3610J and 3620J Positioners

The Type 3610J or 3610JP pneumatic and Type 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 Type 3610J or 3610JP pneumatic positioner in combination with the Type 3622 electro-pneumatic converter becomes the Type 3620J or 3620JP positioner, respectively. This integral electro-pneumatic converter, shown in figure 1, 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 in figures 1 and 2. Figure 3 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 Type 3610J or 3620J series positioner and the actuator.

Note

Neither Emerson®, Emerson Process Management™, Fisher®, nor any of their affiliated entities assumes responsibility for the selection, use, and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

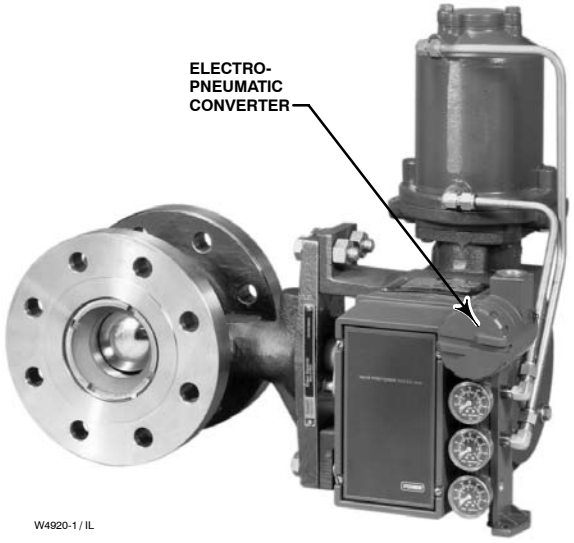

Figure 1. Type 3620JP Electro-Pneumatic Positioner with Type 1061 Actuator and Design V500 Valve

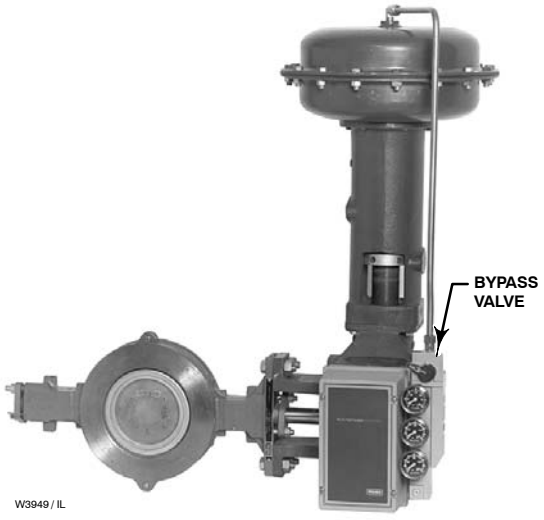

Figure 2. Type 3610J Pneumatic Positioner with Type 1052 Actuator and ēdisc® Valve

Specifications

Available Configurations

Refer to the following type number description on page 5.

Input Signal[1]

Type 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 4.

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

Output Signal[1]

Pneumatic pressure as required by the actuator up to full supply pressure
Action[2]: Field-reversible between ■ direct and ■ reverse within the pneumatic positioner

Equivalent Circuit

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

Typical Performance

Independent Linearity[1]:
Direct-Acting Type 3610J and 3620J: ±1.5% of output span
Reverse-Acting Type 3610J and 3620J: ±0.75% of output span
Direct-Acting Type 3610JP and 3620JP: ±1.25% of output span
Reverse-Acting Type 3610JP and 3620JP: ±0.5% of output span
Hysteresis[1]:
Type 3610J: 1.0% of output span
Type 3620J: 0.75% of output span
Type 3610JP: 0.5% of output span
Type 3620JP: 0.6% of output span
Deadband[1]: 0.1% of input span
Electromagnetic Interference (EMI)[1]:
Type 3620J, 3620JP and 3622: Tested per IEC 61326-1 (Edition 1.1). Meets emission limits for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1 in the IEC specification document). Immunity performance is shown in table 2.

Maximum Supply Air Demand[3]

Type 3610J and 3620J:
1.4 bar (20 psig) Supply: 13 normal m^3/hour (490 scfh)
2.4 bar (35 psig) Supply: 17 normal m^3/hour (640 scfh)
Type 3610JP and 3620JP:
5.2 bar (75 psig) Supply: 37 normal m^3/hour (1380 scfh)
6.9 bar (100 psig) Supply: 46 normal m^3/hour (1700 scfh)

Operating Influences[1]

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

Supply Pressure[1,4]

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[5]

Type 3620J, 3620JP, and 3622 are not approved for use with natural gas as the supply medium.

Steady-State Air Consumption[3]

Type 3610J: 0.40 normal m^3/hour (15 scfh) at 1.4 bar (20 psig) supply pressure
Type 3610JP: 0.64 normal m^3/hour (24 scfh) at 6.9 bar (100 psig) supply pressure
Type 3620J: 0.49 normal m^3/hour (18 scfh) at 1.4 bar (20 psig) supply pressure
Type 3620JP: 0.93 normal m^3/hour (35 scfh) at 6.9 bar (100 psig) supply pressure

Operative Temperature Limits[1,4]

−40 to 82°C (−40 to 180°F)

-continued-

Specifications (continued)

Hazardous Area Classification for Type 3610J Series

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

CE (Ex) II 2 G D

Electrical Classification for Type 3620J Series

Hazardous Area:

CSA® — Explosion proof, Dust-Ignition proof, DIV 2, Intrinsic Safety

FM APPROVED — Explosion proof, Non-incendive, Dust-Ignition proof, Intrinsic Safety

ATEX — Intrinsic Safety, Type n, and Flameproof (Gas Atmospheres Only)

SAA — Intrinsic Safety, Type n, and Flameproof

Refer to tables 3, 4, and 5 for additional information.

Housing Classification for 3620J Series

NEMA 3, IP54 per IEC 529; Mounting orientation requires vent location to be below horizontal

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
Type 3620J and 3620JP:
Housing and Cap: Low copper aluminum alloy

Pressure Connections

1/4-inch NPT female

Conduit Connection for Type 3620J and 3620JP

1/2-inch NPT female (standard), M20 or PG13 adaptor (optional)

Rotary Valve Rotation

60, 75, or 90 degrees

Characterized Cams

See Characterized Cams section

Options

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

Approximate Weight

3610J Series: 2.5 kg (5.6 pounds)
3620J Series: 3.6 kg (8.0 pounds)

1. These terms are defined in ISA Standard S51.1.
2. For direct action, an increasing input signal extends the actuator rod. For reverse action, an increasing input signal retracts the actuator rod.
3. Normal m^3/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).
4. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
5. Natural gas to contain no more than 20 ppm of H_2S.

Table 1. Split-Range Capabilities

TYPE 3610J AND 3610JP POSITIONERS(1)				
Split	**0.2 to 1.0 Bar (3 to 15 Psig) Input Signal**		**0.4 to 2.0 Bar (6 to 30 Psig) Input Signal**	
	Bar	**Psig**	**Bar**	**Psig**
Two-way	0.2 to 0.6 0.6 to 1.0	3 to 9 9 to 15	0.4 to 1.2 1.2 to 2.0	6 to 18 18 to 30
Three-way	0.2 to 0.5 0.5 to 0.7 0.7 to 1.0	3 to 7 7 to 11 11 to 15	0.4 to 0.9 0.9 to 1.5 1.5 to 2.0	6 to 14 14 to 22 22 to 30

TYPE 3620J AND 3620JP POSITIONERS(1)	
Split	**4 to 20 Milliampere Input Signal**
Two-way	4 to 12 12 to 20
Three-way	4 to 9.3 9.3 to 14.7 14.7 to 20

1. This table is only valid for the following standard valve rotations/range spring combinations: 90°/18A7845X012 (blue), 75°/18A7846X012 (yellow), and 60°/18A5118X012 (red). Contact your Emerson Process Management sales office or the factory for input signal ranges not listed.

Table 2. EMC Immunity Performance Criteria

PORT	PHENOMENON	BASIC STANDARD	PERFORMANCE CRITERIA(1)
Enclosure	Electrostatic Discharge (ESD)	IEC 61000-4-2	A
	Radiated EM field	IEC 61000-4-3	A
	Rated power frequency magnetic field	IEC 61000-4-8	A
I/O signal/control	Burst	IEC 61000-4-4	A
	Surge	IEC 61000-4-5	B
	Conducted RF	IEC 61000-4-6	A

Specification limit = ±1% of span
1. A= No degradation during testing. B= Temporary degradation during testing, but is self-recovering.

Table 3. Hazardous Area Classifications for Type 3620J and 3620JP—North America (CSA and FM Approvals)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
CSA	(Intrinsic Safety) Class/Division •Class I, II Division 1 GP A, B, C, D, E, F, G per drawing 21B5606	– – –	T4A ($T_{amb} \leq 82°C$)	CSA ENC 3
	(Explosion Proof) Class I, Division I, Groups A, B, C, D	– – –	T5 ($T_{amb} \leq 82°C$)	CSA ENC 3
	Class I, Division 2, GP A, B, C, D Class II, Division 1, Groups E, F, G Class II, Division 2, GP E, F, G	– – –		CSA ENC 3
FM	(Intrinsic Safety) •Class I, II, III Division 1 GP A, B, C, D, E, F, G per drawing 21B5607	V_{max} = 40 Vdc I_{max} = 200 mA C_i = 0 nF L_i = 0 mH	T4A ($T_{amb} \leq 82°C$)	NEMA 3
	(Explosion Proof) Class I, Division I, Groups A, B, C, D	– – –	T5 ($T_{amb} \leq 82°C$)	NEMA 3
	Class I, Division 2, GP A, B, C, D Class II, Division 1, Groups E, F, G Class II, Division 2, GP F, G	– – –		NEMA 3

Table 4. Hazardous Area Classifications for Type 3620J and 3620JP—ATEX Approvals

CERTIFICATE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
ATEX	⟨Ex⟩II 1 G Gas •EEx ia IIC T4/T5/T6—Intrinsic Safety	U_i = 30 Vdc I_i = 150 mA P_i = 1.25 W C_i = 0 nF L_i = 0 mH	T4 ($T_{amb} \leq 82°C$) T5 ($T_{amb} \leq 62°C$) T6 ($T_{amb} \leq 47°C$)	IP54
	⟨Ex⟩II 2 G Gas •EEx d IIB T5/T6 —Flameproof	– – –	T5 ($T_{amb} \leq 82°C$) T6 ($T_{amb} \leq 74°C$)	IP54
	⟨Ex⟩II 3 G Gas •EEx nA IIC T6 —Type n	– – –	T6 ($T_{amb} \leq 82°C$)	IP54

Table 5. Hazardous Area Classifications for Type 3620J and 3620JP —Australia (SAA Approvals)

CERTIFICATE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
SAA	Ex ia IIC T4—Intrinsic Safety	U_i = 32 Vdc I_i = 150 mA C_i = 0 nF L_i = 0 mH	T4 ($T_{amb} \leq 82°C$)	IP54
	Ex n IIC T4—Type n	– – –	T4 ($T_{amb} \leq 82°C$)	IP54
	Ex d IIB T6—Flameproof	– – –	T6 ($T_{amb} \leq 82°C$)	IP54

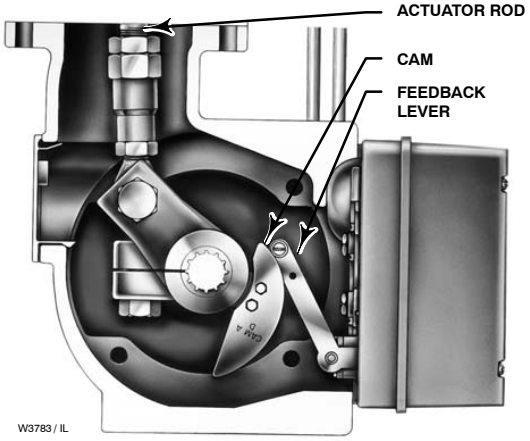

Figure 3. Typical 3610J or 3620J Series Positioner Mounting

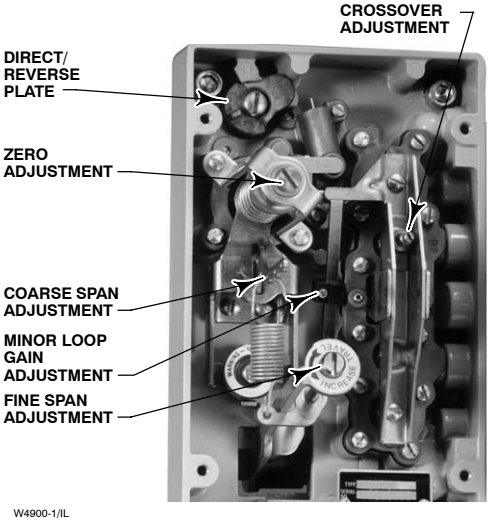

Figure 4. Adjustments for 3610J and 3620J Series Positioners

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 Type 3610J Series positioner easily converts to an electro-pneumatic Type 3620J Series positioner by replacing the existing gauge block with the Type 3622 electro-pneumatic converter assembly. The converter assembly attaches to the existing positioner as shown in figure 1, providing a simple, compact, and cost-effective conversion.

- **Versatility**—The Type 3610J and 3610JP positioners accept a pneumatic input signal and the Type 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 the Type 3610J and 3610JP or Type 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 4, 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 following descriptions provide specific information on the different positioner constructions.

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

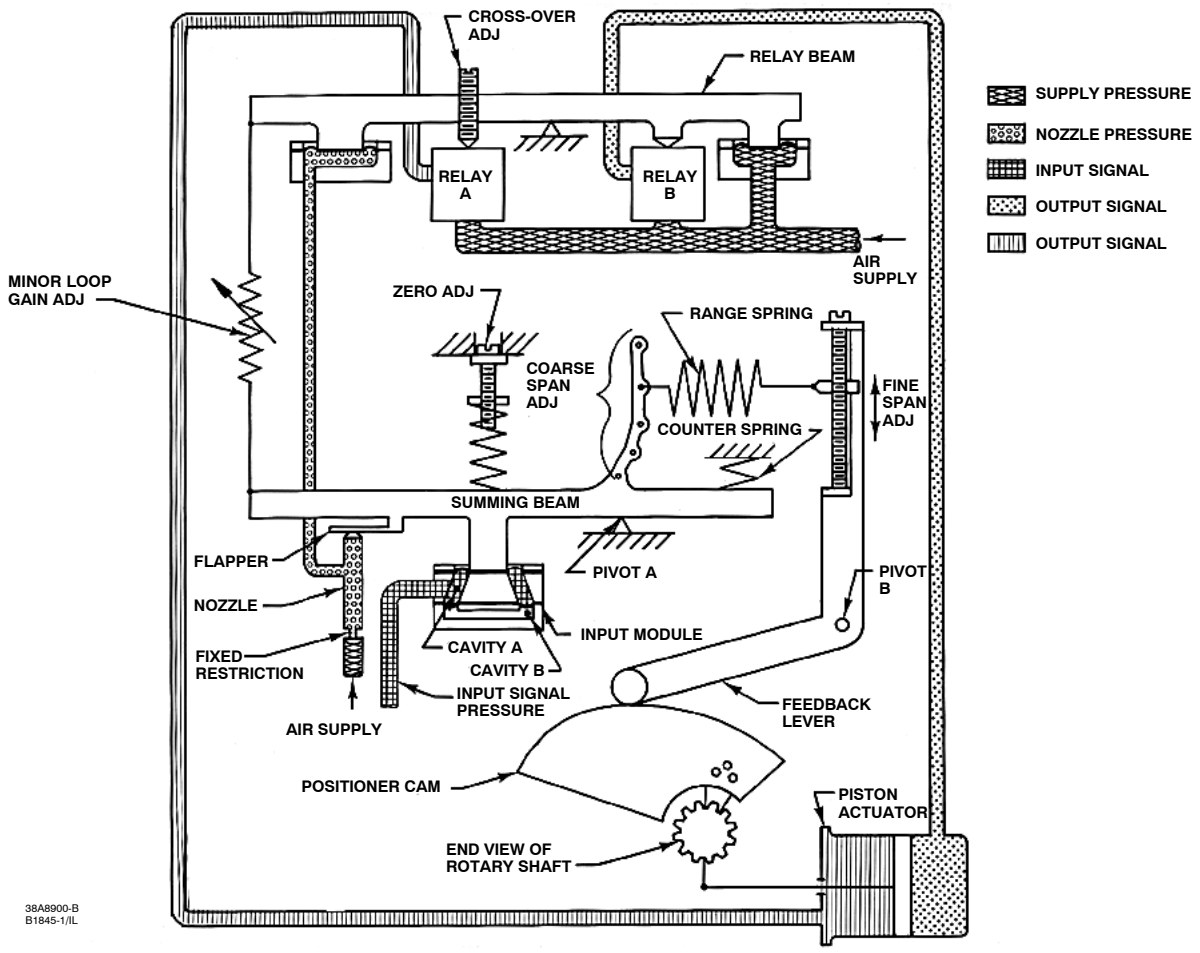

Figure 5. Type 3610JP Positioner Schematic

Type 3610JP: A double-acting pneumatic rotary valve positioner for use with Type 1061 and 1069 actuators.

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

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

Type 3622: An electro-pneumatic converter that converts a 4 to 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 Type 3610J or 3610JP positioner produces a Type 3620J or 3620JP positioner, respectively.

Principle of Operation

The 3610J Series positioners accept a pneumatic input signal and the 3620J Series positioners accept a dc current input signal from a control device. These series of positioners are force-balanced instruments that provide a valve shaft position proportional to the input signal. The following describes the principle of operation for the Type 3610JP and 3620JP positioners. The principle of operation for the Type 3610J and 3620J positioners is similar except relay A is not used. Refer to figures 5 and 6 while reading the following descriptions.

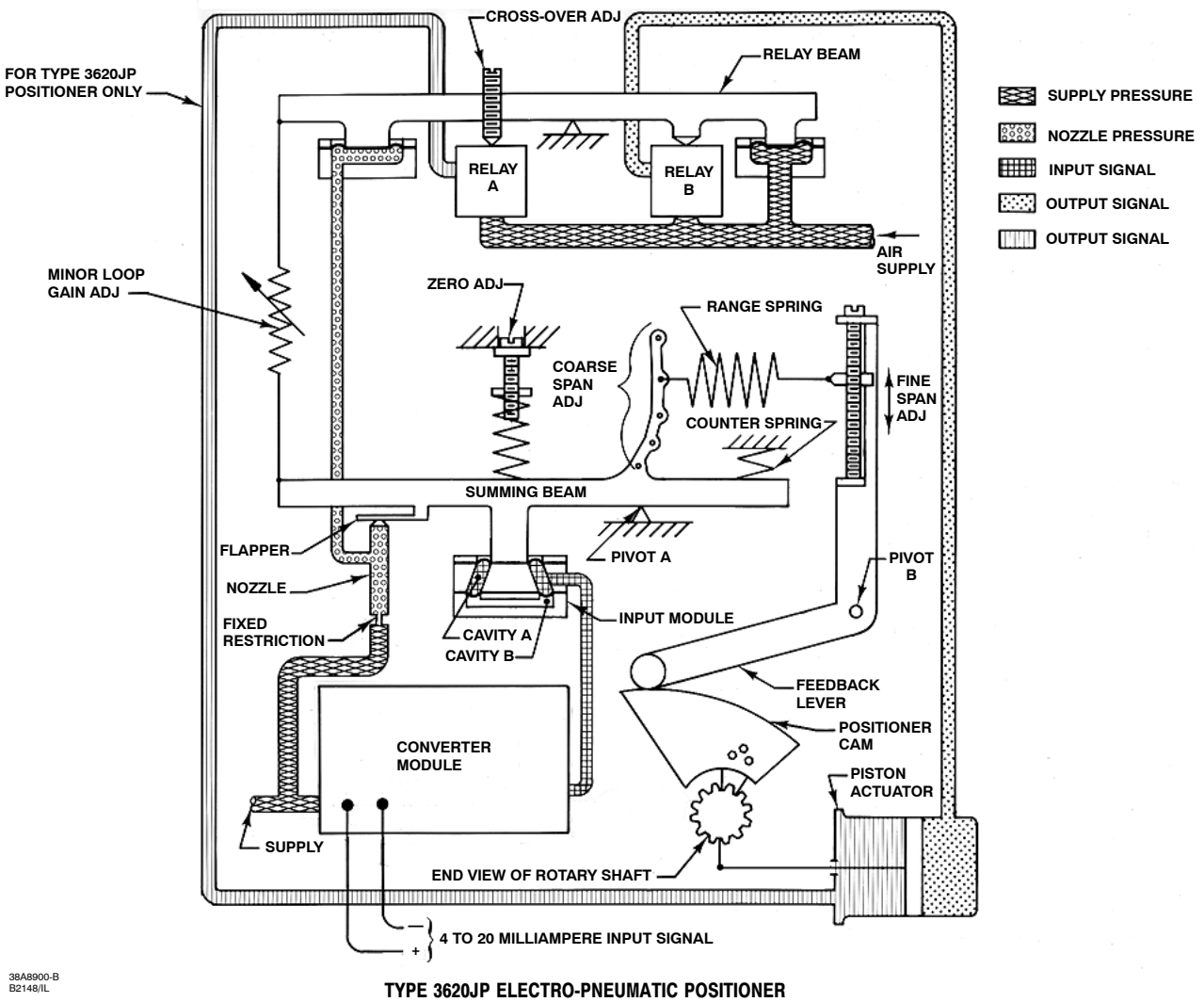

Figure 6. Type 3620JP Positioner Schematic

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.

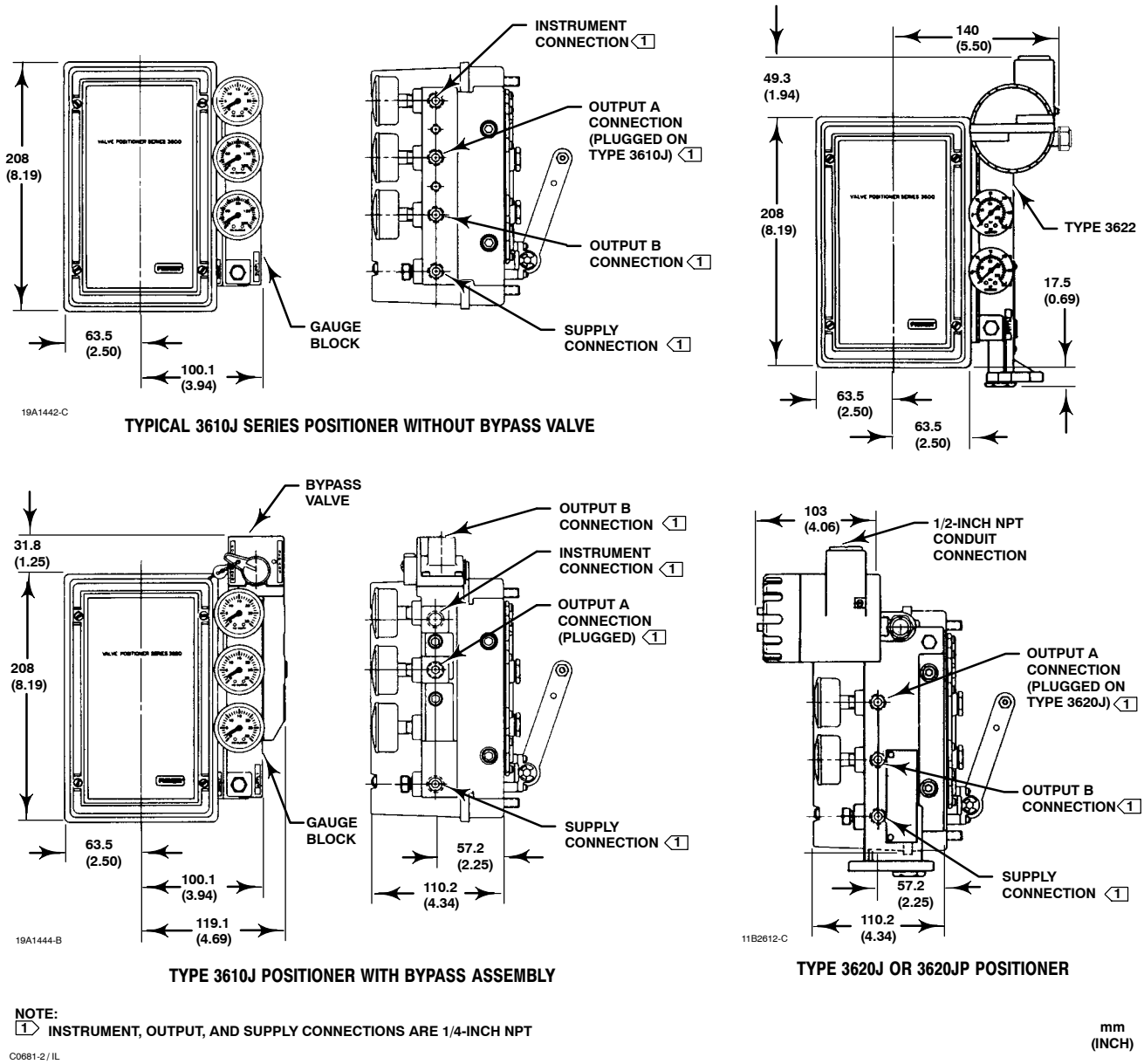

Figure 7. Typical Mounting Dimensions and Connections

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.

Type 3620J or 3620JP positioners (figure 6) are a combination of a Type 3610J or a 3610JP positioner with a Type 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 to 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 Type 3610J or 3610JP pneumatic positioner.

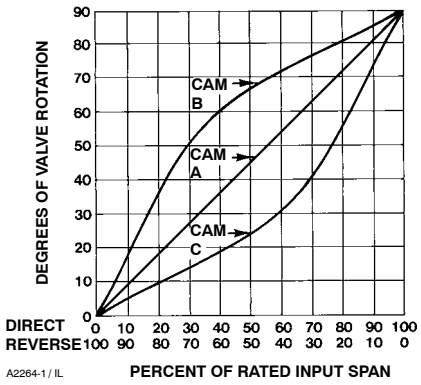

Figure 8. Input Span Versus Valve Rotation

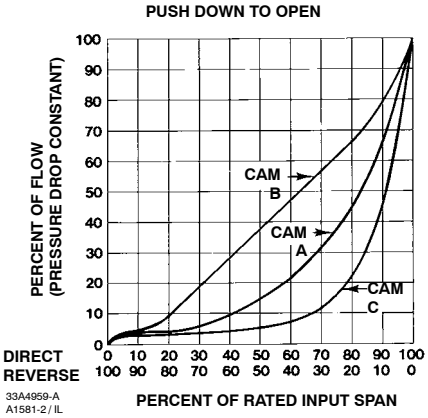

Figure 10. Flow Characteristics for the Various Cams When Used with an Equal Percentage Characteristic, Push-Down-to-Open Valve

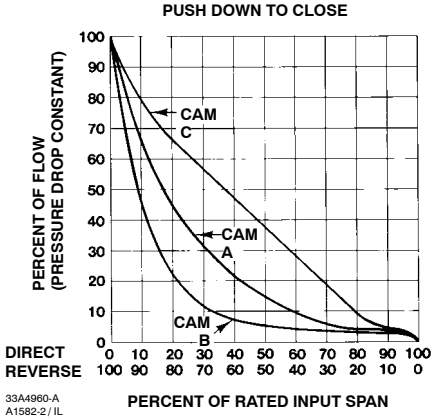

Figure 9. Flow Characteristics for the Various Cams When Used with an Equal Percentage Characteristic, Push-Down-to-Close Valve

Installation

The supply pressure medium must be a clean, dry, and oil-free air, or noncorrosive gas (3610J Series 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 in figures 1 and 2. Overall dimensions are shown in figure 7.

Note

Type 3620J, 3620JP, and 3622 are not approved for use with natural gas as the supply medium.

Characterized Cams

The 3610J Series and 3620J Series positioners are available with any one of three cams, a linear cam (cam A) or two characterized cams (cams B and C). Figure 8 shows the resultant valve rotation due to an incremental instrument pressure change for the three cams. Figures 9 and 10 show how the flow characteristics change when using the cams with a valve that has equal percentage characteristics.

When the linear cam is the operating cam, there is a linear relationship between an incremental instrument pressure change and the resultant valve stem rotation. The flow characteristic is that of the control valve.

As shown in figure 8, installing either characterized cam as the operating cam changes the relationship between the incremental instrument pressure change and valve stem travel, thereby modifying the valve flow characteristics.

3610J and 3620J Positioners

Product Bulletin
62.1:3610
February 2006

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.

Note

Neither Emerson, Emerson Process Management, Fisher, nor any of their affiliated entities assumes responsibility for the selection, use, and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

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