

# Fisher™ 646 Electro-Pneumatic Transducer

The Fisher 646 electro-pneumatic transducer uses a converter module that converts a 4 to 20 milliampere input signal to a proportional 0.2 to 1.0 bar (3 to 15 psig) pneumatic output signal. The converter module uses small parts of minimum mass, which are balanced symmetrically around a pivot point at the center of the mass. This balanced arrangement results in a high performance instrument that reduces sensitivity to vibration.

An integral pneumatic relay provides the high capacity necessary to drive pneumatic control valve/actuator assemblies without additional boosters or positioners. The transducer also provides stable, accurate operation when its output is transmitted to small volume chambers, such as a pneumatic positioner or other pneumatic instrument. Reduced sensitivity to vibration combined with high capacity and first order lag characteristics make the 646 transducer ideal for direct mounting on control valve/actuator combinations.

Connectors and piping can be installed with each 646 transducer for diagnostic testing.

## Features

- **Small Size**—The small size and light-weight design of the transducer facilitate mounting and provide improved space utilization.
- **Vibration Resistance**—The transducer, used in a standard valve/actuator mounted application, exhibits an output shift of less than 1 percent of span when tested to SAMA Standard PMC 31.1, Condition 3.
- **High Output Capability**—The output volume of the transducer is adequate to drive valve/actuator combinations without requiring a positioner or volume booster.
- **Low Air Consumption**—The transducer has low air consumption which cuts operating costs.
- **Easy Maintenance**—Modular design of the converter allows easy replacement in the field for reduced maintenance costs.
- **Superior Performance**—The accuracy, linearity, and frequency response coupled with minimal hysteresis far exceed the requirements of most control systems.



FISHER 646 ELECTRO-PNEUMATIC  
TRANSDUCER WITH FISHER 657  
ACTUATOR AND E VALVE

FISHER 646 ELECTRO-  
PNEUMATIC TRANSDUCER

**Specifications**

**Input Signal**

4 to 20 mA DC, constant current with 30 VDC maximum compliance voltage

**Equivalent Circuit**

The 646 equivalent circuit is a series circuit consisting of a constant voltage drop (battery) of approximately 2.1 VDC and a total resistance of 143 ohms. Input is shunted by three 6.8 V zener diodes (see figure 1).

**Output Signal**

0.2 to 1.0 bar (3 to 15 psig) direct acting only

**Supply Pressure<sup>(1)</sup>**

Recommended: 1.4 bar (20 psig)

Minimum: 1.4 bar (20 psig)

Maximum: 3.4 bar (50 psig)

**Average Steady-State Air Consumption<sup>(2)(3)</sup>**

0.08 m<sup>3</sup>/hr (3 scfh) at 1.4 bar (20 psi) supply pressure

**Maximum Output Air Capacity<sup>(2)</sup>**

8.0 m<sup>3</sup>/hr (300 scfh) at 1.4 bar (20 psig) supply pressure

**Performance<sup>(4)</sup>**

**Reference Accuracy:** ±0.5% of full scale output span; includes combined effects of hysteresis, linearity, and deadband

**Independent Linearity:** ±0.5% of full scale output span

**Hysteresis:** 0.4% of full scale output span

**Frequency Response:** Gain is attenuated 3 dB at 10 Hz with transducer output signal piped to a typical instrument input

**Temperature Effect:** ±4% of full scale output span per 55°C (100°F) change

**Supply Pressure Effect:** 0.2% of full scale output span per psi supply pressure change

**Vibration Effect:** Less than 1% of full scale output span when tested to SAMA PMC 31.1, Condition 3

**Electromagnetic Compatibility:**

Meets EN 61326-1:2013

Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 1 below.

Emissions—Class A

ISM equipment rating: Group 1, Class A

**Operating Ambient Temperature Limits<sup>(1)</sup>**

-40 to 71°C (-40 to +160°F)

**Electrical Classification**

CSA— Intrinsicly Safe, Explosion-proof, Type n, Dust-Ignition proof, Div 2

FM— Intrinsicly Safe, Explosion-proof, Type n, Non-incendive, Dust-Ignition proof

ATEX— Intrinsicly Safe, Flameproof, Type n

IECEX— Intrinsicly Safe, Flameproof, Type n

**Housing**

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

**Other Classifications/Certifications**

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, and Belarus)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KGS— Korea Gas Safety Corporation (South Korea)

Contact your [Emerson sales office](#) for classification/certification specific information

**Construction Materials**

**Housing, Cap, and Relay Body**

ASTM: A03600 material composition alloy

**Adjustments**

**Zero and Span:** Trim potentiometers (20 turn) for zero and span adjustments are located under the housing cap

**Connections**

**Supply and Output Pressure:** 1/4 NPT internal connection

**Vent:** 1/4 NPT internal

**Electrical:** ■ Standard 1/2 NPT or, ■ Optional M20 or PG13 conduit adapter (see figure 3)

**Wire Size:** 18 to 22 AWG

-continued-

**Specifications (continued)**

<p><b>Mounting Position</b></p> <p>Any position is acceptable for standard pipestand, panel, or actuator mounting. For weatherproof housing, mount the transducer to allow the vent to drain.</p>	<p><b>Approximate Weight (Transducer Only)</b></p> <p>1.6 kg (3.5 pounds)</p> <p><b>Options</b></p> <p>Output pressure gauge</p>
---	--

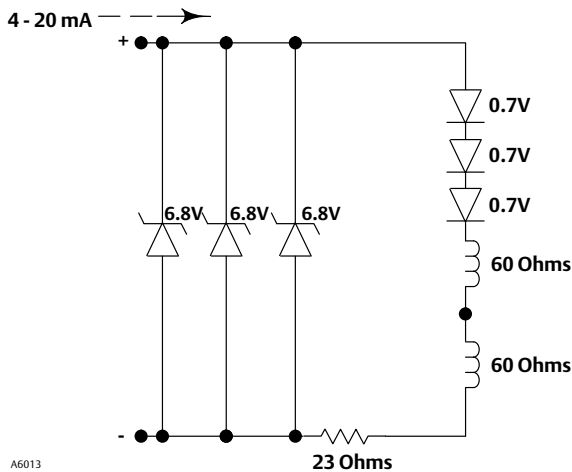
NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.  
 1. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.  
 2. Normal m<sup>3</sup>/hour--Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh--Standard cubic feet per hour (60°F and 14.7 psig).  
 3. Average flow rate determined at 12 mA and 0.6 bar (9 psig) output.  
 4. Performance values are obtained using a transducer with a 4 to 20 mA dc input signal and a 0.2 to 1.0 bar (3 to 15 psig) output signal at an ambient temperature of 24°C (75°F).

**Table 1. EMC Summary Results—Immunity**

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria <sup>(1)</sup>
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 @ 10V/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%	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, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

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

**Figure 1. Equivalent Circuit**



**Valve Stroking Time**

Figure 2 shows relative times for loading and exhausting an actuator. Stroking time depends upon the size of the actuator, travel, relay characteristics and the magnitude and rate of change of the input signal. If stroking time is critical, contact your [Emerson sales office](#).

**Figure 2. Output-Time Relationships**

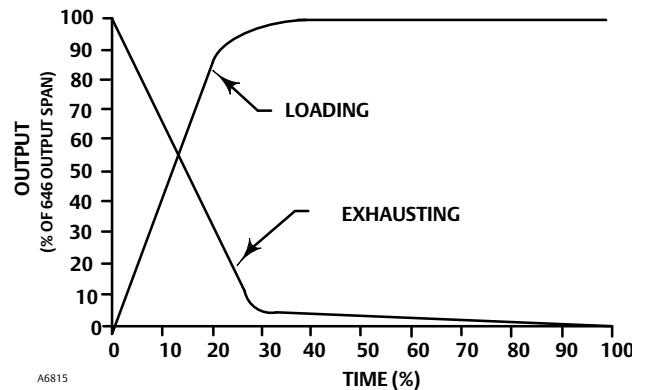
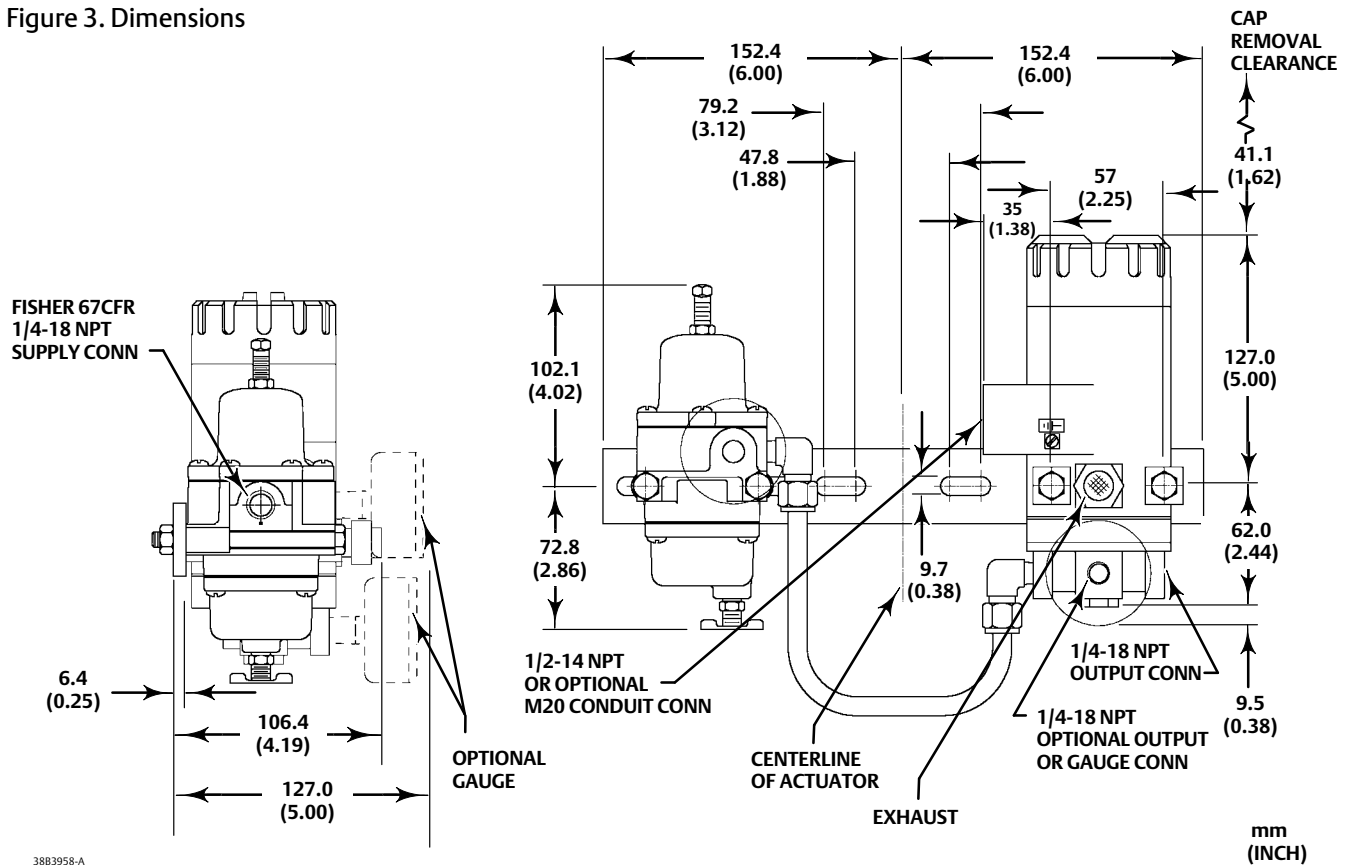


Figure 3. Dimensions



## Installation

Refer to figure 3 for location of standard mounting holes in the housing. Standard mounting hardware is provided for mounting on the actuator, a pipestand, or a panel. Field wiring connections are made to the terminal block accessible under the housing cap. Dimensions are shown in figure 3.

## Ordering Information

To determine what ordering information is required, refer to the specification table. Carefully review the description of each specification. Specify the desired choice whenever there is a selection available. Also, specify options that are applicable to the application.

Neither Emerson, Emerson Automation Solutions, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

Fisher is a mark owned by one of the companies in the Emerson Automation Solutions business unit of Emerson Electric Co. Emerson Automation Solutions, Emerson, and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson Automation Solutions  
Marshalltown, Iowa 50158 USA  
Sorocaba, 18087 Brazil  
Cernay, 68700 France  
Dubai, United Arab Emirates  
Singapore 128461 Singapore

www.Fisher.com

