N20, N34 Series Non-Spring Return Direct Coupled Actuators

APPLICATION

N20 and N34 Series Non-Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements.

Applications include:
- Volume control dampers, mounted directly to the drive shaft or remotely (with the use of accessory hardware).
- Quarter-turn rotary valves, such as ball or butterfly valves mounted directly to the drive shaft.
- Linear stroke globe or cage valves mounted with linkages to provide linear actuation.

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

Location

These actuators are designed to mount directly to a damper external drive shaft. The shaft coupling fastens to the drive shaft. The actuator housing includes a slot which, along with an anti-rotation bracket, secure the actuator to the damper frame or duct work (see Fig. 1).

NOTES:
- When mounted correctly, the slot allows the actuator to float without rotating relative to the damper shaft.
- Using other brackets or linkages, the actuator can be foot-mounted or tandem-mounted.

Preparation

Select Actuator Control Signal

These actuators are available in two control types:
- Floating: includes dial to select the desired input signal (direct, reverse, or service/off).
- Proportioning: includes dial to select the desired input signal. Accepts 0-10 Vdc, 2-10 Vdc, and 4-20 mA signals.

NOTE: See Table 1 for details.

Select the control signal as follows:
- Turn the mode selection dial to the desired control signal (as indicated on the device label).
- For proportioning models, set the DIP switch for voltage (default) or current.
Table 1. Actuator Control Signal Selections.

<table>
<thead>
<tr>
<th>Mode Options</th>
<th>Details</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating DCA (Series 60 control)</td>
<td>Power to terminal 3 drives clockwise. Power to terminal 4 drives counterclockwise.</td>
<td>—</td>
</tr>
<tr>
<td>Direct</td>
<td>Power to terminal 3 drives counterclockwise. Power to terminal 4 drives clockwise.</td>
<td>—</td>
</tr>
<tr>
<td>Reverse</td>
<td>Actuator hub stops in place and ignores control signal changes.</td>
<td>—</td>
</tr>
<tr>
<td>Proportioning DCA (Series 70 control)a</td>
<td>2...10V 2 Vdc signal drives counterclockwise.</td>
<td>Matches the control signal.</td>
</tr>
<tr>
<td></td>
<td>0...10V 0 Vdc signal drives counterclockwise.</td>
<td>2 - 10 Vdc</td>
</tr>
<tr>
<td></td>
<td>10...0V 0 Vdc signal drives clockwise.</td>
<td>0 - 10 Vdc</td>
</tr>
<tr>
<td></td>
<td>10...2V 2 Vdc signal drives clockwise.</td>
<td>10 - 0 Vdc</td>
</tr>
<tr>
<td></td>
<td>4...20 mA 4 mA signal drives counterclockwise.</td>
<td>10 - 2 Vdc</td>
</tr>
<tr>
<td></td>
<td>0...20 mA 0 mA signal drives counterclockwise.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>20...0 mA 0 mA signal drives clockwise.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>20...4 mA 4 mA signal drives clockwise.</td>
<td>—</td>
</tr>
</tbody>
</table>

*a The proportioning signal depends on the DIP switch setting. Set either for voltage (default) or current.

Non-Standard Stroke

Mechanical Stroke Limit Reduction (175 lb-in. only)

For applications requiring a span less than 95 degrees, a simple adjustment can be made. The stroke is adjustable using the range stops. The actuator drives until the shaft coupling reaches the adjustable mechanical stop. The stop causes the motor to discontinue driving and the shaft coupling drives no farther.

To set these stops, proceed as follows:
1. Depress and hold down the declutch button.
2. Rotate the coupling to a mid-stroke position.
3. Release the declutch.
4. Loosen one of the range stop screws.
5. Move the stop to the desired end of the stroke.
6. Tighten the range stop screw taking care to get the screw washer plate flush with the stop.
7. If both range stops are needed, repeat steps 1 through 6 for the other range stop.

Mounting

⚠️ CAUTION
Actuator Damage Hazard.
Using actuator as shaft bearing causes device damage.
Use actuator only to supply rotational torque. Avoid any side loads to actuator output coupling bearings.

⚠️ CAUTION
Equipment Damage Hazard.
Can damage the motor beyond repair.
Never turn the motor shaft by hand or with a wrench. Forcibly turning the motor shaft can damage the gear train.

To mount the actuator to a drive shaft, proceed as follows:
1. Place actuator over the shaft; and hold mounting bracket in place. See Fig. 1.
2. Mark screw holes on the mounting surface.
3. Remove actuator and mounting bracket.
4. Drill or center-punch holes for mounting screws (or use no. 10 self-tapping sheet metal screws).
5. Turn the shaft to desired normal (closed) position.
6. Place actuator and mounting bracket back into position and secure bracket to the mounting surface with sheet metal screws.

NOTE: It can be necessary (or desirable) to bend or trim the mounting bracket.

7. Using 10 mm wrench, tighten shaft adapter securely onto damper shaft using minimum 120 lb-in. (13.6 N•m), maximum 180 lb-in. (20.3 N•m) torque.

NOTE: See Fig. 2 for proper mounting to a square damper shaft.
Fig. 2. Proper mounting to square damper shaft.
WIRING

⚠️ CAUTION
Electrical Shock or Equipment Damage Hazard. Disconnect all power supplies before installation. Motors with auxiliary switches can have more than one disconnect.

IMPORTANT
All wiring must comply with local electrical codes, ordinances and regulations.

Access Cover Removal

⚠️ CAUTION
Equipment Damage Hazard. Improper cover removal can damage electric connections.
The cover contains terminal blocks that must connect to actuator contact pins. Bending these pins can permanently damage the device.

NOTE: This cover can be removed before or after actuator mounting.

In order to wire the device, the access cover must be removed as follows:
1. Remove the screw from the center of the cover, set the screw aside.

   NOTE: The cover hinges on slots at the actuator back.

2. Pull the cover away from the actuator face and out from the hinge slots.
3. Remove conduit dust covers as necessary.
4. Thread wire through conduit holes.
5. Connect wires as appropriate to the terminal block(s). (See Fig. 3.)

   NOTE: With US Models, use 1/2 in. NPS strain relief gland or 1/2 in. conduit adapters. Recommend using flex conduit. With European Models, use M16 strain relief gland.

Typical Wiring
See Fig. 3 through 9 for typical wiring details.

### Table 2. Wiring details.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Floating</th>
<th>Proportioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>~1</td>
<td>power</td>
<td>power</td>
</tr>
<tr>
<td>↓2</td>
<td>common</td>
<td>common</td>
</tr>
<tr>
<td>⇔3</td>
<td>cw</td>
<td>input</td>
</tr>
<tr>
<td>⇔4</td>
<td>ccw</td>
<td>—</td>
</tr>
<tr>
<td>←5</td>
<td>feedback</td>
<td>feedback</td>
</tr>
</tbody>
</table>

#### Nxx24 Models

![Fig. 3. Terminal block details.](M19571A)

![Fig. 4. Wiring for floating control.](M22622)

![Fig. 5. Wiring for SPDT on/off control.](M22621)
Fig. 6. Wiring for SPST on/off control.

Nxx010 Models

Fig. 7. Wiring for 0/2-10 Vdc proportioning controllers.

Fig. 8. Wiring for 4-20 mA proportioning controllers.

Fig. 9. Wiring for 0/2-10 Vdc proportioning controller operating multiple actuators.
OPERATION

The actuator is designed to be used in ventilating and air conditioning installations to operate valves, dampers, ventilation flaps and louvers requiring torque up to the rating.

The actuator is operated by a floating or proportional controller (depending on the model). When using a proportional controller, the actuator drives toward its fully open position when the input signal increases; the actuator drives toward the fully closed position when the input signal decreases. The actuator stops when the input signal reaches the desired proportional control point.

IMPORTANT

The actuator is designed to respond to DDC Controller instantaneous contact closures. Take care not to short cycle the actuator. Unstable damper control can cause premature actuator failure.

Actuator Override

To override the control signal (for freeze protection or similar applications):

1. Override to 50 percent open:
   a. Disconnect the input signal (from terminal 3).
   b. Apply 24 Vac to terminal 3.
   c. See Fig. 10.

2. Override to full closed:
   a. Disconnect the input signal (from terminal 3).
   b. See Fig. 11.

End Switches

Some models include end switches. For wiring details, see Fig. 3.

SPDT Switches (Fig. 12)

For SPDT end switch wiring, see Fig. 3.
CHECKOUT

Proportioning Operation
1. Mount actuator for required application (with proper rotation to open the damper).
2. Connect power to terminals 1 and 2. (See Fig. 3 and Table 2.)
3. Set the mode selection dial to desired control signal. (See Table 1.)
4. Apply control signal for actuator 100% position. (See Fig. 3 and Table 2.)
   a. 0-2-10 Vdc: apply 10 Vdc signal to terminal 3.
   b. 10-(0)2 Vdc: apply (0)2 Vdc signal to terminal 3.
   c. 4-20 mA: apply 20 mA signal to terminal 3.
5. Actuator drives to 100% position.
6. Apply control signal for actuator 0% position. (See Fig. 3 and Table 2.)
   a. (0)2-10 Vdc: apply (0)2 Vdc signal to terminal 3.
   b. 10-(0)2 Vdc: apply 10 Vdc signal to terminal 3.
   c. 4-20 mA: apply 4 mA signal to terminal 3.
7. Actuator drives to 0% position.

Feedback Operation
1. Connect a multi-meter, set for Vdc, to terminals 2 and 5.
2. Apply the same signal as in step 4 of Proportioning Operation.
3. The multi-meter reading increases to match the input signal as actuator drives towards 100% position.
4. Apply the same signal as in step 6 of Proportioning Operation.
5. The multi-meter reading decreases to match the input signal as actuator drives towards 0% position.

Floating Operation
1. Mount actuator for required application (with proper rotation to open the damper).
2. Connect power to terminals 1 and 2. (See Fig. 3 and Table 2.)
3. Apply 24 Vac for actuator 100% position: Across common (2) terminal and appropriate CW (3) or CCW (4) terminal.
4. Actuator drives to 100% position.
5. Apply 24 Vac for actuator 0% position: Across common (2) terminal and appropriate CW (3) or CCW (4) terminal.
6. Actuator drives to 0% position.