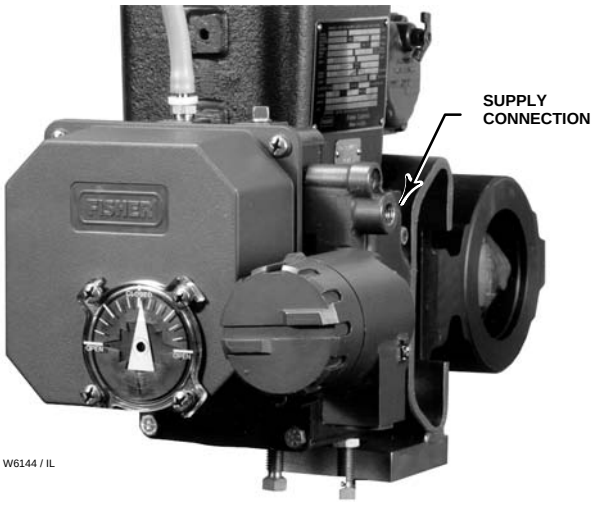
Product Bulletin
62.1:3710
D200437X012
November 2008

Fisher® 3710 and 3720 Positioners and 3722 Electro-Pneumatic Converter

The Fisher® 3710 pneumatic positioner (figure 1) and 3720 electro-pneumatic positioner (figure 2) are designed for use with either diaphragm or piston rotary actuators. These positioners provide a valve ball or disk position for a specific input signal. The 3710 positioner provides a valve position in response to a pneumatic input signal. The 3720 positioner is created by the addition of a Fisher 3722 electro-pneumatic converter (figure 3) to the 3710 positioner. The 3720 positioner provides a valve position in response to a DC current input signal. Either type can easily be configured as single- or double-acting for rotary actuators.



3720 POSITIONER MOUNTED ON A FISHER 1052 ACTUATOR

Figure 2. Fisher® 3720 Positioner

3710 POSITIONER MOUNTED ON A FISHER 1066 ACTUATOR

Figure 1. Fisher® 3710 Positioner

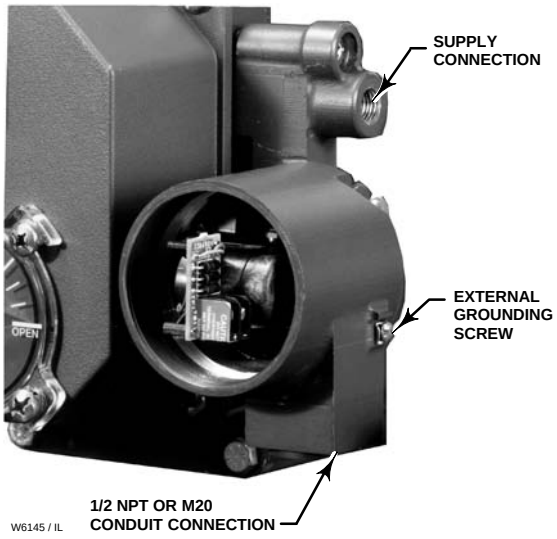


Figure 3. Fisher® 3722 Electro-Pneumatic Converter

Specifications

Available Configuration

3710: ■ Single- or ■ double-acting pneumatic rotary valve positioner
3720: ■ Single- or ■ double-acting electro-pneumatic rotary valve positioner consisting of a 3710 with a 3722 attached
3722: An electro-pneumatic converter that converts a 4-20 mA DC input signal to a 0.2 to 1.0 bar (3 to 15 psig) signal for the pneumatic positioner

Input Signal

3710:.
Standard: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
Split-Range: ■ 0.2 to 0.6 bar (3 to 9 psig) and 0.6 to 1.0 bar (9 to 15 psig) or ■ 0.4 to 1.2 bar (6 to 18 psig) and 1.2 to 2.0 bar (18 to 30 psig)
3720:.
Standard: ■ 4-20 mA DC constant current with 30 VDC maximum compliance voltage
Split-Range: ■ 4-12 mA DC or 12-20 mA DC

Equivalent Circuit

3720: 120 ohms shunted by three 5.6 V zener diodes

Output Signal

Pneumatic pressure as required by the actuator up to full supply pressure
Action(1): Field reversible between direct and reverse

Supply Pressure(2)

Minimum Recommended: 0.3 bar (5 psig) above actuator requirement
Maximum: 10.3 bar (150 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

3710: air or natural gas(3)
3720: air

The 3720 positioner is not approved for use with natural gas as the supply medium

Steady-State Air Consumption(4)

3710:
Standard Spool Valve: 0.61 normal m^3/hr (23 scfh) at 4.1 bar (60 psig) supply pressure
High-Capacity Spool Valve: 0.75 normal m^3/hr (28 scfh) at 4.1 bar (60 psig) supply pressure

3720:
Standard Spool Valve: 0.80 normal m^3/hr (30 scfh) at 4.1 bar (60 psig) supply pressure
High-Capacity Spool Valve: 0.93 normal m^3/hr (35 scfh) at 4.1 bar (60 psig) supply pressure

Maximum Supply Air Demand(4) (Double-Acting)

Standard Spool Valve: 4.1 bar (60 psig) supply, 13 normal m^3/hr (480 scfh)
High-Capacity Spool Valve: 4.1 bar (60 psig) supply, 23 normal m^3/hr (860 scfh)

Typical Performance(5)

3710 Pneumatic Positioner
Independent Linearity: ±0.5% of output span
Hysteresis: 0.5% of output span
Deadband: 0.3% of input span
3720 Electro-Pneumatic Positioner
Independent Linearity: ±1.0% of output span
Hysteresis: 0.6% of output span
Deadband: 0.35% of input span
Electromagnetic Interference (EMI) for 3722 Electro-Pneumatic Converter: Tested per IEC 61326-1 (Edition 1.1). Conforms to the European EMC Directive. 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 1.

Note: Electromagnetic Interference (EMI) specifications also apply to the 3720 positioner

Operating Influences

Supply Pressure Sensitivity: A 10% change in supply pressure changes the valve shaft position less than the following percentages of valve rotation:
3710: 1.0% at 4.1 bar (60 psig) supply pressure
3720: 1.5% at 4.1 bar (60 psig) supply pressure

Operative Temperature Limits(2)

■ −40 to 80°C (−40 to 180°F), ■ −50 to 80°C (−58 to 180°F) or ■ 0 to 107°C (32 to 225°F) (3710 only)

-continued-

Specifications (Continued)

Construction Materials

Positioner Base: Low copper aluminum alloy
Cover: Polyester plastic
Feedback Shaft: Stainless steel
Range Spring: Stainless steel
Input Module Diaphragm, O-rings: ■ Nitrile, ■ Fluorocarbon, or ■ Ethylene-propylene (EPDM)
Spool Valve: S31600 (316 stainless steel)
Tubing: Copper (standard)
Fittings: Brass (standard)
Gauges: Chrome-plated brass connection with plastic case
Connectors for diagnostic testing: ■ Stainless steel or ■ Brass

Hazardous Area Classification for 3710

3710 pneumatic positioners comply with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D

Housing Classification for 3722

CSA Type 3 Encl., NEMA 3, IP54 per IEC 60529. Mount instrument with vent on side or bottom if weatherproofing is a concern.

Note: These classifications also apply to the 3720 positioner

Electrical Classifications for 3722

CSA Intrinsic Safety, Explosion Proof, Type n, Dust-Ignition Proof

FM APPROVED Intrinsic Safety, Explosion Proof, Type n, Non-incendive, Dust-Ignition Proof

ATEX Intrinsic Safety, Flameproof, Type n

IECEx Intrinsic Safety, Flameproof, Type n

SAA Intrinsic Safety, Flameproof, Type n

Refer to tables 2, 3, 4, 5, and 6 for additional approvals information.

Note: These classifications also apply to the 3720 positioner

Pressure Connections

1/4 NPT internal

Conduit Connection to the 3722

■ 1/2 NPT internal or ■ optional M20 connection

Rotary Valve Rotation

■ 90 degrees (standard) ■ 60 degrees (optional)

Options

Spool Valve: ■ standard, ■ vibration and corrosion resistant (standard), or ■ vibration and corrosion resistant (high-capacity)
Span Adjuster Assembly: ■ 0.2 to 1.0 bar (3 to 15 psig) input range or, ■ 0.4 to 2.0 bar (6 to 30 psig) input range
Elastomers (O-rings, diaphragm): ■ standard temperature range, –40 to 80°C (–40 to 180°F), low temperature range –50 to 80°C (–58 to 180°F) ■ high temperature range (3710 only), 0 to 107°C (32 to 225°F) or ■ special applications ■ Beacon Indicator, ■ Gauges(6), tire valves, or connectors for diagnostic testing

Approximate Weight

3710: 2.04 kg (4.5 pounds)
3720: 2.72 kg (6.0 pounds)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 – Process Instrument Terminology.
1. Direct-acting, an increasing input signal extends actuator rod. Reverse-acting, an increasing input signal retracts actuator rod.
2. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
3. Natural gas should not contain more than 20 ppm of H_2S.
4. 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).
5. Typical values determined by tests with a 1061 size 30 actuator at 4.1 bar (60 psig) supply pressure. Performance may vary with other actuator types and supply pressures.
6. Gauges not available for high temperature range.

Table 1. Electromagnetic Immunity Performance Criteria for Fisher® 3722 Electro-Pneumatic Converter(1)

PORT	PHENOMENON	BASIC STANDARD	TEST LEVEL	PERFORMANCE CRITERIA(2)
Enclosure	Electrostatic Discharge (ESD)	IEC 61000-4-2	4 KV contact; 8 KV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz, 10 V/m 1 KHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 KV	A
	Surge	IEC 61000-4-5	1 KV (line to ground only)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 volts	A

Specification limit = ±1% of span
1. The information contained in the table also applies to the 3720 positioner.
2. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Features

- **Accurate, Fast Response**—3710 and 3720 positioners use field-proven spool valve technology for a simple design that gives accurate, fast-responding operation with high cycle life. These positioners are able to withstand the severe vibrations of most plant environments.

- **Modular Construction**—The 3710 positioner converts easily to a 3720 positioner by adding the 3722 electro-pneumatic converter (figure 3). The converter mounts over the instrument and supply ports in the 3710 positioner base. This provides a simple, compact, and cost-effective field conversion from pneumatic to electro-pneumatic valve positioning.

- **Corrosion-Resistant Construction with Air Purge**—Case, components, and gasket materials withstand harsh environments. Proven engineered resins and 300 Series stainless steel construction is used throughout each unit. Die castings are low copper aluminum alloy to maximize corrosion resistance. Positioner bleed air purges internal positioner parts. As an option with some Fisher actuators, bleed air also purges the actuator housing for additional protection.

- **Extended Temperature Capability**—With EPDM O-rings and input module diaphragm, 3710 and 3720 positioners can be used in low-temperature applications. With fluorocarbon O-rings and input module diaphragm, 3710 positioners can be used in high-temperature applications.

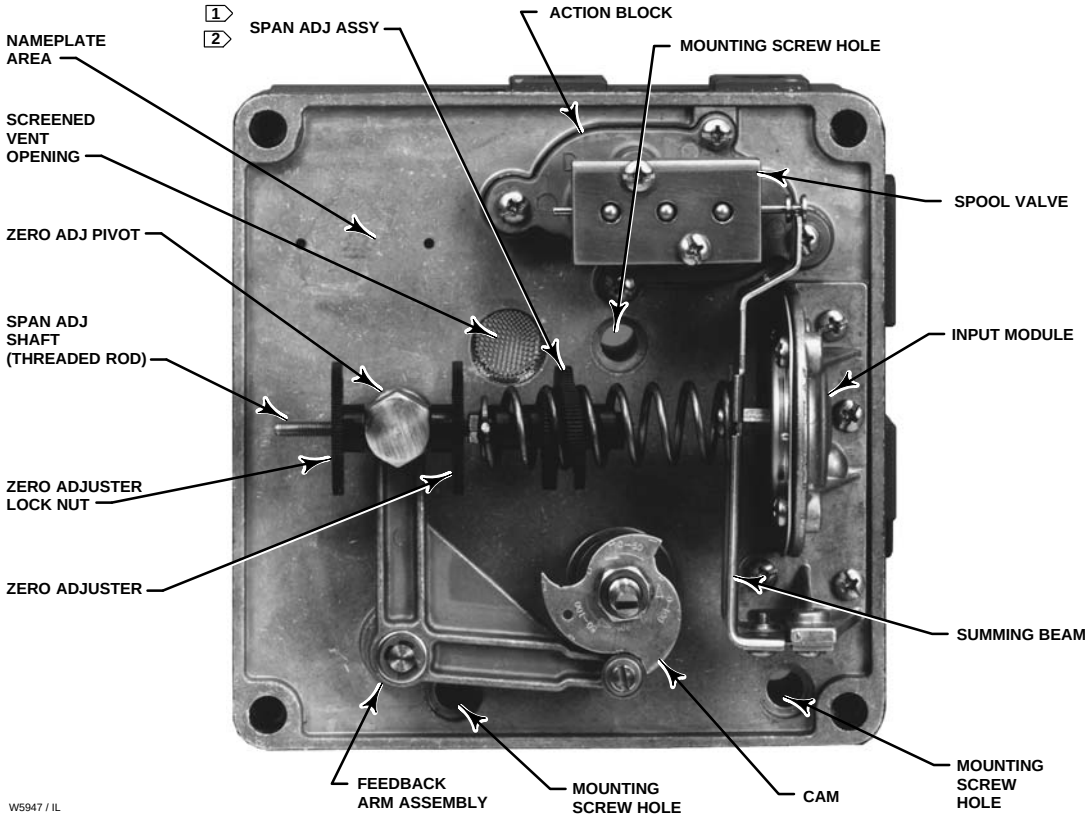
- **Meets Special Application Requirements**—3710 and 3720 positioners with fluorocarbon or EPDM O-rings and input module diaphragm can be used in applications with special material requirements as in the food and beverage industry, pharmaceuticals, and tobacco processing.

- **Easy Positioner Adjustments**—With the cover removed (figure 4), all internal components are easily accessed. Zero and span adjustments are made by hand with no tools required.

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

- **Control Valve Diagnostic Testing Capability**—To support diagnostic testing of valve/actuator/positioner packages, connectors, piping, and other hardware can be installed between the 3710 positioner and the actuator. A typical connector installation is shown in figure 8.

- **Valve Position Indicator**—Standard, low-profile indicator or optional, beacon-style indicator mount easily to the positioner cover.



NOTE:
1 THE SPAN ADJ ASSY IS MADE UP OF THE RANGE SPRING, SPAN ADJ SHAFT (THREADED ROD), AND SPAN ADJ KNOB.
2 THE SPAN ADJ ASSY FEATURES A RED COLOR-CODED RANGE SPRING FOR A 6 TO 30 PSIG INPUT SIGNAL

Figure 4. Features and Adjustments

Actuators

The positioner mounts integrally to the actuator cover plate (figure 5) of the following Fisher actuators:

- 1051 and 1052, size 30: The size 30 actuator is no longer manufactured by Emerson Process Management. The 3710 positioner is available for field installation on existing size 30 actuators.
- 1051, sizes 40 and 60
- 1052, sizes 40, 60, and 70
- 1061, sizes 30, 40, 60, and 68

A mounting plate is used to mount the 3710 positioner to the following Fisher actuators:

- 1031, sizes 26, 33, 45, 60, and 80
- 1032, sizes 45, 70, 185, 280, 425, 680, 1125, 1370, 2585, and 4585
- 1051, size 33
- 1052, sizes 20, 33
- 1061, sizes 80, 100
- 1066, sizes 20, 27, and 75

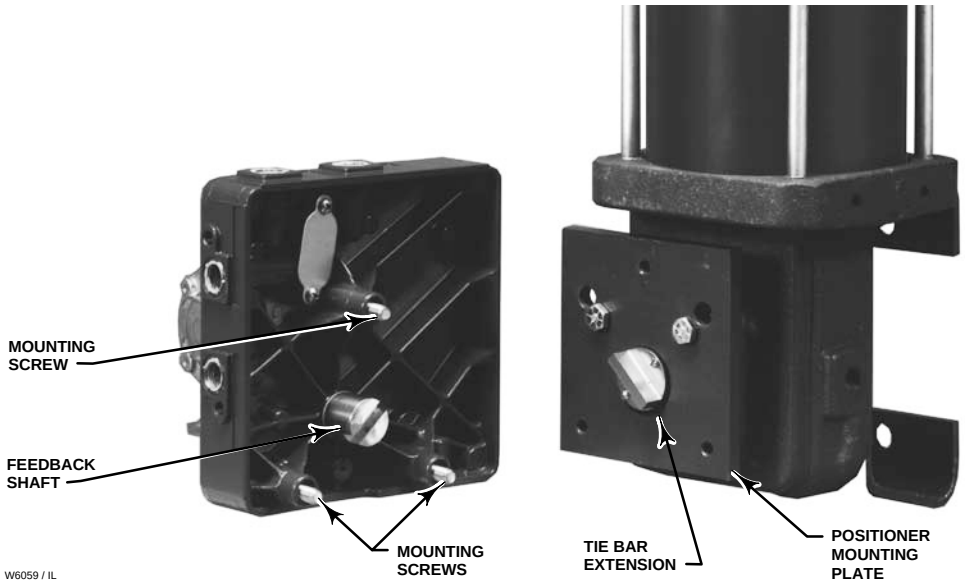


Figure 5. Mounting the Positioner Base Plate

Principle of Operation

Refer to the positioner schematic (figure 6). The operational description here follows the schematic layout and orientation.

The 3710 pneumatic positioner is a force-balance instrument that provides a control valve position proportional to a pneumatic input signal. The balance of opposing forces in the positioner occurs at the summing beam.

One force applied to the summing beam is developed from the input signal pressure on the diaphragm. The other force is from the feedback spring and is proportional to the position of the feedback lever.

When the input pressure is increased to the diaphragm of the input module, the diaphragm strokes down, increasing the effective force from the input module and compressing the feedback spring. The summing beam moves the spool down in the spool body, opening output port B to supply air to the left side of the actuator. At the same time, output port A of the spool valve opens, allowing the right side of the actuator to vent to atmosphere.

The piston in the actuator moves to the right, rotating the feedback shaft and cam counterclockwise. This rotation causes the feedback lever to rotate clockwise, increasing the compression on the feedback spring. These rotations continue until the additional force from the spring balances with the input module force on the summing beam. When the forces are equal, the summing beam returns to its steady state or neutral position and the actuator is held at a new position.

In a 3720 positioner, the 3722 converter receives the milliampere (mA), direct current (DC), input signal and provides a proportional pneumatic output signal through a nozzle/flapper arrangement. Nozzle pressure from the converter module travels through the converter housing to provide the input signal pressure to the 3710 pneumatic positioner.

The feedback lever position is determined by the location or rise of the cam (figure 7) which is attached to the feedback shaft. When the two opposing forces are equal or at a steady state, the

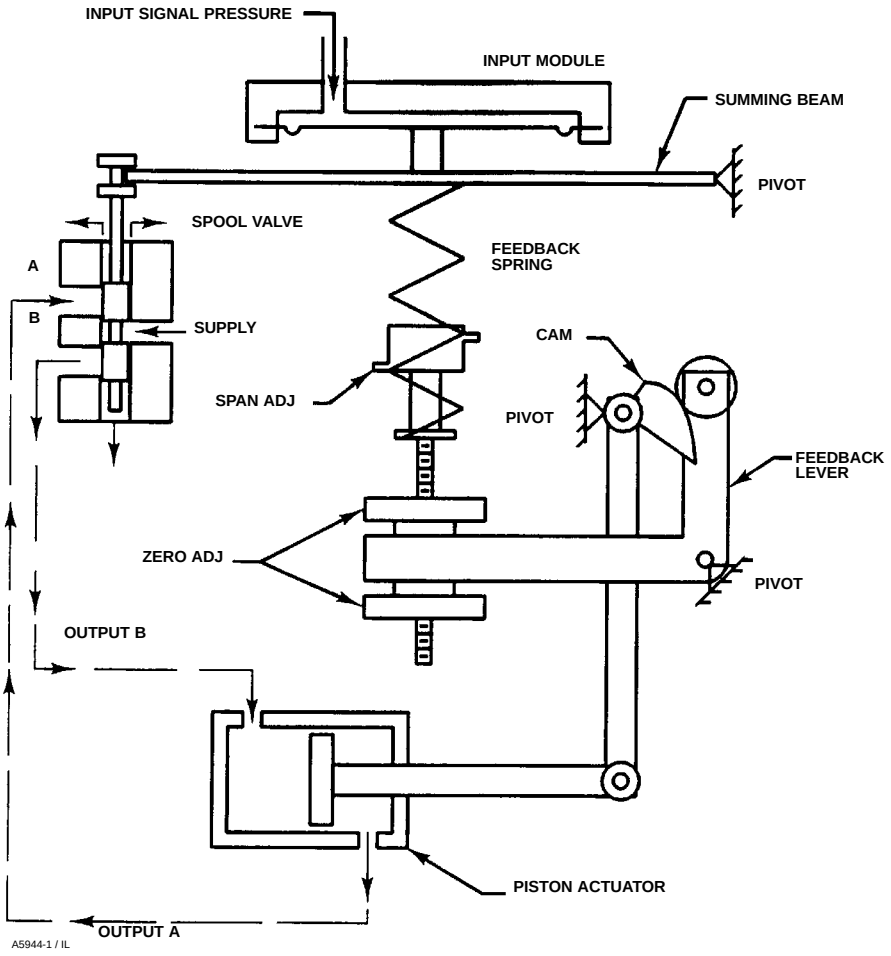


Figure 6. Fisher® 3710 Positioner Schematic

summing beam holds the spool in a neutral position. At steady state, a small flow of air passes from supply through both outputs of the spool valve to the actuator, holding the actuator at a constant position. At the same time, another small flow of air exhausts out each end of the spool valve.

Installation

The supply pressure medium must be a clean, dry, filterd air, or noncorrosive gas (3710 positioner only). If the supply source is capable of exceeding the maximum actuator operating pressure or positioner supply pressure, take appropriate steps during installation to protect the positioner and all connected equipment against overpressure.

Positioner connections including connections for diagnostic testing and overall dimensions are shown in figure 8.

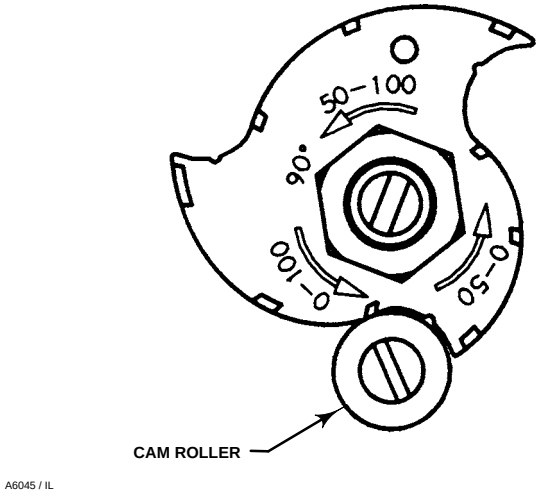


Figure 7. Cam

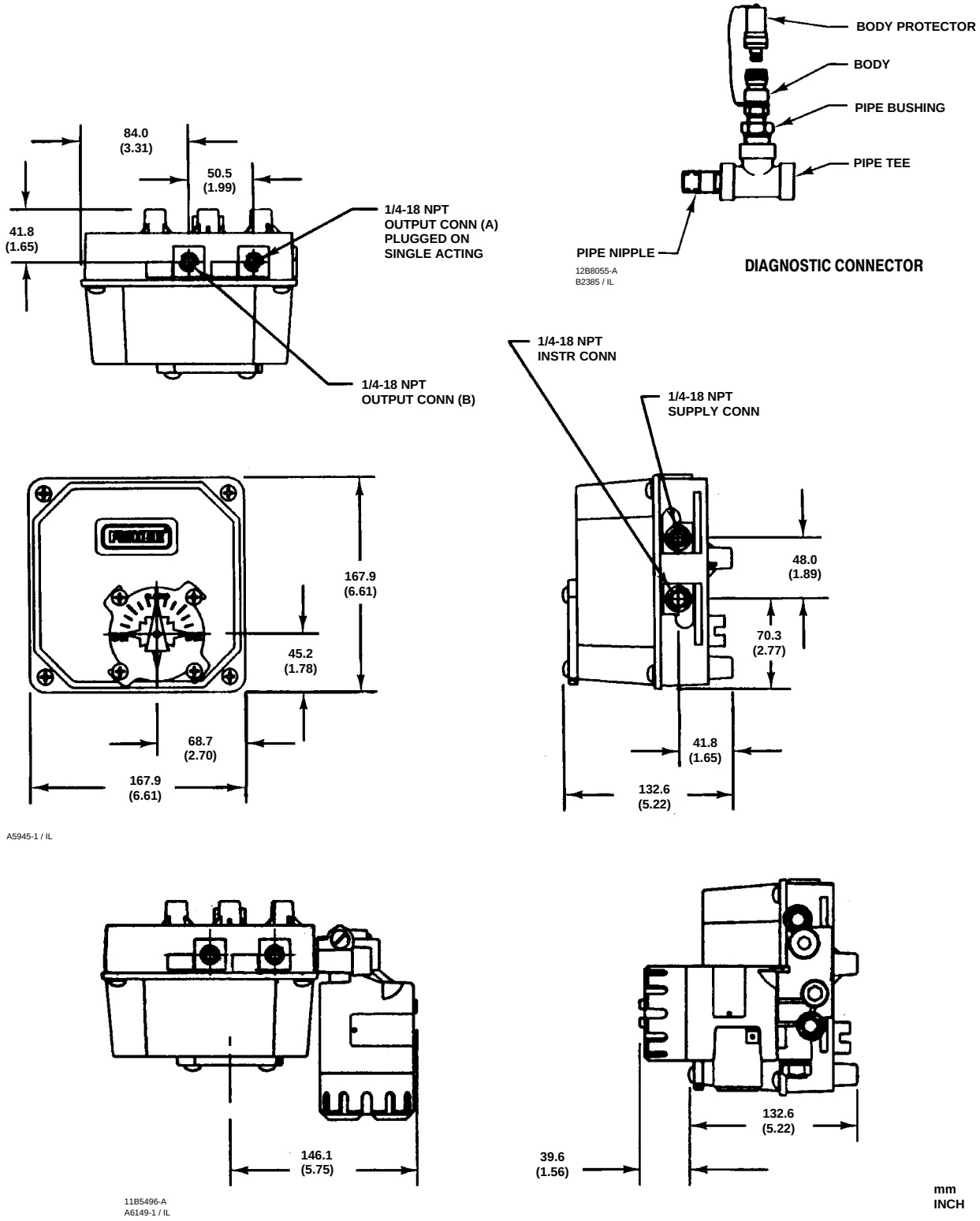


Figure 8. Dimensions and Connections

Ordering Information

When ordering, specify:

Required Application Information

1. Positioner type number

2. Pneumatic or DC current input signal range

3. Direct- or reverse-acting

4. Actuator type, size, and degrees of rotation

5. Standard or vibration and corrosion resistant spool valve. For vibration and corrosion resistant spool valve, specify standard or high capacity.

6. Maximum supply pressure available

7. Ambient temperature range

8. Special application material requirements such as EPDM or fluorocarbon elastomers

9. Supply pressure regulator and options such as gauges or tire valves, if required

10. Connectors for diagnostic testing, if required

Construction Specifications

Refer to the construction details given in the Specifications. If different materials of construction are required, contact your Emerson Process Management sales office.

Note

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

Table 2. Hazardous Area Classifications for Fisher® 3722 Converter(1)—CSA (Canada)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
CSA	(Intrinsic Safety) Zone Ex ia IIC T4/T5/T6 per drawing GE28591 Class/Division Class I, II Division 1 GP A,B,C,D,E,F,G T4/T5/T6 per drawing GE28591	V_{max} = 30 VDC I_{max} = 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 ($T_{amb} \leq 47°C$)	CSA Type 3 Encl.
	(Explosion Proof) Zone Ex d IIC T5 Class/Division Class I, Division 1, GP A,B,C,D T5	– – –	T5 ($T_{amb} \leq 82°C$)	CSA Type 3 Encl.
	(Type n) Zone Ex nA IIC T6	– – –	T6 ($T_{amb} \leq 82°C$)	CSA Type 3 Encl.
	Class I, Division 2, GP A,B,C,D T6	– – –	T6 ($T_{amb} \leq 82°C$)	CSA Type 3 Encl.
	Class II, Division 1, GP E,F,G T5		T5 ($T_{amb} \leq 82°C$)	
	Class II, Division 2, GP F,G T6		T6 ($T_{amb} \leq 82°C$)	

1. These hazardous area classification also apply to 3720 positioners.

Table 3. Hazardous Area Classifications for Fisher® 3722 Converter(1)—FM (United States)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
FM	(Intrinsic Safety) Zone Class I Zone 0 AEx ia IIC T4/T5/T6 per drawing GE28590 Class/Division Class I, II, III Division 1 GP A,B,C,D,E,F,G T4/T5/T6 per drawing GE28590	V_{max} = 30 VDC I_{max} = 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 ($T_{amb} \leq 47°C$)	NEMA 3, IP54
	(Explosion Proof) Zone Class I Zone 1 AEx d IIC T5 Class/Division Class I, Division I, GP A,B,C,D T5	– – –	T5 ($T_{amb} \leq 82°C$)	NEMA 3, IP54
	(Type n) Zone Class I Zone 2 AEx nA IIC T5	– – –	T5 ($T_{amb} \leq 82°C$)	NEMA 3, IP54
	Class I, Division 2, GP A,B,C,D T5 Class II, Division 1, GP E,F,G T5 Class II, Division 2, GP F,G T5	– – –	T5 ($T_{amb} \leq 82°C$)	NEMA 3, IP54

1. These hazardous area classification also apply to 3720 positioners.

Table 4. Hazardous Area Classifications for Fisher® 3722 Converter(1)—ATEX

CERTIFICATION	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
ATEX	⟨Ex⟩ II 1 G Gas Ex 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 Ex d IIC T5 – Flameproof	– – –	T5 ($T_{amb} \leq$ 82°C)	IP54
	⟨Ex⟩ II 3 G Gas Ex nA IIC T6 - Type n	– – –	T6 ($T_{amb} \leq$ 82°C)	IP54

1. These hazardous area classification also apply to 3720 positioners.

Table 5. Hazardous Area Classifications for Fisher® 3722 Converter(1)—IECEx

CERTIFICATION	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
IECEx	Gas Ex 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
	Gas Ex d II T5/T6 – Flameproof	– – –	T5 ($T_{amb} \leq$ 82°C)	IP54
	Gas Ex nA II T6 - Type n	– – –	T6 ($T_{amb} \leq$ 82°C)	IP54

1. These hazardous area classification also apply to 3720 positioners.

Table 6. Hazardous Area Classifications for Fisher® 3722 Converter(1)—SAA (Australia)

CERTIFICATION	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
SAA	Gas Ex ia IIC T4 – Intrinsic Safety	U_i = 32 VDC I_i = 150 mA C_i = 0 nF L_i = 0 mH	T4 ($T_{amb} \leq$ 40°C)	IP54
	Gas Ex d IIB T6 – Flameproof	– – –	T6 ($T_{amb} \leq$ 40°C)	IP54
	Gas Ex n IIC T4 - Type n	– – –	T4 ($T_{amb} <$ 40°C)	IP54

1. These hazardous area classification also apply to 3720 positioners.

3710 and 3720 Positioners

Product Bulletin
62.1:3710
November 2008

Emerson Process Management
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Chatham, Kent ME4 4QZ UK
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

EMERSON
Process Management