# Pressure Independent Control Series

## Rack & Pinion Actuators

### Description
The Pressure Independent Control Series Rack & Pinion Actuator couples an OpenAir® GPC Actuator to a 1-1/2- or 2-inch Pressure Independent Control Series two-way valve using a linkage. The linkage transforms the actuator rotary movement into the linear motion required to position the valve.

### Features
- Bi-directional fail-safe spring return
- Orderable as direct (Normally Open) or reverse (Normally Closed) acting
- Brushless DC motor technology with stall protection
- Pre-cabled
- Plenum-rated
- 60-second run time
- Integrated 1/2-inch NPT conduit connection
- Modulating control signal selectable 0 to 10V or 2 to 10V
- Modulating actuator has 0(2) to 10 Vdc feedback

### Application
The Pressure Independent Control Series valves are used to control water and glycol solutions to 50 percent in small to large air handling units and central plant applications.

### Warning/Caution Notations
- **WARNING:** ![Warning Icon] Personal injury or loss of life may occur if you do not perform a procedure as specified.
- **CAUTION:** ![Warning Icon] Equipment damage may occur if you do not perform a procedure as specified.
Product Numbers  

Table 1 provides a complete description of the product numbers.

Table 1. Pressure Independent Control Series Rack & Pinion Actuator Product Numbers.

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>336NO-xxxx-xx</td>
<td>Assembly consisting of: OpenAir® Electronic Actuator, linkage, and 1-1/2- or 2-inch Pressure Independent Control Series two-way valve body. Product Number 336NO/NC-xxxx-xx includes: OpenAir GPC131.1P Electronic Actuator for 3-position floating control with a 24 Vac or 24 Vdc supply voltage. Product Number 337NO/NC-xxxx-xx includes: OpenAir GPC161.1P Electronic Actuator for 0 to 10 Vdc modulating control with a 24 Vac or 24 Vdc supply voltage. The xxxx of the product number specifies a particular Pressure Independent Control Series valve body. For details and complete product numbers, see Pressure Independent Control Series 2-Way Valves and Electronic Valve Actuators Submittal Sheet, 154-087 for details and product numbers.)</td>
</tr>
<tr>
<td>599-03616NO</td>
<td>Assembly consisting of: OpenAir GPC131.1P Electronic Actuator and linkage. The assembly is ready for field installation on a 1-1/2- or 2-inch Pressure Independent Control Series valve. For details on the actuator, see OpenAir™ GPC Series Spring Return, 35 lb-in (4 Nm), Rotary Electronic Damper Actuators Technical Instructions (155-782).</td>
</tr>
<tr>
<td>599-03617NO</td>
<td>Assembly consisting of: OpenAir GPC161.1P Electronic Actuator and linkage. The assembly is ready for field installation on a 1-1/2- or 2-inch Pressure Independent Control Series valve. For details on the actuator, see OpenAir™ GPC Series Spring Return, 35 lb-in (4 Nm), Rotary Electronic Damper Actuators Technical Instructions (155-782).</td>
</tr>
<tr>
<td>599-03615</td>
<td>Linkage only. For replacement or mounting of an alternate OpenAir GPC electronic actuator on the linkage and installation of that linkage/actuator assembly on a 1-1/2-inch or 2-inch Pressure Independent Control Valve Series valve.</td>
</tr>
</tbody>
</table>
## Specifications

### Power supply
- **Operating voltage**: 24 Vac ±20%, 24 Vdc ±20%
- **Frequency**: 50/60 Hz
- **Power consumption**:
  - 599-03616 assembly (with GPC131.1P actuator): 3.5 VA running, 2.8 VA holding
  - 599-03617 assembly (with GPC161.1P actuator): 3.5 VA running, 2.8 VA holding

### Control signal
- **Input signal**: Voltage input
  - 0 (2) to 10 Vdc (max. 35 Vdc)
- **Input resistance**: 100K ohms
- **Position output feedback signal**: 0 (2) to 10 Vdc, ±1 mA maximum

### Run Time for 90°
- Operating with motor: 60 seconds
- On power loss with spring return: 15 seconds, typical

### Ambient conditions
- **Ambient temperature**:
  - Operation: -25 to 130°F (-32 to 55°C)
  - Storage and transport: -40 to 158°F (-40 to 70°C)
- **Ambient humidity (non-condensing)**: 95% rh

### Mounting
- **Nominal angle of rotation**: 90°
- **Maximum angular rotation**: 95°
- **Enclosure**: NEMA 1 (see Figure 1.)

### Linkage
- **Frame**: Aluminum alloy frame
- **Construction**: Steel rack, pinion and stem shaft pre-lubricated, bronze bushings

### Agency certification
- **GPC Actuator**: UL-listed per UL 60730, cUL to CSA 60730
- **NOTE**: These actuators were approved for installation in plenum areas by Underwriters Laboratories, Inc. (UL) per UL 2043.

### Physical characteristics
- **Actuator enclosure**: IP54
- **Pre-connected cable**: 18 AWG, 3 ft (0.9 m)
- **Dimensions**: See Figure 2.
- **Weight**: 1.32 lb (0.60 kg)

For valve specifications, see the following document:

*Pressure Independent Control Series Two-Way, Brass Valve Bodies, 1/2-inch to 2-inch, ANSI 250 Technical Instructions (155-774).*

For OpenAir® Electronic Damper Actuator specifications, see the following document:

*OpenAir® GPC Series Spring Return, 35 lb-in (4 Nm), Rotary Electronic Damper Actuators Technical Instructions (155-782).*
Operation

599-03617 assembly with GPC161.1P actuator
A continuous 0 to 10 Vdc signal from a controller to Terminal Y (8, gray) operates the actuator, and the valve opens and closes. The linkage proportionally translates the rotary actuator stroke into a linear valve stem motion.

A 0 to 10 Vdc position output feedback signal at Terminal U (9, pink) is available to monitor the position of the actuator.

In the event of a power failure or when the operating voltage is absent, the actuator returns to the fail-safe (90°) position and the valve opens or closes depending on the configuration ordered.

In the event of a stall, the actuator is overload protected over the full range to prevent damage.

599-03616 assembly with GPC131.1P actuator
When power is applied to control signal Y1 or Y2, the actuator operates as described in the table below. The linkage translates the rotary actuator stroke into a linear valve stem motion.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Valve Motion When Signal Y1 is Energized</th>
<th>Valve Motion When Signal Y2 is Energized</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>Closes</td>
<td>Opens</td>
</tr>
<tr>
<td>NC</td>
<td>Opens</td>
<td>Closes</td>
</tr>
</tbody>
</table>

In the event of a power failure or when operating voltage is absent, the actuator returns to the fail-safe (90°) position and the valve opens or closes depending on the configuration ordered.

In the event of a stall, the actuator is overload protected over the full range to prevent damage.

Life expectancy
An improperly-tuned loop will cause excessive repositioning that will shorten the life of the actuator.

Installation and Mounting
Pressure Independent Control Series Rack & Pinion Actuators are suitable for water applications where the actuator mounts on the linkage perpendicularly.

Pressure Independent Control Series Rack & Pinion Actuators can be installed on normally-open Pressure Independent Control Series valves for direct or reverse-acting control applications. The actuator orientation and the position of the actuator shaft adapter on the linkage determine whether the linkage shaft rotates clockwise or counterclockwise for the proper control action. Pressure Independent Control Series Rack & Pinion Actuators Installation Instructions (A6V11611545), shipped with the assembly, provides details to configure the assembly for the desired control application.

Install the Pressure Independent Control Series Rack & Pinion Actuator so that the flow of the medium follows the direction of the arrow cast on the valve body. Figure 1 shows acceptable NEMA 1 mounting positions. Do not mount the assembly so that the actuator is below horizontal or upside-down.

Allow sufficient space for servicing the assembly. See Dimensions and the recommended service envelope in Figure 2.
Installation and Mounting, Continued

Figure 1. Acceptable Mounting Positions.

Wiring

All wiring must conform to NEC, and local codes and regulations.

Use earth ground isolating step-down Class 2 transformers. Do not use autotransformers.

Determine the supply transformer rating by summing the total VA of all actuators used. The maximum rating for a Class 2 step-down transformer is 100 VA.

Table 3 shows the recommended maximum actuators per Class 2 circuit and includes a safety factor of 80% of the transformer VA. Operating additional actuators requires additional transformers or separate 100 VA power trunks.

Table 3. Recommended Maximum Power Consumption (VA) for a Class 2 Step-Down Transformer.

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Power Consumption</th>
<th>Actuator per Class 2 Supply Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPC131.1P</td>
<td>4.3 VA</td>
<td>23</td>
</tr>
<tr>
<td>GPC161.1P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wiring Diagrams

599-03617 assembly with GPC161.1P actuator

Table 4. 599-03617 Assembly (with GPC161.1P) for Modulating Control with 24 Vac or 24 Vdc Supply Voltage.

<table>
<thead>
<tr>
<th>Standard Symbol</th>
<th>Function</th>
<th>Terminal Connection</th>
<th>Standard Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply (SP)</td>
<td>G</td>
<td>Red</td>
</tr>
<tr>
<td>2</td>
<td>Neutral (SN)</td>
<td>G0</td>
<td>Black</td>
</tr>
<tr>
<td>8</td>
<td>0 to 10 Vdc input signal</td>
<td>Y</td>
<td>Gray</td>
</tr>
<tr>
<td>9</td>
<td>Output for 0 to 10 Vdc position feedback indication</td>
<td>U</td>
<td>Pink</td>
</tr>
</tbody>
</table>

599-03616 assembly with GPC131.1P actuator

Table 5. 599-03616 Assembly (with GPC131.1P) for 24 Vac or 24 Vdc Three-position Floating Control.

<table>
<thead>
<tr>
<th>Standard Symbol</th>
<th>Function</th>
<th>Terminal Connection</th>
<th>Standard Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply (SP)</td>
<td>G</td>
<td>Red</td>
</tr>
<tr>
<td>2</td>
<td>Neutral (SN)</td>
<td>G0</td>
<td>Black</td>
</tr>
<tr>
<td>6</td>
<td>Control signal clockwise</td>
<td>Y1</td>
<td>Violet</td>
</tr>
<tr>
<td>7</td>
<td>Control signal counterclockwise</td>
<td>Y2</td>
<td>Orange</td>
</tr>
</tbody>
</table>

Start Up/Commissioning

- Check that the wires are connected correctly.
- OpenAir® GPC Series Spring Return, 35 lb-in (4 Nm), Rotary Electronic Damper Actuators Technical Instructions (155-782).

Service

**WARNING:**

Do not open the actuator.

If the linkage or actuator is inoperative, replace the unit.
Dimensions

Figure 2. Dimensions of the Pressure Independent Control Series Rack & Pinion Actuator in Inches (Millimeters).

NOTES: For valve dimensions, see the following documents:
Pressure Independent Control Series Two-Way, Brass Valve Bodies, 1/2-inch to 2-inch, ANSI 250 Technical Instructions (155-774)