Fisher™ 3610J and 3620J Positioners and 3622 Electro-Pneumatic Converter

Fisher 3610J, 3610JP, 3620J, 3620JP, 3621JP, and 3622 instruments are part of the 3600 series of positioners. 3610J or 3610JP pneumatic and 3620J or 3620JP electro-pneumatic positioners are used in combination with either single or double-acting rotary actuators to accurately position control valves used in throttling applications. The positioner mounts integrally to the actuator housing. These rugged positioners provide a valve position proportional to a pneumatic or a DC current input signal.

The 3610J or 3610JP pneumatic positioner in combination with the Fisher 3622 electro-pneumatic converter becomes the 3620J or 3620JP positioner, respectively. This integral electro-pneumatic converter, can be factory installed or installed in the field on existing positioners. The electro-pneumatic converter receives the DC current input signal and provides a proportional pneumatic output signal through a nozzle/flapper arrangement.

The output signal from the converter becomes the input signal pressure to the pneumatic positioner, eliminating the need for a remote mounted transducer.

The positioner mounts on the actuator as shown below. Figure 1 shows the cam feedback mechanism for a positioner mounted on the actuator. Positioner bleed air continually purges the enclosure containing the feedback lever and the feedback linkages.

To support diagnostic testing of valve/actuator/positioner packages, connectors, piping, and other hardware can be installed between the 3610J or 3620J positioner and the actuator.
Specifications

Available Configurations
Refer to the type number description on page 6

Input Signal
3610J or 3610JP:
Standard: ■ 0.2 to 1.0 bar (3 to 15 psig), ■ 0.4 to 2.0 bar (6 to 30 psig), or ■ split range, see table 1.
Adjustable: Zero is adjustable from 0.07 to 1.5 bar (1 to 22 psig) for standard valve rotations. Span is adjustable from 0.2 to 2.0 bar (3.2 to 28.8 psi) for standard valve rotations. Location of adjustments are shown in figure 2.

3620J and 3620JP:
4-20 mA DC constant current with 30 VDC maximum compliance voltage. Minimum terminal voltage is 2.4 VDC at 20 mA. Split range is also available, see table 1.

Output Signal
Pneumatic pressure as required by the actuator up to full supply pressure
Action(1): Field-reversible between ■ direct and ■ reverse within the pneumatic positioner

Equivalent Circuit
3620J and 3620JP: 120 ohms shunted by three 5.6 V zener diodes

Typical Performance
Independent Linearity:
Direct-Acting 3610J and 3620J: ±1.5% of output span
Reverse-Acting 3610J and 3620J: ±0.75% of output span
Direct-Acting 3610JP and 3620JP: ±1.25% of output span
Reverse-Acting 3610JP and 3620JP: ±0.5% of output span

Hysteresis:
3610J: 1.0% of output span
3620J: 0.75% of output span
3610JP: 0.5% of output span
3620JP: 0.6% of output span

Deadband: 0.1% of input span

Electromagnetic Compliance for 3622 electro-pneumatic converter:
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 2 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Note: The Electromagnetic Compliance specifications also apply to 3620J positioners

Maximum Supply Air Demand(2)
3610J and 3620J:
1.4 bar (20 psig) Supply: 13 normal m³/hour (490 scfh)
2.4 bar (35 psig) Supply: 17 normal m³/hour (640 scfh)

3610JP and 3620JP:
5.2 bar (75 psig) Supply: 37 normal m³/hour (1380 scfh)
6.9 bar (100 psig) Supply: 46 normal m³/hour (1700 scfh)

Operating Influences
Supply Pressure Sensitivity: A 10% change in supply pressure changes the valve shaft position less than the following percentages of valve rotation:
3610J and 3620J: 1.0% at 1.4 bar (20 psig) supply pressure
3610JP and 3620JP: 1.5% at 4.1 bar (60 psig) supply pressure

Supply Pressure(3)
Minimum Recommended: 0.3 bar (5 psig) above actuator requirement [1.4 bar (20 psig) for a 0.2 to 1.0 bar (3 to 15 psig) nominal actuator signal; 2.4 bar (35 psig) for a 0.4 to 2.0 bar (6 to 30 psig) nominal actuator signal].
Maximum: 10.3 bar (150 psig) or maximum pressure rating of the actuator, whichever is lower.

Supply Medium: Air or Natural Gas
3620J and 3620JP are not approved for use with natural gas as the supply medium
Specifications (continued)

### Steady-State Air Consumption\(^{(2)}\)
- **3610J**: 0.40 normal m\(^3\)/hour (15 scfh) at 1.4 bar (20 psig) supply pressure
- **3610JP**: 0.64 normal m\(^3\)/hour (24 scfh) at 6.9 bar (100 psig) supply pressure
- **3620J**: 0.49 normal m\(^3\)/hour (18 scfh) at 1.4 bar (20 psig) supply pressure
- **3620JP**: 0.93 normal m\(^3\)/hour (35 scfh) at 6.9 bar (100 psig) supply pressure

### Operative Temperature Limits\(^{(3)}\)
- -40 to 82°C (-40 to 180°F)

### Electrical Classification for 3622
- **Hazardous Area**:
  - CSA—Intrinsically Safe, Explosion proof, Type n
  - Dust-Ignition proof, Division 2
  - FM—Intrinsically Safe, Explosion proof, Type n,
  - Non-incendive, Dust-Ignition proof,
  - ATEX—Intrinsically Safe, Type n, Flameproof
  - IECEx—Intrinsically Safe, Type n, Flameproof
- **Gas Atmospheres Only**
- **Note**: These classifications also apply to 3620J positioners

### Housing Classification for 3622
- **CSA**—Type 3 Encl.
- **FM**—NEMA 3, IP54
- **ATEX**—IP64
- **IECEX**—IP54
- Mount instrument with vent on side or bottom if weatherproofing is a concern.
- **Note**: These classifications also apply to 3620J positioners

### Other Classifications/Certifications for 3622
- **CUTR**—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)
- **INMETRO**—National Institute of Metrology, Quality and Technology (Brazil)

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KGS—Korea Gas Safety Corporation (South Korea)

Contact your Emerson sales office for classification/certification specific information

**Note**: These classifications also apply to 3620J positioners

### Hazardous Area Classification for 3610J Positioners
- **Complies with the requirements of ATEX Group II Category 2 Gas and Dust**
  - **Ex h IIC Tx Gb**
  - **Ex h IIC Tx Db**
- Maximum surface temperature (Tx) depends on operating conditions
- **Gas**: T6
- **Dust**: T82

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

- **Note**: These ratings do not apply to 3620J positioners

### Construction Materials
- **All Positioners**:
  - **Case**: Low copper aluminum alloy
  - **Cover**: Polyester plastic
  - **Feedback Lever**: Stainless steel
  - **Range Spring**: Zinc-plated steel
  - **Input Module and Relay Diaphragms**: Nitrile and polyester
  - **Relay Valve Plugs and Seats**: Stainless steel
  - **Tubing**: Copper (standard)
  - **Fittings**: Brass (standard)
  - **Gauges**: Chrome-plated brass connection with plastic case
- **3620J and 3620JP**:
  - **Housing and Cap**: Low copper aluminum alloy

### Pressure Connections
- 1/4 NPT internal
Specifications (continued)

**Rotary Valve Rotation**
- 60, 75, or 90 degrees

**Characterized Cams**
- See Characterized Cams section

**Electrical Connection for 3620J and 3620JP**
- 1/2-14 NPT Conduit Connection

**Options**
- **3610J and 3610JP:**
  - Supply pressure gauge, ■ tire valves, or ■ plugs,
  - Integral mounted bypass valve on 3610J only
- **3620J and 3620JP:**
  - Supply pressure gauge, ■ tire valves, or ■ plugs

**Approximate Weight**
- 3610J positioners: 2.5 kg (5.6 pounds)
- 3620J positioners: 3.6 kg (8.0 pounds)

**Table 1. Split-Range Capabilities**

<table>
<thead>
<tr>
<th>Split</th>
<th>0.2 to 1.0 Bar (3 to 15 Psig) Input Signal</th>
<th>0.4 to 2.0 Bar (6 to 30 Psig) Input Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bar</td>
<td>Psig</td>
</tr>
<tr>
<td>Two-way</td>
<td>0.2 to 0.6</td>
<td>3 to 9</td>
</tr>
<tr>
<td></td>
<td>0.6 to 1.0</td>
<td>9 to 15</td>
</tr>
<tr>
<td>Three-way</td>
<td>0.2 to 0.5</td>
<td>3 to 7</td>
</tr>
<tr>
<td></td>
<td>0.5 to 0.7</td>
<td>7 to 11</td>
</tr>
<tr>
<td></td>
<td>0.7 to 1.0</td>
<td>11 to 15</td>
</tr>
</tbody>
</table>

**Table 2. Fisher 3622 Electro-Pneumatic Converter**

**EMC Summary Results—Immunity**

<table>
<thead>
<tr>
<th>Port</th>
<th>Phenomenon</th>
<th>Basic Standard</th>
<th>Test Level</th>
<th>Performance Criteria(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure</td>
<td>Electrostatic Discharge (ESD)</td>
<td>IEC 61000-4-2</td>
<td>4 kV contact; 8 kV air</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Radiated EM field</td>
<td>IEC 61000-4-3</td>
<td>80 to 1000 MHz @ 1V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Rated power frequency</td>
<td>IEC 61000-4-8</td>
<td>60 A/m at 50 Hz</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>magnetic field</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O signal/control</td>
<td>Burst (fast transients)</td>
<td>IEC 61000-4-4</td>
<td>1 kV</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Surge</td>
<td>IEC 61000-4-5</td>
<td>1 kV (line to ground only, each)</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>Conducted RF</td>
<td>IEC 61000-4-6</td>
<td>150 kHz to 80 MHz at 3 Vrms</td>
<td>A</td>
</tr>
</tbody>
</table>

Specification limit = ±1% of span

1. The information contained in the table also applies to 3620J, 3620JP, and 3621JP electro-pneumatic positioners.
2. A=No degradation during testing, B = Temporary degradation during testing, but is self-recovering.

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.

1. For direct action, an increasing input signal extends the actuator rod. For reverse action, an increasing input signal retracts the actuator rod.
2. Normal m³/hr—normal cubic meters per hour (0 °C and 1.01325 bar absolute). Scfh—standard cubic feet per hour (60 °F and 14.7 psia).
3. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
3610J and 3620J Positioners

Features

- **Accurate, Efficient, Vibration-Resistant Operation**—The positioner provides accurate, fast-response and can withstand the vibrations of most plant environments. Low steady-state air consumption contributes to efficient operation.

- **Modular Design**—The pneumatic 3610J positioner easily converts to an electro-pneumatic 3620J positioner by replacing the existing gauge block with the 3622 electro-pneumatic converter assembly. The converter assembly attaches to the existing positioner, providing a simple, compact, and cost-effective conversion.

- **Versatility**—3610J and 3610JP positioners accept a pneumatic input signal and 3620J and 3620JP positioners accept a DC current input signal from a control device. The pneumatic and electro-pneumatic positioners provide split range capabilities and adjustable zero and span. The rangeability of the positioner zero and span permits using a single range spring for all standard input signals including split ranges.

- **Fewer Spare Parts**—Most of the parts for 3610J and 3610JP or 3620J and 3620JP positioners are interchangeable, requiring fewer spare parts to support these positioners.

- **Easy Positioner Adjustments**—With the cover removed, zero, span, and cross-over adjustments, shown in figure 2, are easily accessible and can be made with a screwdriver.

- **Application Flexibility**—Easily adjustable minor loop gain fine tunes the positioner to optimize dynamic response for each specific actuator size and application.

- **Stable Operation**—Changes in supply pressure have minimal effect on positioner operation.

- **Corrosion Resistant**—Case, components, and gasket materials withstand harsh environments. Positioner bleed air purges internal parts and actuator housing for additional protection.

- **Field Reversible**—Simple adjustments permit switching between direct and reverse action; no additional parts are required.
**Type Number Description**

The Fisher 3600 series of positioners include the models listed below.

The following descriptions provide specific information on the different positioner constructions.

3610J: A single-acting pneumatic rotary valve positioner for use with Fisher 1051 and 1052 actuators.


3620J: A single-acting electro-pneumatic rotary valve positioner for use with 1051 and 1052 actuators.

3620JP: A double-acting electro-pneumatic rotary valve positioner for use with 1061 and 1069 actuators.

3622: An electro-pneumatic converter that converts a 4-20 mA DC input signal to a 3 to 15 psig (0.2 to 1.0 bar) input signal for the pneumatic positioner. Combining this unit with a 3610J or 3610JP positioner produces a 3620J or 3620JP positioner, respectively.
Principle of Operation

3610J positioners accept a pneumatic input signal and 3620J positioners accept a DC current input signal from a control device.

These positioners are force-balanced instruments that provide a valve shaft position proportional to the input signal. The following describes the principle of operation for 3610JP and 3620JP positioners. The principle of operation for 3610J and 3620J positioners is similar except relay A is not used. Refer to figures 3 and 4 while reading the following descriptions.

For direct action, input signal pressure from a control device is channeled to cavity A in the input module. An increase in input signal pressure results in a downward force on the summing beam, pivoting the summing beam counterclockwise. This moves the flapper slightly toward the nozzle, increasing the nozzle pressure. As nozzle pressure increases, the relay beam pivots clockwise, causing relay B to increase upper cylinder pressure and relay A to exhaust lower cylinder pressure of the actuator.
As a result, the actuator rod extends and the actuator rotary shaft rotates clockwise. This causes the feedback lever to pivot clockwise and the force applied to the summing beam by the range spring increases. This force, which opposes the downward force on the summing beam caused by the increasing input signal pressure, continues to increase until the summing beam torques are in equilibrium. At this point, the valve shaft is in the correct position for the specific input signal applied.

For reverse action, input signal pressure is channeled to both cavities A and B. An increase in signal pressure results in an upward force on the summing beam, pivoting the summing beam clockwise and causing relay B to exhaust upper actuator cylinder pressure to atmosphere and relay A to increase lower actuator cylinder pressure. As a result, the actuator rod retracts and the actuator rotary shaft rotates counterclockwise. This causes the feedback arm to pivot counterclockwise reducing the force applied to the summing beam by the range spring.

As the valve shaft rotates counterclockwise, the range spring force to the summing beam continues to reduce until the summing beam torques are in equilibrium. At this point, the valve shaft is in the correct position for the specific input signal applied.

3620J or 3620JP positioners (figure 4) are a combination of a 3610J or a 3610JP positioner with a 3622 electro-pneumatic converter. The electro-pneumatic converter provides a 0.2 to 1.0 bar (3 to 15 psig) output pressure proportional to the 4-20 mA DC input signal. The 0.2 to 1.0 bar (3 to 15 psig) output pressure becomes the input signal pressure to the 3610J or 3610JP pneumatic positioner.

**Installation**

The supply pressure medium must be a clean, dry, and oil-free air, or noncorrosive gas (3610J positioners only). If the supply pressure source is capable of exceeding the maximum actuator operating pressure or positioner supply pressure, appropriate steps must be taken during installation to protect the positioner and all connected equipment against overpressure.

Typical positioner mounting on an actuator is shown on the front page. Overall dimensions are shown in figure 5.

**Note**

3620J and 3620JP positioners are not approved for use with natural gas as the supply medium.
Figure 5. Typical Mounting Dimensions and Connections

**TYPICAL FISHER 3610J POSITIONER WITHOUT BYPASS VALVE**

**FISHER 3610J POSITIONER WITH BYPASS ASSEMBLY**

**FISHER 3620J OR 3620JP POSITIONER**

Note:
1/ Instrument, Output, and Supply connections are 1/4 NPT.
Characterized Cams

3610J and 3620J positioners are available with any one of three cams, a linear cam (cam A) or two characterized cams (cams B and C). Figure 6 shows the resultant valve rotation due to an incremental instrument pressure change for the three cams.

Figures 7 and 8 show how the flow characteristics change when using the cams with a valve that has equal percentage characteristics.

Ordering Information

When ordering, specify the product application and construction:

**Application**
1. Positioner type number
2. Maximum supply pressure available
3. Actuator size and type number
4. Cam characteristic
5. Input signal

**Construction**

Refer to the specifications. Carefully review each specification; indicate your choice whenever a selection is to be made.
3610J and 3620J Positioners

November 2019

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