

# Fisher™ 646 Electro-Pneumatic Transducer

## Contents

|                                                                                                                            |    |
|----------------------------------------------------------------------------------------------------------------------------|----|
| Introduction .....                                                                                                         | 1  |
| Scope of Manual .....                                                                                                      | 1  |
| Description .....                                                                                                          | 3  |
| Specifications .....                                                                                                       | 4  |
| Educational Services .....                                                                                                 | 4  |
| Installation .....                                                                                                         | 4  |
| Hazardous Area Classifications and<br>Special Instructions for “Safe Use” and<br>Installation in Hazardous Locations ..... | 5  |
| Mounting .....                                                                                                             | 5  |
| Pneumatic Connections .....                                                                                                | 5  |
| Supply Pressure Requirements .....                                                                                         | 6  |
| Diagnostic Connections .....                                                                                               | 7  |
| Vent .....                                                                                                                 | 7  |
| Electrical Connections .....                                                                                               | 7  |
| Operating Information .....                                                                                                | 9  |
| Calibration .....                                                                                                          | 9  |
| Equipment Required .....                                                                                                   | 9  |
| Calibration Procedure .....                                                                                                | 9  |
| Principle of Operation .....                                                                                               | 10 |
| Maintenance .....                                                                                                          | 11 |
| Troubleshooting .....                                                                                                      | 12 |
| Converter Module Replacement .....                                                                                         | 12 |
| Relay Maintenance .....                                                                                                    | 13 |
| Parts Ordering .....                                                                                                       | 15 |
| Parts List .....                                                                                                           | 15 |
| Parts Kits .....                                                                                                           | 15 |

Figure 1. Fisher 646 Electro-Pneumatic Transducer Mounted on a Sliding-Stem Actuator



W6783-1

## Introduction

### Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts ordering information for the Fisher 646 transducer. Refer to separate manuals for instructions covering equipment used with the transducer.



Do not install, operate or maintain a 646 electro-pneumatic transducer without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance. To avoid personal injury or property damage it is important to carefully read, understand, and follow all of the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) before proceeding.

Table 1. Specifications

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <p><b>Input Signal</b><br/>4-20 mA DC, constant current with 30 VDC maximum compliance voltage</p> <p><b>Equivalent Circuit</b><br/>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 6).</p> <p><b>Output Signal</b><br/>0.2 to 1.0 bar (3 to 15 psig) direct acting only</p> <p><b>Supply Pressure<sup>(1)</sup></b><br/>Recommended: 1.4 bar (20 psig)<br/>Minimum: 1.4 bar (20 psig)<br/>Maximum: 3.4 bar (50 psig)</p> <p><b>Average Steady-State Air Consumption<sup>(2)(3)</sup></b><br/>0.08 m<sup>3</sup>/hr (3 scfh) at 1.4 bar (20 psi) supply pressure</p> <p><b>Maximum Output Air Capacity<sup>(2)</sup></b><br/>8.0 m<sup>3</sup>/hr (300 scfh) at 1.4 bar (20 psig) supply pressure</p> <p><b>Performance<sup>(4)</sup></b><br/>Reference Accuracy: <math>\pm 0.5\%</math> of full scale output span; includes combined effects of hysteresis, linearity, and deadband<br/>Independent Linearity: <math>\pm 0.5\%</math> of full scale output span<br/>Hysteresis: 0.4% of full scale output span<br/>Frequency Response: Gain is attenuated 3 dB at 10 Hz with transducer output signal piped to a typical instrument input<br/>Temperature Effect: <math>\pm 4\%</math> of full scale output span per 55°C (100°F) change<br/>Supply Pressure Effect: 0.2% of full scale output span per psi supply pressure change<br/>Vibration Effect: Less than 1% of full scale output span when tested to SAMA PMC 31.1, Condition 3<br/>Electromagnetic Compatibility<br/>Meets EN 61326-1:2013<br/>Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 2 below.<br/>Emissions—Class A<br/>ISM equipment rating: Group 1, Class A</p> | <p><b>Operating Ambient Temperature Limits<sup>(1)</sup></b><br/>-40 to 71 °C (-40 to +160 °F)</p> <p><b>Electrical Classification</b><br/>CSA—Intrinsically Safe, Explosion proof, Type n, Dust-Ignition proof, DIV 2<br/>FM—Intrinsically Safe, Explosion proof, Type n, Non-incendive, Dust-Ignition proof<br/>ATEX—Intrinsically Safe, Flameproof, Type n<br/>IECEx—Intrinsically Safe, Flameproof, Type n</p> <p><b>Housing</b><br/>CSA—Type 3 Encl.<br/>FM—NEMA 3, IP54<br/>ATEX—IP64<br/>IECEx—IP54<br/>Mount instrument with vent on side or bottom if weatherproofing is a concern.</p> <p><b>Other Classifications/Certifications</b><br/>CUTR—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)<br/>INMETRO—National Institute of Metrology, Quality and Technology (Brazil)<br/>KTL—Korea Testing Laboratory (South Korea)<br/>Contact your Emerson sales office for classification/certification specific information</p> <p><b>Connections</b><br/>Supply and Output Pressure: 1/4 NPT internal connection<br/>Vent: 1/4 NPT internal<br/>Electrical: 1/2-14 NPT conduit connection<br/>Wire Size: 18 to 22 AWG</p> <p><b>Adjustments</b><br/>Zero and Span: Trim potentiometers (20 turn) for zero and span adjustments are located under the housing cap (see figure 7)</p> |
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-continued-

Table 1. 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 so the vent can drain.</p> <p><b>Approximate Weight (Transducer Only)</b></p> <p>1.6 kg (3.5 pounds)</p> <p><b>Actuator Stroking Time</b></p> <p>See figure 2</p> | <p><b>Declaration of SEP</b></p> <p>Fisher Controls International LLC declares this product to be in compliance with Article 4 paragraph 3 of the PED Directive 2014/68/EU. It was designed and manufactured in accordance with Sound Engineering Practice (SEP) and cannot bear the CE marking related to PED compliance.</p> <p>However, the product <i>may</i> bear the CE marking to indicate compliance with <i>other</i> applicable European Community Directives.</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>/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. Average flow rate determined at 12 mA and 0.6 bar (9 psig) output.

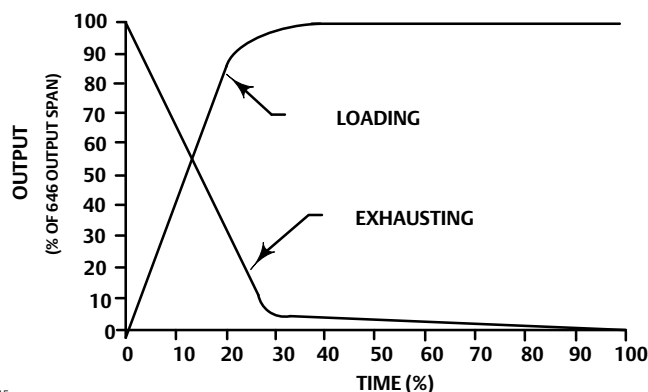
4. Performance values are obtained using a transducer with a 4 to 20 mA DC input signal and a 0.2 to 1.0 bar (r3 to 15 psig) output signal at an ambient temperature of 24°C (75°F).

Table 2. 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<br>8 kV air                                                                                                                    | A                                   |
|                    | Radiated EM field             | IEC 61000-4-3  | 80 to 1000 MHz @ 10V/m with 1 kHz AM at 80%<br>1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80%<br>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                                   |

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

Figure 2. Output-Time Relationships for Fisher 646 Transducer



A6815

## Description

The transducer, shown in figure 1, receives a 4-20 milliamper DC input signal and transmits a proportional 0.2 to 1.0 bar (3 to 15 psig) pneumatic output pressure to a final control element. A typical application is in electronic control loops where the final control element is a control valve assembly that is pneumatically operated. The input signal and output pressure range of the transducer is indicated on the nameplate attached to the housing.

**NOTICE**

Dropping or rough handling of the transducer can cause damage to the converter module resulting in a shifted output or a minimum output.

**⚠ WARNING**

This product *does not* meet third party approvals (CSA, FM, ATEX, or IECEx) for use with natural gas as the supply medium. Use of natural gas as the supply medium can damage the instrument and result in personal injury or property damage from fire or explosion.

Should you need an instrument for use with natural gas, Fisher 846 and i2P-100 electro-pneumatic transducers both meet third party approvals for use with natural gas as the supply medium. Contact your [Emerson sales office](#) for information on these products.

## Specifications

Specifications for the 646 transducer are listed in table 1.

## Educational Services

Emerson Automation Solutions  
Educational Services - Registration  
Phone: +1-800-338-8158  
E-mail: [education@emerson.com](mailto:education@emerson.com)  
[emerson.com/mytraining](http://emerson.com/mytraining)

## Installation

**⚠ WARNING**

Always wear protective clothing, gloves, and eyewear when performing any installation operations to avoid personal injury.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

**NOTICE**

Do not use sealing tape on pneumatic connections. This instrument contains small passages that may become obstructed by detached sealing tape. Thread sealant paste should be used to seal and lubricate pneumatic threaded connections.

## Hazardous Area Classifications and Special Instructions for “Safe Use” and Installation in Hazardous Locations

Refer to the following instruction manual supplements for approval information.

- CSA Hazardous Area Approvals Fisher 646 Electro-Pneumatic Transducer ([D104199X012](#))
- FM Hazardous Area Approvals Fisher 646 Electro-Pneumatic Transducer ([D104200X012](#))
- ATEX Hazardous Area Approvals Fisher 646 Electro-Pneumatic Transducer ([D104201X012](#))
- IECEx Hazardous Area Approvals Fisher 646 Electro-Pneumatic Transducer ([D104202X012](#))

All documents are available from your Emerson sales office or at Fisher.com. Contact your Emerson sales office for all other approval/certification information.

## Mounting

When a transducer is ordered as part of a control valve assembly, the factory mounts the transducer on the actuator and connects the necessary tubing, then adjusts the transducer as specified on the order.

Transducers also can be ordered separately for mounting on a control valve assembly already in service, or for mounting on a 2 inch diameter pipestand, a flat surface, or a bulkhead. The transducer may be ordered either with or without mounting parts. Mounting parts include a mounting plate and bolts and, if ordered for pipestand mounting, a pipe clamp. Tubing is not included if the transducer is not factory mounted. Use 10 mm (3/8-inch) diameter tubing for all input and output connections. The length of tubing between the transducer output and the final control element should be as short as possible. Transducer overall dimensions are shown in figure 3. If weatherproofing is required, mount the transducer so that the vent can drain. Do not allow moisture or condensate to collect in the vent.

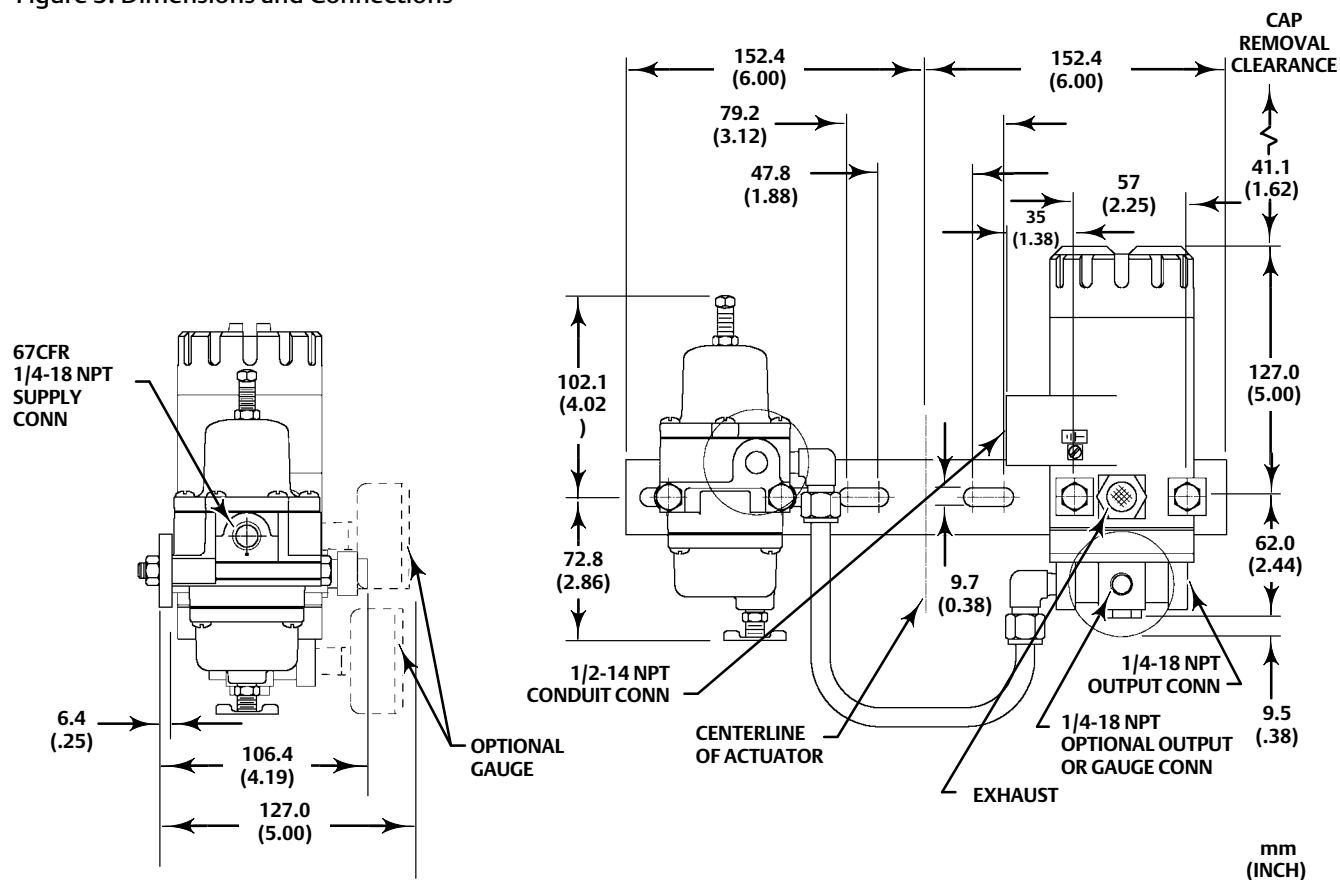
## Pneumatic Connections

### **NOTICE**

**Do not use sealing tape on pneumatic connections. This instrument contains small passages that may become obstructed by detached sealing tape. Thread sealant paste should be used to seal and lubricate pneumatic threaded connections.**

As shown in figure 3, all pressure connections on the transducer are 1/4 NPT internal connections. Use 10 mm (3/8-inch) tubing for all pressure connections. Refer to the vent subsection below for remote vent connections.

Figure 3. Dimensions and Connections

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A6816-1

## Supply Pressure Requirements

### ⚠ WARNING

Severe personal injury or property damage may occur if the instrument air supply is not clean, dry and oil-free. While use and regular maintenance of a filter that removes particles larger than 40 micrometers in diameter will suffice in most applications, check with an Emerson field office and industry instrument air quality standards for use with corrosive air or if you are unsure about the proper amount or method of air filtration or filter maintenance.

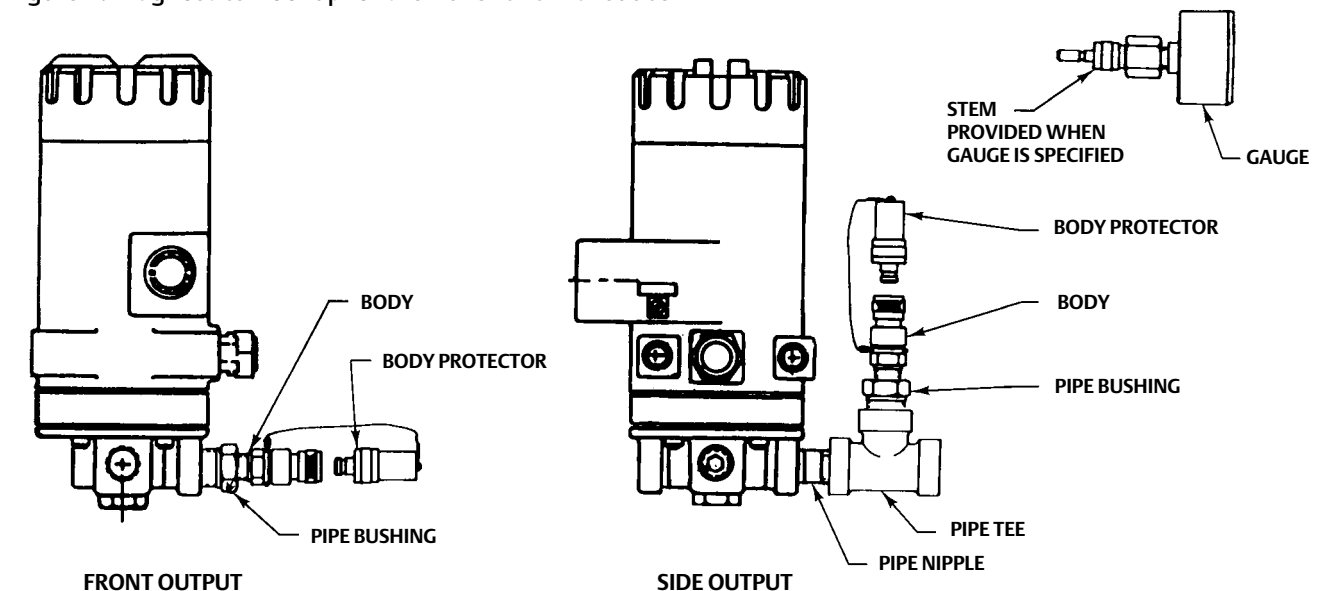
Supply pressure must be clean, dry air. Use a Fisher 67CFR filter regulator with standard 5 micrometer filter, or equivalent, to filter and regulate supply air. The filter regulator can be mounted on a bracket with the transducer as shown in figure 11 or mounted on the actuator mounting boss. An output pressure gauge may be installed on the regulator to indicate the supply pressure to the transducer. Also, as an aid for calibration, a second gauge may be installed on the transducer to indicate transducer output pressure.

Connect the nearest suitable supply source to the 1/4 NPT IN connection on the filter regulator (if furnished) or to the 1/4 NPT SUPPLY connection on the transducer case (if the filter regulator is not attached).

## Diagnostic Connections

To support diagnostic testing of valve/actuator/positioner packages, special connectors and hardware are available. Typical connector installations are shown in figure 4. The hardware used includes a 1/4 NPT pipe nipple and pipe tee with a 1/8 NPT pipe bushing for the connector. The connector consists of a 1/8 NPT body and body protector.

Figure 4. Diagnostics Hookup for the Fisher 646 Transducer



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B2395-1

### Note

If the 646 transducer is used in a valve assembly with a positioner, no hook-up for diagnostic testing is required for the 646. The hook-up for diagnostic testing should be installed at the positioner.

Install the connectors and hardware between the 646 transducer and the actuator.

1. Before assembling the pipe nipple, pipe tee, pipe bushings, actuator piping, and connector body, apply sealant to all threads.
2. Turn the pipe tee to position the connector body and body protector for easy access when doing diagnostic testing.

## Vent

If a remote vent is required, the vent line must be as short as possible with a minimum number of bends and elbows. To connect a remote vent, remove the plastic vent (key 41, figure 10). The vent connection is 1/4 NPT internal. Use 3/8-inch tubing to provide a remote vent.

## Electrical Connections

### ⚠ WARNING

For explosion-proof applications, disconnect power before removing the housing cap.

For explosion-proof Class 1, Division 1 applications using metal conduit, install a conduit seal no more than 457 mm (18 inches) from the transducer. Personal injury or property damage may result from explosion if the seal is not installed. For other explosion-proof applications, install the transducer in accordance with applicable codes.

#### Note

For proper wiring and installation for intrinsically safe installations, refer to the nameplate affixed to the product and loop schematics for CSA and FM or to instructions provided by the barrier manufacturer.

### ⚠ WARNING

Select wiring and/or cable glands that are rated for the environment of use (such as hazardous area, ingress protection, and temperature). Failure to use properly rated wiring and/or cable glands can result in personal injury or property damage from fire or explosion.

Wiring connections must be in accordance with local, regional, and national codes for any given hazardous area approval. Failure to follow the local, regional, and national codes could result in personal injury or property damage from fire or explosion.

Use the 1/2-14 NPT conduit connection, shown in figure 3, for installation of field wiring. For Class I, Division I explosion-proof applications, install rigid metal conduit and a seal no more than 457 mm (18 inches) from the transducer. Also, install conduit using local and national electrical codes which apply to the application.

Refer to figures 5, 6, and 7 when connecting field wiring from the control device to the transducer. Connect the positive wire from the control device to the transducer “+” terminal and, the negative wire from the control device to the transducer “-” terminal. Do not overtighten the terminal screws. Maximum torque is 0.45 N•m (4 lbf•in.). Connect the transducer grounding terminal to earth ground. Grounding terminals are provided both inside and outside the transducer housing.

Figure 5. Typical Field Wiring Diagram

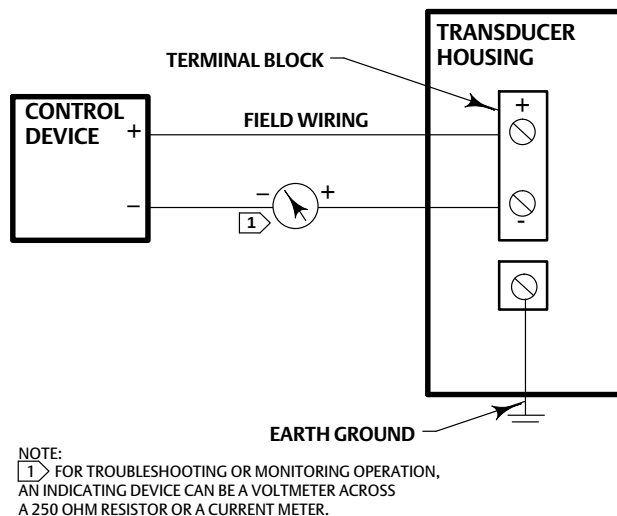


Figure 6. Equivalent Circuit

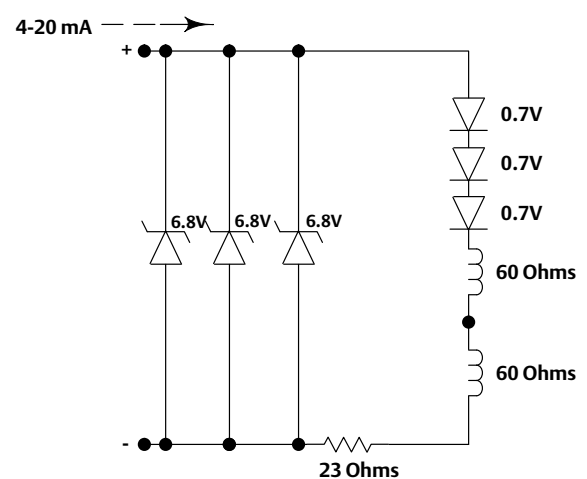
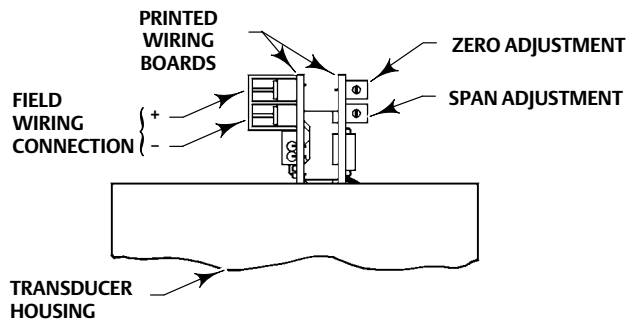


Figure 7. Zero and Span Adjustments and Terminal Block Connections (Cap Removed)



A3876-2

## Operating Information

The normal mode of operation for the 646 transducer requires that the pneumatic output pressure be piped to the final control element. If this is not done the resulting pneumatic output will vent to the atmosphere.

## Calibration

### ⚠ WARNING

On explosion-proof instruments, remove electrical power before removing the housing cap in a hazardous area. Personal injury or property damage may result from fire or explosion if power is applied to the transducer with the cap removed in a hazardous area.

For intrinsically safe areas, current monitoring during operation must be with a meter approved for use in hazardous areas.

## Equipment Required

Choose a current or voltage source that is capable, without switching ranges, of driving the transducer through its entire input range. Switching ranges on a current or voltage source will produce spikes or mid-scale reverses in the input signal presented to the transducer, causing errors. The current source should be capable of delivering 30 mA with 30 VDC maximum compliance voltage.

## Calibration Procedure

### ⚠ WARNING

For critical processes, this calibration procedure requires taking the final control element out of service. To avoid personal injury or property damage due to an uncontrolled process, provide some temporary means of process control before beginning the calibration procedure.

Refer to figure 7 for adjustment locations.

1. If a current source other than the control device is used as the input source, disconnect the control device and connect the current source positive terminal to the transducer “+” terminal and the current source negative terminal to the transducer “-” terminal.

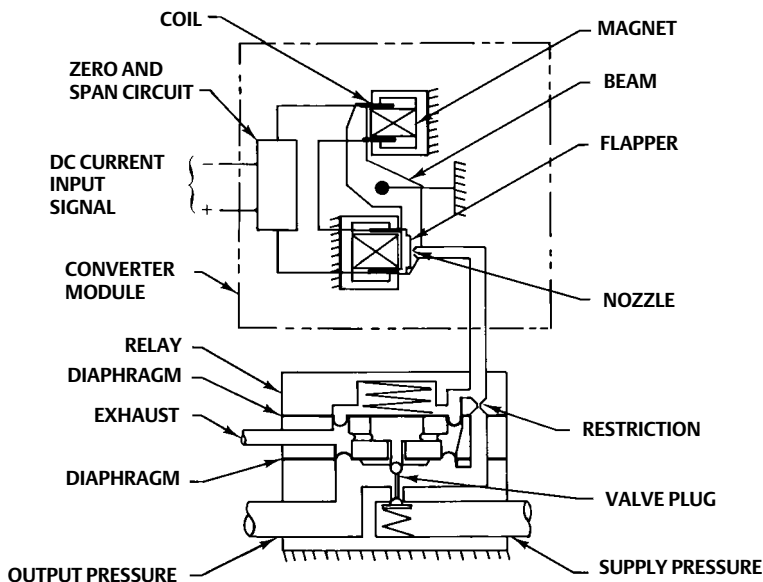
If an external meter is used, connect the current source positive terminal to the transducer “+” terminal. Connect the meter positive terminal to the transducer “-” terminal and the meter negative terminal to the current source negative terminal as shown in figure 5.

2. Check the supply pressure to ensure it is at the recommended pressure listed on the transducer nameplate.
3. Adjust the input current to 4.00 milliamperes DC.
4. The output pressure should be 0.2 bar (3 psig). If not, adjust the ZERO potentiometer until the output pressure is 0.2 bar (3 psig).
5. Adjust the input current to 20.00 milliamperes DC.
6. The output pressure should be 1.0 bar (15 psig). If not, adjust the SPAN potentiometer until the output pressure is 0.8 bar (15 psig).
7. Repeat steps 2 through 6 until the output pressure is within the referenced accuracy requirements without further adjustment.
8. If a current source other than the control device was used, disconnect the current source and reconnect the control device.

## Principle of Operation

The converter module receives a standard DC current input signal from a control device to operate coils in a force balanced beam system which in turn, controls bleed air through an integral nozzle/flapper arrangement. The nozzle pressure provides the input signal to operate the relay as shown in figure 8. Relay output pressure is applied, through tubing, directly to the final control element or valve/actuator assembly.

Figure 8. Fisher 646 Transducer Schematic



## Maintenance

The normal mode of operation for the 646 transducer requires that the pneumatic output pressure be piped to the final control element. If this is not done the resulting pneumatic output will vent to the atmosphere.

Due to normal wear or damage from external sources such as debris in the supply medium, periodic maintenance or repair of the transducer may be necessary. Maintenance of the transducer consists of troubleshooting, removal for inspection, and replacement of component parts.

### WARNING

To avoid personal injury or property damage from the sudden release of pressure:

- Always wear protective clothing, gloves, and eyewear when performing any maintenance operations.
- Do not remove the actuator from the valve while the valve is still pressurized.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure on both sides of the valve.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- Do not open when an explosive dust atmosphere is present.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

### WARNING

For explosion proof applications, disconnect power before removing the housing cap. Personal injury or property damage may result if power is not disconnected.

### WARNING

The presence of Emerson personnel and approval agency personnel may be required if you service (other than normal, routine maintenance, such as calibration) or replace components on a 646 transducer that carries a third-party approval. When you replace components, use only components specified by the factory. Substitution with other components may void the third-party approval and result in personal injury or property damage. Also, always use proper component replacement techniques, as presented in this manual. Improper techniques can cause poor quality repairs and impair the safety features of the device.

The converter module should never be disassembled because the magnetism in the coils will decrease permanently. If troubleshooting or alignment attempts indicate a faulty converter module, replace the module or return the transducer to your [Emerson sales office](#) for repair.

## Troubleshooting

The following procedures require taking the control valve/actuator assembly out of service. Provide some temporary means of process control before taking the control valve out of service.

### Electrical

1. Ensure terminal lug connections from the control device to the transducer are of the correct polarity (refer to the electrical connection procedures in the Installation section).
2. At the transducer, ensure that the milliampere DC signal is applied and that it is within the 4 to 20 milliampere range.

### Pneumatic

Provide a 4-30 milliampere DC current source, supply pressure, and a gauge to monitor the output pressure when checking transducer operation. Refer to figure 10 for key number locations.

1. Ensure that supply pressure to the transducer is a consistent 1.4 bar (20 psig).
2. If a filter/regulator is used, ensure that it is working correctly. If not, ensure the dripwell is not plugged because of excessive moisture accumulation. If necessary, drain off any moisture, and clean or replace the filter element.
3. Force the converter module to maximum output pressure with a 30 milliampere DC signal. Output pressure should build up to the approximate value of the supply pressure.
4. When the input current is removed, the transducer output pressure should drop to less than 0.14 bar (2 psig). If it does not, check to ensure the vent and exhaust air passageway is free from foreign material.
5. To inspect the relay assembly, refer to the relay maintenance procedures.

## Converter Module Replacement

### Removal

Refer to figure 10 for key number locations.

1. Remove the housing cap (key 4).
2. Note the location of the wires, then remove the electrical wiring from the terminal block mounted on the printed wiring board.
3. Remove the two screws (key 19) and remove the converter module and wire guide (key 42) from the housing.
4. Inspect the O-ring (key 18) and replace if necessary.

### Replacement

1. Lubricate the O-ring (key 18) with a lubricating compound such as key 20 before replacing the converter module in the housing.
2. Insert the converter module and wire guide (key 42) into position in the housing (key 3). Replace the two screws (key 19) and tighten them.
3. Replace the electrical wiring removed in step 2 of the removal procedures. Do not overtighten the terminal screws. Maximum torque is 0.45 N•m (4 lbf•in).
4. Electrically calibrate the module following the procedures in the Calibration section.
5. Replace the housing cap (key 4).

## Relay Maintenance

Refer to figure 10 for key number locations.

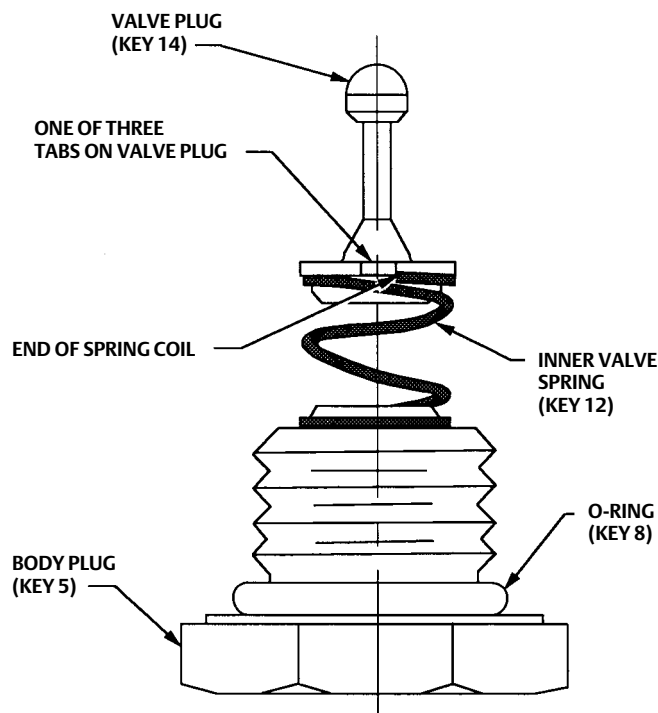
### Removal

1. Remove the four mounting screws (key 7) and remove the relay from the transducer. Be careful not to lose the bias spring (key 13) and input diaphragm (key 9).
2. Remove the body block (key 2) from the relay body assembly (key 1).
3. Remove the exhaust port assembly (key 10) from the relay assembly.
4. Remove the body plug (key 5) that holds the inner valve spring (key 12) and valve plug (key 14) in place.
5. Inspect the springs, exhaust seat, valve plug, and other parts for wear or damage; replace as necessary. Note: the valve plug supply seat is an insert in the relay body (key 1). If this insert is bad, replace the relay body.
6. Ensure that the fixed restriction in the transducer housing is clear of foreign matter.
7. Make sure all parts of the relay are clean and that all passages are clear of foreign matter.

### Assembly

1. Assemble the inner valve spring (key 12) onto the body plug (key 5) and fit the valve plug (key 14) onto the inner valve spring as shown in figure 9. To assure best alignment between the valve plug, inner valve spring, and body plug; fit the valve plug onto the inner valve spring so that one of the three tabs at the base of the valve plug sets at the end of the last coil of the inner valve spring.

Figure 9. Valve Plug, Inner Valve Spring and Body Plug Assembly



2. Insert the assembled valve plug, inner valve spring, and body plug into the relay body (key 1). Compress the spring and thread the body plug (key 5) into place. Then, tighten the body plug.
3. Insert two of the mounting screws (key 7) into two opposite holes of the relay body (key 1). Hold the screws in place while assembling the following parts on the relay body. The screws serve as studs to align the parts as they are being assembled.
4. When replacing the exhaust port assembly (key 10), make sure all passages and screw holes are aligned and that the hole in the center of the exhaust port assembly fits over the valve plug (key 14). Place the exhaust port assembly on the relay body (key 1). Hold assembled parts in place.
5. Make sure the tabs on the body block (key 2) align with the tabs on the relay body (key 1) and that the side with 5 holes faces the relay body. Place the body block on the assembled parts. Hold assembled parts in place.
6. When replacing the input diaphragm (key 9), make sure all passages and screw holes are aligned. Place the input diaphragm on the body block (key 2). Hold assembled parts in place.
7. Install the bias spring (key 13) into the transducer housing assembly (key 3). Make sure the tabs on the body block and relay body align with the tab on the transducer housing assembly. Place the assembled parts onto the transducer housing assembly. Thread the two mounting screws (key 7) into the transducer housing assembly. Install the remaining two mounting screws. Tighten all mounting screws to 2 N•m (20 lbf•in).
8. Perform the procedures in the Calibration section.

## Parts Ordering

A serial number is assigned to each transducer and stamped on the nameplate. Always refer to this serial number when corresponding with your [Emerson sales office](#) regarding spare parts or technical information.

### **⚠ WARNING**

**Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson may void your warranty, might adversely affect the performance of the instrument, and could result in personal injury or property damage.**

## Parts Kits

| Description                                                                                                                                  | Part Number |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 646 Transducer Repair Kit<br>Includes keys 6, 8, 9, 10, 12, 13, 14, and 18. The O-ring for the converter module is also included in the kit. | R646X000012 |

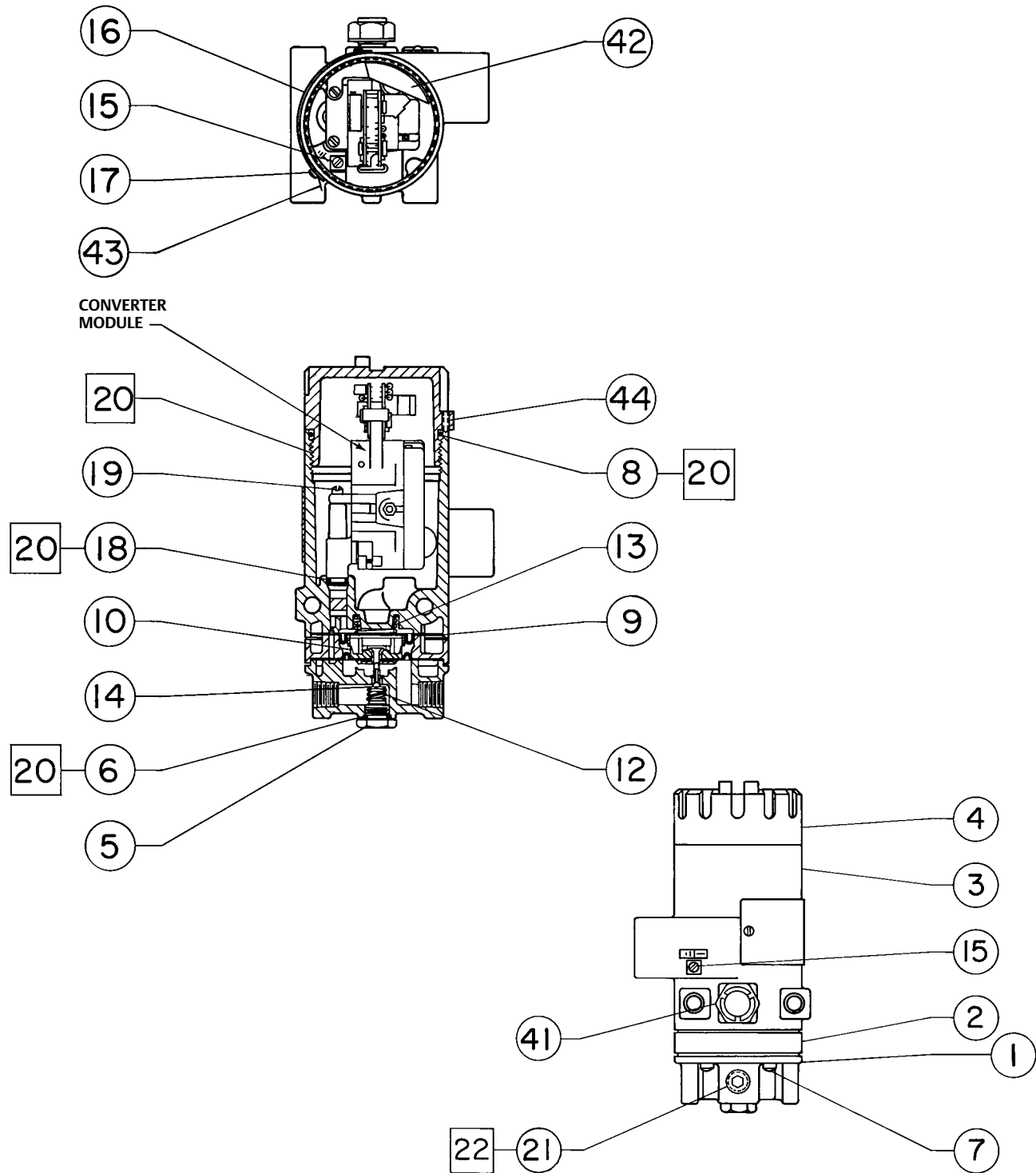
## Parts List

### Note

Contact your Emerson sales office for Part Ordering information.

| Key | Description                                             |
|-----|---------------------------------------------------------|
| 1   | Relay body assembly                                     |
| 2   | Body block                                              |
| 3   | Housing assembly<br>1/2 NPT conduit connection          |
| 4   | Housing Cap                                             |
| 5   | Body plug                                               |
| 6*  | O-ring                                                  |
| 7   | Machine screw (4 req'd)                                 |
| 8*  | O-ring                                                  |
| 9*  | Input diaphragm                                         |
| 10  | Exhaust port assembly                                   |
| 12  | Inner valve spring                                      |
| 13  | Bias spring                                             |
| 14* | Valve plug                                              |
| 15  | Wire retainer (2 req'd)                                 |
| 16  | Nameplate, w/o approvals                                |
| 17  | Screw (2 req'd)                                         |
| 18* | O-ring                                                  |
| 19  | Screw (2 req'd)                                         |
| 20  | Anti-seize lubricant<br>(not furnished with transducer) |
| 21  | Pipe plug, use when gauge is not specified (not shown)  |
| 21* | Gauge, 0-30 psig/0-0.2 MPa/0-2 bar<br>(not shown)       |
| 22  | Anti-seize sealant (not furnished with transducer)      |
| 41  | Vent, plastic                                           |
| 42  | Wire guide                                              |
| 43  | Wire lug                                                |
| 44  | Set Screw (LCIE)                                        |
| --- | Converter module                                        |

Figure 10. Fisher 646 Transducer Assembly



NOTE:  
KEY NUMBER 49 IS NOT SHOWN  
□ APPLY LUB/SEALANT

4182373-E

## Diagnostic Connections

### Note

Contact your [Emerson sales office](#) for diagnostic connections ordering information.

#### Description

FlowScanner™ diagnostic system hook-up  
Includes pipe tee, pipe nipple, pipe  
bushings, connector body, and body  
protector. See figure 4 for part  
identification.

### Note

If the 646 transducer is used in a valve assembly with a positioner, no  
hook-up for diagnostic testing is required for the 646. The hook-up for  
diagnostic testing should be installed at the positioner.

#### Front Output

For units with gauges

SST fittings

Brass fittings

For units without gauges

SST fittings

Brass fittings

#### Side Output

For units with gauges

SST fittings

Brass fittings

For units without gauges

SST fittings

Brass fittings

## Mounting Parts

### Yoke Mounting With 67CFR Filter Regulator

### Note

Contact your Emerson sales office for information on ordering the  
following 646 mounting options.

#### Key Description

For the following actuator types and sizes:

480 sizes 30-130; 585C all sizes; 656, sizes 40 & 60; 657 & 667,  
sizes 30-100; 1051 & 1052, sizes 30-60; 061 sizes 30-100; 1066  
all sizes

|     |                                                                                     |
|-----|-------------------------------------------------------------------------------------|
| 23  | Cap screw (4 req'd)                                                                 |
| 24  | Washer (6 req'd)                                                                    |
| 25  | Hex nut (4 req'd)                                                                   |
| 26  | Mounting plate                                                                      |
| 27  | Cap screw (2 req'd)<br>(Not req'd for 585C)                                         |
| 28  | Washer (6 req'd)<br>585C only                                                       |
| 36  | Elbow, for 3/8-inch tubing (4 req'd)<br>657, 1051, 1052, 1061, 1066 and 1066SR only |
| 37  | Connector, for 3/8-inch tubing (2 req'd)<br>480, 585C, and 667 only                 |
| --- | Spacer (2 req'd)<br>For 667 size 30                                                 |
| --- | Cap Screw (2 req'd)<br>For 585C only<br>For 667 size 30                             |

### Yoke Mounting w/o 67CFR Filter Regulator

For the following actuator types and sizes:

480 sizes 30-130; 585C all sizes; 657 sizes 30-100; 667 sizes  
40-100; 1051 & 1052 sizes 30-60; 1061 sizes 30-100; 1066 all  
sizes

|    |                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------|
| 23 | Cap screw (2 req'd)                                                                                                           |
| 36 | Elbow, for 3/8-inch tubing<br>For 657, 1051, 1052, 1061,<br>1066, and 1066SR only                                             |
| 37 | Connector, for 3/8-inch tubing<br>For 657, 1051, 1052, 1061,<br>1066, and 1066SR (1 req'd)<br>For 480, 585C and 667 (2 req'd) |

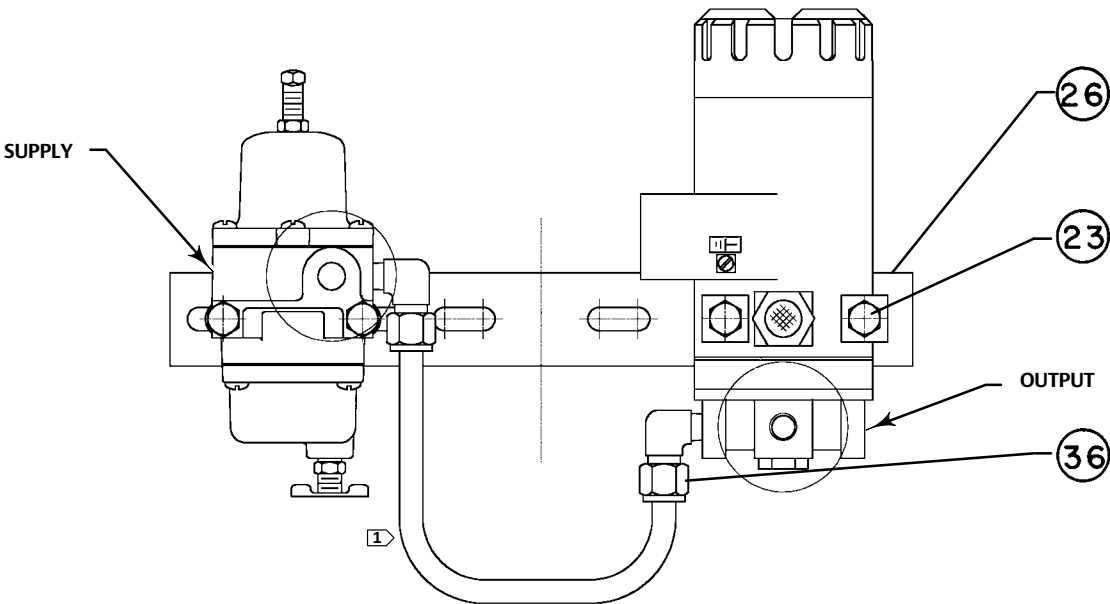
### Casing Mounting

For the following actuator types and sizes:

657 & 667 all sizes; 1051 sizes 30-60; 1052 sizes 20-70

|    |                                                              |
|----|--------------------------------------------------------------|
| 23 | Cap screw<br>With 67CFR (4 req'd)<br>Without 67CFR (2 req'd) |
| 24 | Washer<br>With 67CFR (4 req'd)<br>Without 67CFR (2 req'd)    |
| 25 | Hex nut<br>With 67CFR (4 req'd)<br>Without 67CFR (2 req'd)   |

Figure 11. Typical Fisher 646 Mounting With 67CFR Filter Regulator



NOTES:  
1 3/8-INCH TUBING SUPPLIED ONLY WHEN 646 IS FACTORY MOUNTED  
KEY NUMBERS 24, 25, 27, 32, 33, 37, 38, 39 ARE NOT SHOWN.

38b3958-A  
B2381-2

| Key | Description                                                                                            |
|-----|--------------------------------------------------------------------------------------------------------|
| 26  | Mounting plate<br>For 657 & 667 sizes 80 & 100 only<br>With 67CFR (2 req'd)<br>Without 67CFR (1 req'd) |
| 26  | Mounting plate<br>For other actuators<br>With 67CFR (2 req'd)<br>Without 67CFR (1 req'd)               |
| 36  | Elbow, for 3/8-inch tubing<br>With 67CFR (2 req'd)<br>Without 67CFR (1 req'd)                          |
| 37  | Connector, for 3/8-inch tubing<br>With 67CFR (2 req'd)<br>Without 67CFR (1 req'd)                      |

### Pipestand and Panel Mounting

|    |                                                                                                                                         |
|----|-----------------------------------------------------------------------------------------------------------------------------------------|
| 23 | Cap screw<br>Pipestand with 67CFR (4 req'd)<br>Pipestand without 67CFR & panel (2 req'd)<br>45° multiple panel <sup>(1)</sup> (2 req'd) |
|----|-----------------------------------------------------------------------------------------------------------------------------------------|

| Key | Description                                                                                                                              |
|-----|------------------------------------------------------------------------------------------------------------------------------------------|
| 24  | Washer<br>Pipestand<br>with 67CFR (4 req'd)<br>without 67CFR (2 req'd)<br>Panel (2 req'd)<br>45° multiple panel <sup>(1)</sup> (4 req'd) |
| 26  | Mounting plate<br>Pipestand with 67CFR<br>Pipestand without 67CFR<br>45° multiple panel <sup>(1)</sup>                                   |
| 27  | Cap screw<br>45° multiple panel <sup>(1)</sup> (2 req'd)                                                                                 |
| 32  | Hex nut<br>Pipestand with 67CFR (4 req'd)<br>Pipestand without 67CFR & panel (2 req'd)<br>45° multiple panel <sup>(1)</sup> (4 req'd)    |
| 33  | Pipe clamp<br>(pipestand only)                                                                                                           |
| 36  | Elbow, for 3/8-inch tubing<br>Pipestand & Panel W/67CFR (2 req'd)                                                                        |



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