Mounting of ATP-2040]

**Figure 5: Standard Mounting of ATP-2040**

2. Place the ATP-2040 on the VAV box as shown in Figure 5 so that the damper shaft protrudes through the shaft coupler.

![Diagram of Actuator Position]

**Figure 6: Actuator Position**

3. Place the actuator in the desired mounting position 1/8 inch (3.2 mm) from the surface of the VAV box as shown in Figure 6 such that wiring connections are easily accessible.

4. Mark the center of the shoulder washer on the mounting surface and then remove the actuator from the shaft.

5. Drill a hole into the VAV box through the mark on the mounting surface using a drill and a 5/32 inch (4 mm) bit.

6. Install the actuator in the desired mounting position.

7. Insert the #10 thread cutting tapping screw provided and tighten.

8. Insert the short arm of a 3/32 inch Allen wrench into the hex socket screw of the coupler.
9. Rotate the Allen wrench clockwise until the hex socket screw contacts the
damper shaft.

Note: Maintain 1/8 inch clearance between the VAV box and actuator while
tightening the hex socket screws as illustrated in Figure 6.

10. Continue rotating the Allen wrench until the hex socket screw tightens and
no further effortless rotation of the screw can be made. Repeat for the other
coupler hex socket screw.

![Figure 7: Tightening Hex Socket Screw](image)

11. After bottoming each screw against the damper shaft, continue turning the
Allen wrench until obtaining approximately a 30 degree deflection of the
wrench as illustrated in Figure 7. Repeat for the other hex socket screw.

Note: When pressure on the Allen wrench is removed, the wrench will return
to its original shape.

12. **Lift and hold the manual release lever** and then turn the shaft by hand to
ensure that the damper can rotate from its full open to full closed positions.

Proceed to the *Electrical Connections* section to continue installation.
Flush Mounting

1. Manually rotate the damper shaft to gently close the damper.

2. Install the shaft coupler to the damper shaft with the O-ring away from the damper as shown in Figure 8. The shaft coupler should be 1/8 inch (3.2 mm) from the VAV box surface.

3. Insert the short arm of a 3/32 inch Allen wrench into one of the hex socket screws in the coupler as shown in Figure 7.

4. Rotate the Allen wrench clockwise until each hex socket screw contacts the damper shaft.

5. Continue rotating the Allen wrench until the hex socket screw tightens and no further effortless rotation of the screw can be made. Repeat for the other coupler hex socket screw.

6. After bottoming each screw against the damper shaft, continue turning the Allen wrench until obtaining approximately a 30 degree deflection of the wrench as shown in Figure 7. Repeat for the other coupler hex socket screw.

Note: When pressure on the Allen wrench is removed, the wrench will return to its original shape.

7. Place the actuator onto the shaft coupler in the desired mounting position so that wiring connections are easily accessible.

8. Mark the center of the shoulder washer on the mounting surface and remove the actuator from the shaft.

9. Drill a hole into the VAV box through the mark on the mounting surface using a drill and a 5/32 inch (4 mm) bit.

10. Install the actuator in the desired mounting position.

11. Insert the #10 thread cutting tapping screw provided and tighten.
12. **Lift and hold the manual release lever** and turn the shaft by hand to ensure that the damper can rotate from its full open to full closed positions.

*Note:* If manual rotation of the actuator is not possible, connect a 24 VAC power source to the actuator and drive it to the fully open and closed positions.

Proceed to the *Electrical Connections* section to continue installation.

**Mounting to D-1300 Damper Option**

![Figure 9: Typical Damper Mounting](image)

1. On the side of the damper which contains the internal linkage, locate the blade pin to be extended (normally the preferred driving blade) and mounting holes. The blade pins are located six inches (152 mm) apart.

*Note:* On 24 inch and smaller dampers, the labeled driving blade may be next to the bottom of the duct. If the labeled blade cannot be used, then use the third blade.

2. Cut a 1-1/4 inch (32 mm) hole in the duct at the pin location.

*Note:* If a hole saw is used, be sure that the pilot drill does not damage the blade pin.

![Figure 10: Installing Blade Pin Extension](image)
3. Snap the pre-assembled blade pin extension and clip (D-9999-142) onto the blade pin. The drive pin has a groove that allows the clip to lock in place.

Note: Orient the drive pin extension such that the slot indicates the position of the damper blade with respect to the damper frame.

4. Place the ATP-2040 on the damper as shown in Figure 10 so that the drive pin extension protrudes through the shaft coupler.

5. Place the actuator in the desired mounting position 1/8 inch (3.2 mm) from the surface of the damper as shown in Figure 6.

6. Position the actuator in its desired mounting orientation so that wiring connections are easily accessible.

7. Holding the actuator in place, mark the center of the shoulder washer on the mounting surface. Remove the actuator from the drive pin extension.

8. Drill a hole into the mounting surface through the mark using a drill and a 5/32 inch (4 mm) bit.

9. Install the actuator in the desired mounting position.

10. Insert the #10 thread cutting tapping screw provided and tighten.

11. Insert the short arm of a 3/32 inch Allen wrench into the hex socket screw of the coupler.

12. Rotate the Allen wrench clockwise until the hex socket screw contacts the drive pin extension.

Note: Maintain 1/8 inch clearance between the damper and actuator as illustrated in Figure 10.

13. Continue rotating the Allen wrench until the hex socket screw tightens and no further effortless rotation of the screw can be made. Repeat for the other coupler hex socket screw.

14. After bottoming each screw against the damper shaft, continue turning the Allen wrench until obtaining approximately a 30 degree deflection of the wrench as illustrated in Figure 11. Repeat for the other hex socket screw.

Note: When pressure on the Allen wrench is removed, the wrench will return to its original shape.

15. Lift and hold the manual release lever and then turn the shaft by hand to ensure that the damper can rotate from its full open to full closed positions.

Proceed to the Electrical Connections section to continue installation.

**Electrical Connections**

The ATP-2040 requires a 24 VAC control signal and is compatible with a variety of controllers including the Metasys® VAV Controller.

All wiring must be in accordance with the National Electrical Code and applicable local code requirements.
CAUTION: Disconnect all power supplies to the system before wiring the ATP-2040 to avoid damage to equipment or possible electrical shock.

Figure 11: Single Duct—Pressure Independent with Baseboard Heat
A wiring harness (CBL-2000) is provided with the ATP-2040 package or can be ordered separately.

The DPT-2000 requires a 15 VDC power signal (14 to 30 VDC, unregulated) which can be obtained from the Metasys VAV Controller and provides a nominal 1 to 5 VDC control signal. It is compatible with a variety of controllers including the Metasys AS-VAV Series Controller.

Table 1 shows the harness connections between the ATP-2040 and a Metasys AS-VAV Series Controller.
Table 1: CBL-2000 Wiring Harness Connections

<table>
<thead>
<tr>
<th>Device</th>
<th>Terminal Designation</th>
<th>Wire Color</th>
<th>Signal</th>
<th>VAV Terminal Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDA-2040</td>
<td>CCW</td>
<td>White/Orange</td>
<td>CCW actuator input signal</td>
<td>*BO-1 or BO-2</td>
</tr>
<tr>
<td></td>
<td>COM</td>
<td>White</td>
<td>Common</td>
<td>24 VAC</td>
</tr>
<tr>
<td></td>
<td>CCW</td>
<td>White/Brown</td>
<td>CW actuator input signal</td>
<td>*BO-1 or BO-2</td>
</tr>
<tr>
<td>DPT-2000</td>
<td>VDC</td>
<td>Red</td>
<td>Input power, 14 to 30 VDC</td>
<td>15 VDC</td>
</tr>
<tr>
<td></td>
<td>OUT</td>
<td>Blue</td>
<td>Output Control signal, 1 to 5 VDC</td>
<td>AI-4</td>
</tr>
<tr>
<td></td>
<td>COM</td>
<td>Black</td>
<td>Common</td>
<td>AI-COM</td>
</tr>
</tbody>
</table>

*BO-1 is “Box Open” and BO-2 is “Box Closed.” Determine if CW or CCW action of the actuator opens or closes the VAV box damper and connect the wires accordingly.

To wire an ATP-2040 to a Metasys Controller using the wiring harness, proceed as follows:

1. Connect the wiring harness to the ATP-2040 and the Metasys Controller as shown in Table 1.
2. Apply power to the Metasys controller.

Table 2: Wiring Without Harness

<table>
<thead>
<tr>
<th>EDA Terminal</th>
<th>Signal</th>
<th>VAV Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 CCW</td>
<td>24 VAC</td>
<td>BO-1</td>
</tr>
<tr>
<td>2 COM</td>
<td>Common</td>
<td>24 VAC</td>
</tr>
<tr>
<td>3 CW</td>
<td>24 VAC</td>
<td>BO-2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DPT Terminal</th>
<th>Signal</th>
<th>VAV Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDC</td>
<td>Power (14 to 30 VDC)</td>
<td>15 VDC</td>
</tr>
<tr>
<td>OUT</td>
<td>Signal (1 to 5 VDC)</td>
<td>AI-4</td>
</tr>
<tr>
<td>COM</td>
<td>Common (Power and Signal)</td>
<td>AI-COM</td>
</tr>
</tbody>
</table>

To wire an ATP-2040 without the wiring harness to a Metasys or other controller, proceed as follows:

1. Refer to the controller documentation to determine the CW, CCW, +15 VDC, and COM outputs, and the signal and common inputs.
2. Make the wiring connections on the ATP-2040 according to Table 2.
3. Apply power to the controller and perform the checkout procedure provided in the controller instructions to ensure proper operation of the actuator.

Flow Sensor Connections

1. Locate the pressure sensing probe and tubing (1/4 inch OD) provided with the VAV box.

2. Cut two lengths of tubing long enough to reach from the barbed port on the DPT-2000 to the probe.

3. Connect the tubing to the High (H) and Low (L) ports on the DPT-2000 as shown in Figure 13.

4. Connect the other end of the tubing to the corresponding high and low ports on the VAV box flow pickups.

![Figure 13: Flow Sensor Connections](image)

5. When used with a Metasys AS-VAV Controller, the DPT-2000 must be assigned an input address using the HVAC PRO Configuration Tool. Refer to the HVAC PRO User’s Manual for details.

6. Apply power to the DPT-2000 and allow at least ten minutes for warm up and then perform the checkout procedure.

Checkout Procedures

Field experience has shown that it is usually unnecessary to calibrate the DPT-2000 when used with Metasys controllers because of the VAV Controller “Auto Zero” feature. This feature periodically corrects for drift of the DPT-2000 output, which is a normal occurrence in this and similar pressure transmitters. The VAV “Auto Zero” feature compensates for output drift in a less time consuming, less problematic, and more accurate manner, resulting in lower installation and commissioning costs when compared to individual manual transmitter adjustments. Refer to the Variable Air Volume Controller Technical Bulletin in the Metasys Network Technical Manual (FAN 636) for further details describing the “Auto Zero” feature.
**Inspection**

1. The actuator/transmitter must be mounted on the VAV box.
2. All electrical connections must be completed and power applied.
3. The flow pickups from the VAV box must be connected to the DPT-2000.
4. The actuator/transmitter must be at room temperature. Allow at least ten minutes warm up time after applying power.
5. Perform the checkout procedure described in the controller's instructions to check proper operation of the actuator/transmitter.
6. Verify that the damper fully opens and closes.

**DPT-2000 Calibration**

Because the span of the DPT-2000 output remains very stable, the controller offsets the output signal reading based on the reading at the zero point. If a problem is suspected with the DPT-2000, the offset value (which is determined by the “Auto Zero” feature) can be checked using the HVAC PRO Commissioning Tool.

1. The DPT-2000 should be warmed up for one hour before any action is taken.
2. If the offset value is between +0.3 and -0.3 inch w.c. for a 0 to 1.5 inch w.c. range transmitter or between +0.1 and -0.1 inch w.c. for a 0 to 0.5 inch w.c. range transmitter, manual calibration of the DPT-200 is unnecessary.
3. If the offset value is outside of the appropriate range, perform the following calibration procedures.

The following calibration process should only be followed as a final troubleshooting step when a problem with the DPT-2000 is still suspected after the controller has performed an “Auto Zero” and the offset value has been checked. If adjustment of zero at the transmitter is necessary (to account for possible drift due to reorientation during installation or temperature fluctuation during shipment), perform the following steps:

1. Disconnect the air lines from the high and low ports on the DPT-2000.
2. Place voltmeter leads across terminals OUT and COM (wiring harness colors blue and black).
3. After ten minutes with power applied to the transmitter, if the output is less than 0.5 volts or greater than 1.5 volts, continue to Step 4. If the output is correct, no calibration is required.
4. Slide outward on the concealed calibration door located on the top panel of the DPT-2000 to reveal a recessed potentiometer as shown in Figure 14.

5. Use a 0.1 inch flat blade or small Phillips-head screwdriver to slowly turn the calibration potentiometer until the output voltage reads 1.0 VDC. Turn the screw clockwise to increase or counterclockwise to decrease the output voltage.

Note: Adjust slowly and allow adequate time between turns for the readout to stabilize.

6. Slide the calibration door into place.

7. Connect the air line tubing to the appropriate ports on the DPT-2000.

8. Place the transmitter back into service.

Calibration will change the zero signal of the DPT-2000, so an Auto Zero must occur before a difference in the offset value will be noticed.
Unit Replacement

The EDA-2040, DPT-2000 and ATP-2040 are not field repairable. For a replacement, contact the nearest Johnson Controls branch office or the wholesale distributor.