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/acutator 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.

W6783-1

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

W4908-1

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(1)

Recommended: 1.4 bar (20 psig)

Minimum: 1.4 bar (20 psig)
Maximum: 3.4 bar (50 psig)

Average Steady-State Air Consumption(2)(3)

0.08 m^3/hr (3 scfh) at 1.4 bar (20 psi) supply pressure

Maximum Output Air Capacity(2)

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

Performance(4)

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 (First Edition)
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(1)

-40 to 71°C (-40 to +160°F)

Electrical Classification

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

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

ATEX— Intrinsically Safe, Flameproof, Type n

IECEx— Intrinsically Safe, Flameproof, Type n

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

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 Process Management sales office for classification/certification specific information

Construction Materials

Housing, Cap, and Relay Body: Die cast aluminum with less than 1% copper

-continued-

Specifications (continued)

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

Mounting Position

Any position is acceptable for standard pipestand, panel, or actuator mounting. For weatherproof housing, mount the transducer to allow the vent to drain.

Approximate Weight (Transducer Only)

1.6 kg (3.5 pounds)

Options

Output pressure gauge

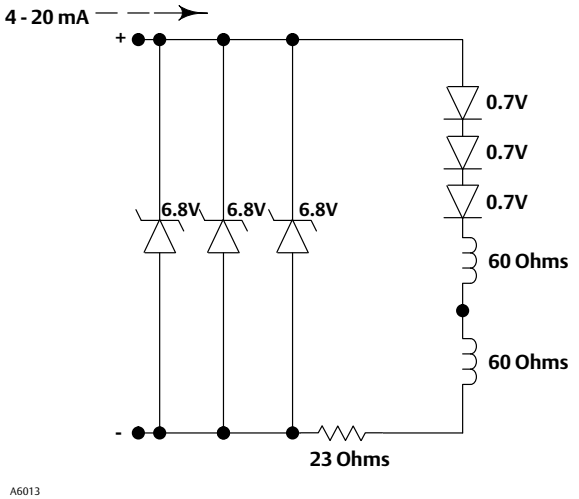
NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
2. Normal m^3/hour--Normal cubic meters per hour (0°C and 1.01325 bar, 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(1)
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



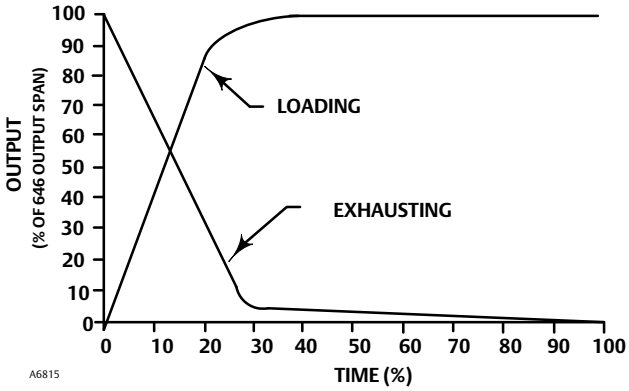
Features

- 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.

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 Process Management sales office.

Figure 2. Output-Time Relationships



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.

Figure 3. Dimensions

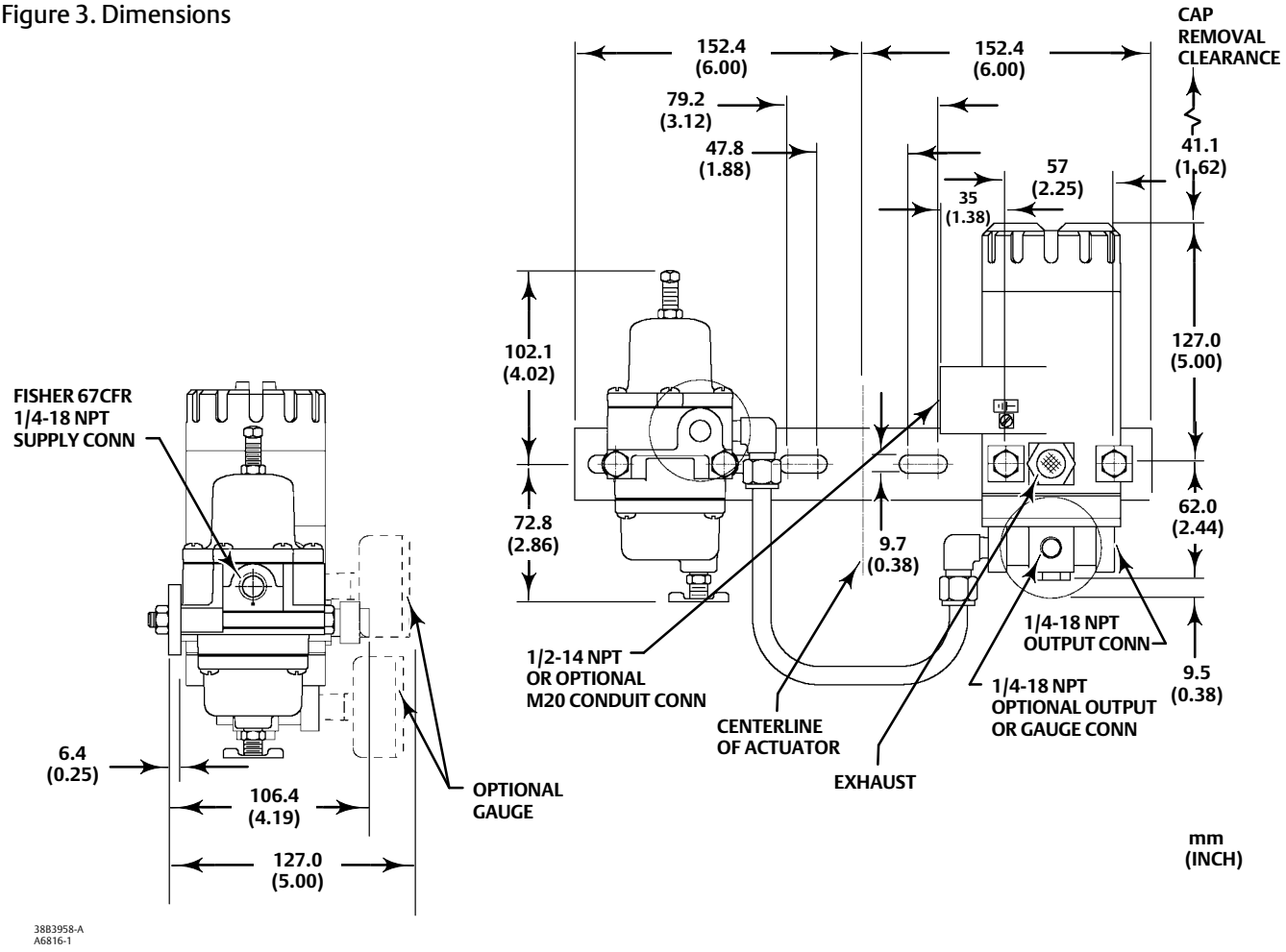


Table 2. Hazardous Area Classifications—CSA (Canada)

Certification Body	Certification Obtained	Entity Rating	Temperature Code
CSA	Intrinsically Safe Ex ia IIC T4/T5 per drawing GE28591 Ex ia Intrinsically Safe Class I, II, Division 1 GP A,B,C,D,E,F,G T4/T5 per drawing GE28591	Vmax = 30 VDC Imax = 150 mA Pi = 1.0 W Ci = 0 nF Li = 0 mH	T4 (Tamb ≤ 71°C) T5 (Tamb ≤ 40°C)
	Explosion-proof Ex d IIC T6 Class I, Division I, GP A,B,C,D T6	---	T6 (Tamb ≤ 71°C)
	Type n Ex nL IIC T6	---	T6 (Tamb ≤ 71°C)
	Class I, Division 2, GP A,B,C,D T6 Class II, Division 1, Groups E,F,G T6 Class II, Division 2, GP F,G T6	---	T6 (Tamb ≤ 71°C)

Table 3. Hazardous Area Classifications—FM (United States)

Certification Body	Certification Obtained	Entity Rating	Temperature Code
FM	Intrinsically Safe Class 1 Zone 0 AEx ia IIC T4/T5 per drawing GE28590 Class I, II, III Division 1 GP A,B,C,D,E,F,G T4/T5 per drawing GE28590	Vmax = 30 VDC Imax = 150 mA Pi = 1.0 W Ci = 0 nF Li = 0 mH	T4 (Tamb ≤ 71°C) T5 (Tamb ≤ 40°C)
	Explosion-proof Class 1 Zone 1 AEx d IIC T6 Class I, Division I, GP A,B,C,D T6	---	T6 (Tamb ≤ 71°C)
	Type n CL 1 Zone 2 AEx nL IIC T6	---	T6 (Tamb ≤ 71°C)
	Class I, Division 2, GP A,B,C,D T6 Class II, Division 1, Groups E,F,G T6 Class II, Division 2, GP F,G T6	---	T6 (Tamb ≤ 71°C)

Table 4. Hazardous Area Classifications—ATEX

Certificate	Certification Obtained	Entity Rating	Temperature Code
ATEX	⟨Ex⟩ II 1 G & D		
	Intrinsically Safe Gas Ex ia IIC T4/T5 Ga	Ui = 30 VDC Ii = 150 mA Pi = 1.0 W Ci = 0 nF Li = 0 mH	T4 (Tamb ≤ 71°C) T5 (Tamb ≤ 40°C)
	Dust Ex ia IIIC T155°C Da (Tamb ≤ 71°C) T124°C (Tamb ≤ 40°C)		---
	⟨Ex⟩ II 2 G & D		
	Flameproof Gas Ex d IIC T6 Gb	---	T6 (Tamb ≤ 71°C)
	Dust Ex tb IIIC T74°C Db (Tamb ≤ 71°C)	---	---
	⟨Ex⟩ II 3 G & D		
	Type n Gas Ex nA IIC T6 Gc	---	T6 (Tamb ≤ 71°C)
	Dust Ex tc IIIC T74°C Dc (Tamb ≤ 71°C)		---

Table 5. Hazardous Area Classifications—IECEx

Certificate	Certification Obtained	Entity Rating	Temperature Code
IECEx	Intrinsically Safe Gas Ex ia IIC T4/T5 Ga	Ui = 30 VDC Ii = 150 mA Pi = 1.0 W Ci = 0 nF Li = 0 mH	T4 (Tamb ≤ 71°C) T5 (Tamb ≤ 40°C)
	Flameproof Gas Ex d IIC T6 Gb	- - -	T6 (Tamb ≤ 71°C)
	Type n Gas Ex nA IIC T6 Gc	- - -	T6 (Tamb ≤ 71°C)

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