

# F003 FLOW SWITCH

INSTALLATION AND OPERATIONS MANUAL

In-Line Flow Switch



**SOLUTIONS WITH INNOVATION**

AN INNOVATIVE SENSING COMPANY

ISO 9001:2008 CERTIFIED



## READ THIS MANUAL PRIOR TO INSTALLATION

This manual provides information on the **F003 In-Line Flow Switch**. It is important that all instructions are read carefully and followed sequentially. The **QuickStart Installation** instructions are a brief guide to the sequence of steps for experienced technicians to follow when installing the equipment. Detailed instructions are included in the **Complete Installation** section of this manual.

### Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data and safety information are presented in narrative form. The following styles are used for notes, cautions and warnings:

#### Notes

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions and often follow the procedural steps to which they refer.

#### Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician of unsafe practices, the need for special protective equipment, or specific materials. In this manual, a caution indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury.

#### Warnings

Warnings identify potentially dangerous situations, or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, may result in serious injury or death.

### Safety Messages

Follow all standard industry procedures for servicing electrical and computer equipment when working with, or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

If the equipment is used in a manner not specified by the manufacturer, protection provided by equipment may be impaired.

### Notice of Copyright and Limitations

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Solutions With Innovation reserves the right to make changes to the product described in this manual at any time without notice. Solutions With Innovation makes no warranty with respect to the accuracy of the information in this manual.

### Warranty

All Solutions With Innovation Electronic Level and Flow Controls are warranted free of defects in materials and workmanship for one full year from the date of the original factory shipment. If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Solutions With Innovation will repair or replace the product at no cost to the purchaser (or owner) other than transportation.

Solutions With Innovation shall not be liable for misapplication, labor claims, direct or consequential damage, or expenses arising from the installation or use of the equipment. There are no other warranties expressed or implied, except special written warranties covering specific Solutions With Innovation products.

### Quality Assurance

The Quality Assurance System in place at Solutions With Innovation guarantees the highest level of quality throughout the company. Solutions With Innovation is committed to providing full customer satisfaction; both in quality products and in quality service.

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# F003 FLOW SWITCH

In-Line Switch

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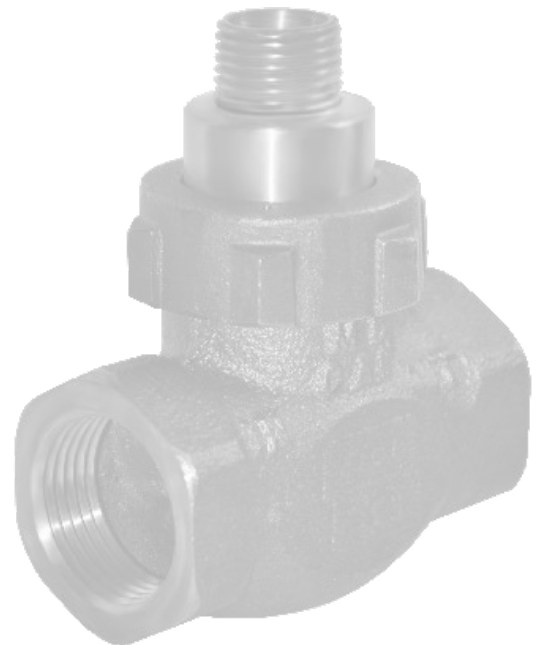
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## 1.0 QUICKSTART INSTALLATION

The Quickstart Installation procedures provide key steps for mounting, wiring and configuring the F003 Flow Switch. These procedures are intended for experienced installers of electronic level measurement instruments. Refer to **Section 2.0: Complete Installation** for detailed installation instructions.

### 1.1 GETTING STARTED

Before beginning the Quickstart Installation procedures, have the proper equipment, tools and information readily available.

#### 1.1.1 Equipment and Tools

- Open-End Wrenches or An Adjustable Wrench to Fit the Process Connection Size and Type

#### 1.1.2 Configuration Information

The standard F003 In-Line Flow Switch models are factory-calibrated devices. Therefore, field calibration is not required.

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## 2.0 COMPLETE INSTALLATION

This section provides detailed procedures on properly installing the F003 In-Line Flow Switches.

 **CAUTION!** IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.

### 2.1 UNPACKING

Unpack the instrument, carefully. Make sure that all components have been removed from the packing material. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours of receiving. Compare the contents with the packing slip and report any discrepancies to the factory immediately. Record the sales order number and/or serial number for future reference when ordering parts.

#### **Before Proceeding to Installation, Complete the Following:**

- Inspect all components for damage. Report any damage to the carrier within 24 hours of receiving.
- Record the model and serial numbers for future reference when ordering parts.

Model Number \_\_\_\_\_

Serial Number \_\_\_\_\_

### 2.2 INSTALLATION LOCATION

The F003 In-Line Flow Switches should be located within easy access for service and monitoring. Flow switches should not be exposed to ambient temperatures below  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ) or above  $+300^{\circ}\text{F}$  ( $+148^{\circ}\text{C}$ ). Special precaution should be made to prevent exposure to corrosive atmospheres, excessive vibration, shock and physical damage.

### 2.3 BEFORE YOU BEGIN

#### 2.3.1 Site Preparation

- 1 Each F003 Flow Switch is built to the specifications indicated during the ordering process. Make sure that the connection is correct for the threaded mounting on the vessel or pipe where the flow switch will be placed. Refer to **Section 2.4: Mounting**.
- 2 Ensure that the wiring for the F003 Flow Switch is complete and correct for the type of installation. Refer to **Section 4.5: Specifications**.
- 3 When installing the F003 Flow Switch in a general purpose area, all local, state and federal regulations/guidelines must be observed. Refer to **Section 2.5: Wiring**.

#### 2.3.2 Equipment and Tools

No special equipment or tools are required to install the F003 In-Line Flow Switches.

#### **The Following Are Recommended:**

- Open-End Wrenches or An Adjustable Wrench to Fit the Process Connection Size and Type

## 2.4 MOUNTING

The F003 In-Line Flow Switch is mounted using a threaded process connection. This device can be installed horizontally or vertically. Contact the manufacturer for additional connection sizes available.

### 2.4.1 Installing the Switch

**⚠ WARNING!** DO NOT DISASSEMBLE THE FLOW SWITCH WHEN IT IS IN SERVICE AND/OR UNDER PRESSURE.

#### Before Proceeding:

- Verify that the flow switch has adequate room for installation.
- Ensure that the process temperature, pressure and viscosity are within the switch's designated ranges.

#### How to Install a F003 In-Line Flow Switch:

- 1 Verify that the process connection is the correct size for the flow switch.
- 2 Align the flow switch's process connection with the threaded mounting on the application.
- 3 Verify that the media's flow direction corresponds to the "in" and "out" port body markings. The flow switch only operates in one flow direction. *The flow switch will not operate in the reverse flow direction.*
- 4 Tighten the hex portion of the flow switch's process connections by hand.
- 5 Use an open-end or adjustable wrench to tighten the process connections.

## 2.5 WIRING

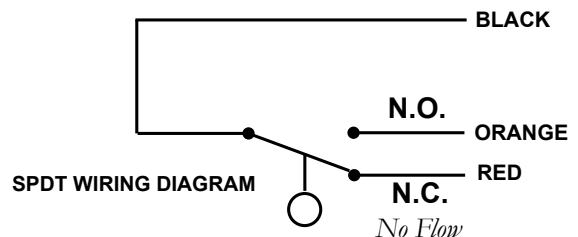
**⚡ CAUTION!** OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.

### 2.5.1 General Purpose Wiring

- A General Purpose Installation does not have flammable media present.
- Power must be shut off before attempting to wire the device.

#### How to Install General Purpose Wiring:

- 1 Connect the wiring to the proper switch leads, as illustrated to the right.



#### Contact Protection:

In order to maintain the life and reliability of the internal reed switch, it is essential to provide protection when switching inductive loads. When the current breaks, the energy stored in the load generates a high frequency voltage across the switch contacts. If the voltage is large enough, it can initiate arcing and cause the contacts to weld together. Damage can ultimately be prevented by suppressing the voltage. Through the use of a diode for DC circuits and a resistor-capacitor network for AC circuits, contact protection will ensure reliable performance from the reed switch.

## 3.0 PREVENTATIVE MAINTENANCE

Periodic inspections are necessary to maintain the proper functionality of the F003 Flow Switch. The switch is a safety device that protects the equipment they serve. A systematic program of preventative maintenance should be implemented at the time of installation. If the following instructions are completed routinely, the switches will provide continuous, reliable protection.

### 3.1 MAINTENANCE PROCEDURES

#### 3.1.1 Inspect Connections Monthly

F003 Flow Switches may be vulnerable to excessive heat and moisture. Under these conditions, the electrical wire insulation can periodically break or peel away. As a result, the bare wires may become exposed to the elements and incur damages.

- Inspect all wiring, carefully and replace any wires exhibiting signs of brittle insulation.
- Inspect all electrical connections to ensure tightness.
- Repair or replace any wiring, if necessary.

#### 3.1.2 Keep Unit Clean

Periodic cleanings of the inlet and outlet ports will ensure the continual, uninterrupted movement of the mechanism. Always keep the flow ports clean and free of any potential interferences. Objects and debris may cause systematic interruptions and a loss in equipment functionality.



### 3.2 WHAT TO AVOID

- ⚠ NEVER LEAVE THE SWITCH WIRING EXPOSED TO THE ELEMENTS.**
- ⚠ NEVER PLACE A JUMPER WIRE ACROSS THE TERMINALS TO “CUT-OUT” THE CONTROL.** *If a jumper is necessary for testing purposes, ensure that it is removed prior to placing the control into service.*
- ⚠ NEVER USE IN SYSTEMS CONTAINING IRON PARTICLES.** *The magnet within the float assembly can attract the particles and become jammed.*

## 4.0 REFERENCE INFORMATION

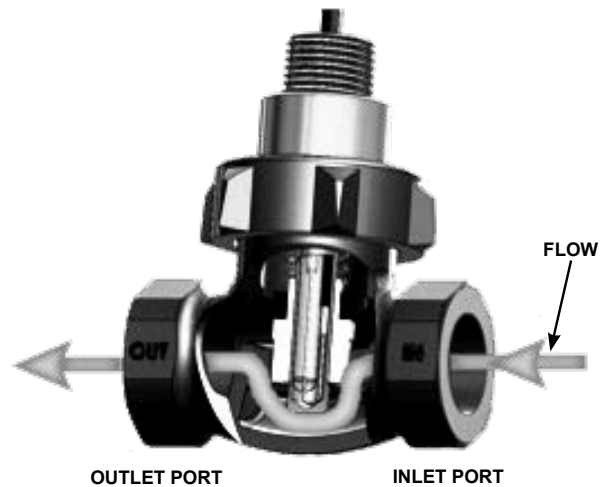
This section illustrates an overview of the F003 In-Line Flow Switches, as well as information on troubleshooting common problems, agency approval listings, and detailed physical, functional and performance specifications.

### 4.1 DESCRIPTION

The F003 In-Line Flow Switch is a cost-effective device designed to monitor flow rates up to 50 GPM. The compact and durable design allows for easy installation and maintenance with a removable bonnet assembly. The F003 is comprised of a bronze body with a Teflon® shuttle mechanism.

### 4.2 THEORY OF OPERATION

A spring-loaded Teflon® shuttle magnet is vertically displaced by liquid through the valve chamber in between the inlet and outlet ports. As the magnet moves, it actuates a hermetically-sealed reed switch element within the housing system.



### 4.3 TROUBLESHOOTING

The F003 In-Line Flow Switches are designed and engineered for trouble-free operation over a wide range of operating conditions. Common problems are discussed in terms of their symptoms and recommended corrective actions.


#### 4.3.1 Flow Switch Problems

SYMPTOM	PROBLEM	SOLUTION
FLOW RATE IS INACCURATE.	DIRT OR CHIPS ARE TRAPPED WITHIN THE BODY.	FLUSH OUT THE INTERIOR SURFACES. IF THE BODY IS CLOGGED WITH CONTAMINANTS, THE FLOW RATE WILL FLUCTUATE.
FLOW RATE IS INACCURATE.	THE SHUTTLE IS STICKING.	CLEAN THE SHUTTLE & STEM. IF CONTAMINANTS ARE CAUSING THE SHUTTLE TO STICK, THEY MUST BE FLUSHED OUT TO PREVENT FUTURE BINDING ISSUES.
FLOW RATE IS INACCURATE.	MEDIA HAS ERODED THE SHUTTLE DIMENSIONS.	REPLACE THE EXISTING BONNET ASSEMBLY WITH A NEW ONE.

 *If you are still in doubt about the condition or performance of your control, consult the factory for further instructions.*

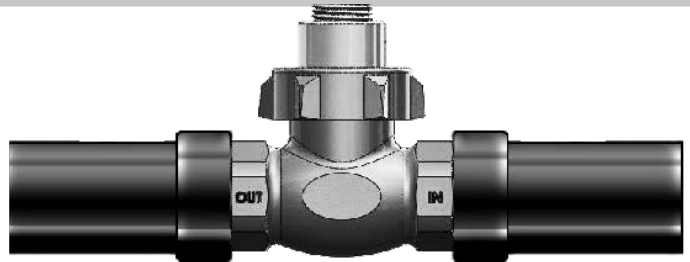


## 4.4 AGENCY APPROVALS

AGENCY	APPROVED MODEL(S)	FILE NUMBER	AREA CLASSIFICATION
UL 	F003	E203716	RECOGNIZED UNDER UL508 MOTOR CONTROLLERS (NKPZ2, NKPZ8)

## 4.5 SPECIFICATIONS

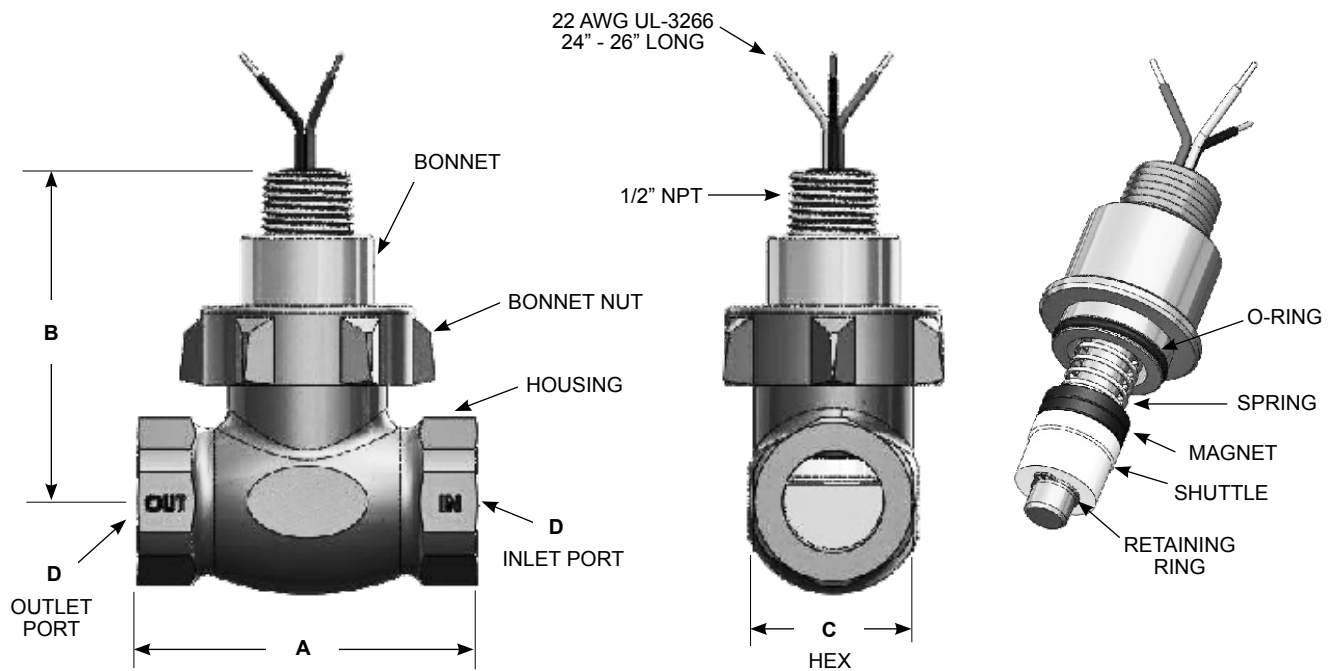
**CAUTION!** UNITS ARE CALIBRATED IN A HORIZONTAL FLOW WITH THE CONDUIT FITTING/ LEAD WIRES POINTING UPWARD. UNITS WILL CHANGE SETPOINTS WITH THEIR INLET UP OR DOWN AS WELL AS THEIR CONDUIT WIRES ORIENTATED HORIZONTAL OR DOWNWARD.



### 4.5.1 Functional Specifications

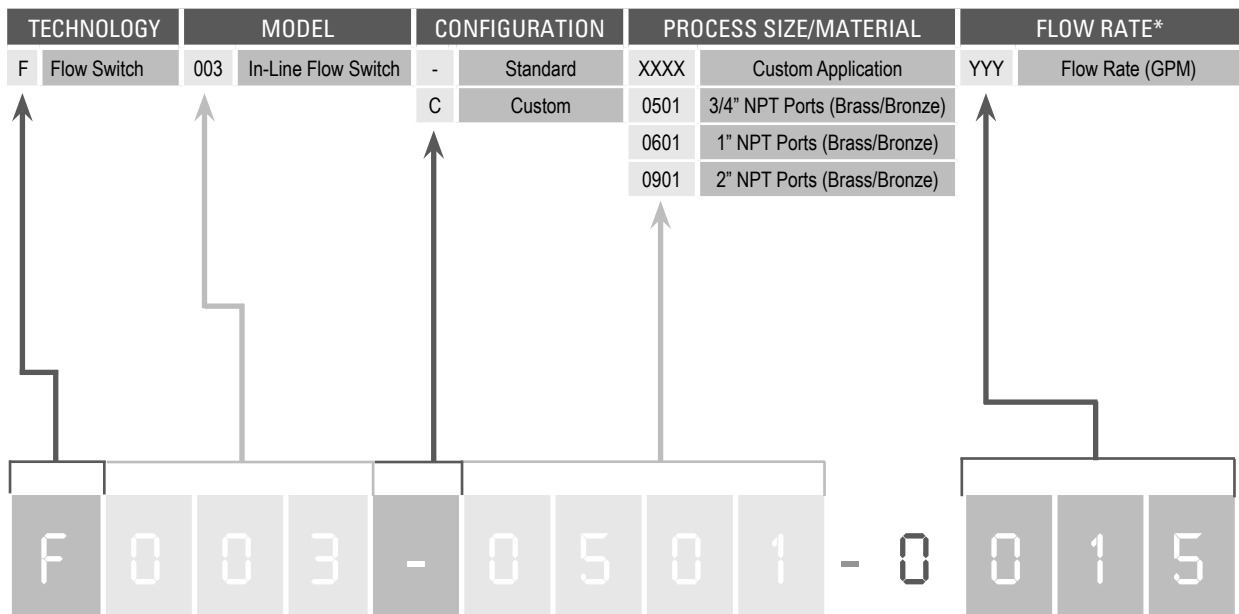
INPUT	
MEASUREMENT PRINCIPLE:	Spring-Loaded Teflon® Shuttle and Reed Switch
MEASURED VARIABLE:	Flow Rate Indication Set at Customer-Specified GPM Value
OUTPUT	
SIGNAL:	Reed Switch Set Point Range
RANGE:	3/4" NPT Port: 0.50 to 6.0 GPM 1" NPT Port: 0.50 to 8.0 GPM 2" NPT Port: 2.0 to 50.0 GPM
SETPOINT ACCURACY:	± 10%
SETPOINT DIFFERENTIAL:	15% Max.
REPEATABILITY:	1% Max. Deviation
TYPE OF CONTACTS:	SPDT
TYPE OF SWITCHES:	Hermetically-Sealed Reed Switch or TRIAC Version
SWITCH RATINGS:	SPDT 20 VA or 100 VA
ELECTRICAL TERMINATION:	24" - 26", 22 AWG Polymeric Lead Wires (UL 3266)
ENVIRONMENTAL	
OPERATING TEMPERATURE:	-40° to +300° F (-40° to + 149° C)
PRESSURE RATING:	400 PSIG (27 bar) at 100° F (37° C)
MATERIALS	
HOUSING:	Bronze
SHUTTLE:	Teflon®
BONNET:	Brass
SPRING:	316 Stainless Steel
O-RING:	Viton®
RETAINING RING:	Beryllium Copper

## 4.5.2 Dimensional Specifications



MODEL	"A" DIM.	"B" DIM.	"C" HEX	"D" PORT SIZE NPT
F003-0501	3"	3"	1 7/16"	3/4"
F003-0601	3 1/4"	3"	1 11/16"	1"
F003-0901	5 3/8"	3 1/16"	2 25/32"	2"

## 4.6 MODEL CONFIGURATOR



\*YYY = Flow Rate in Gallons Per Minute (GPM)

Examples: 005 is 0.50 GPM

015 is 1.50 GPM

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## 4.7 NOTES

# ASSURED QUALITY & SERVICE COST LESS

## Service Policy

Owners of Solutions With Innovation products may request a return of the product, or any part of the product for complete rebuilding or replacement. Units will be rebuilt or replaced promptly. Products returned under the SWI Service Policy must be returned by prepaid transportation. Solutions With Innovation will repair or replace the product at no cost to the purchaser (or owner) other than transportation if:

- 1 Returned within the warranty period; and
- 2 Factory Inspection finds the cause of the claim to be covered under the warranty.

If the problem is due to circumstances beyond Solutions With Innovation's liability, or is NOT covered by the warranty, there will be charges for labor in addition to the parts required to rebuild or replace the equipment.

In rare cases, it may be expedient to ship replacement parts; or in extreme cases, an entire product before the damaged product is returned. If a quick replacement service is necessary, notify the manufacturer of the damaged product's model and serial number. In such cases, credit for the returned materials will be determined on the applicability of the warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

## Return Material Procedure

In order to efficiently process any returned materials, it is essential that a *Return Material Authorization* (RMA) number be obtained from the manufacturer prior to an item's return. RMA's can be issued through local representatives, or by contacting the factory directly.

Please supply the following information:

- 1 The Company's Name
- 2 Description of the Material
- 3 Product Serial Number
- 4 Reason for Return
- 5 Product's Application

Used units must be properly cleaned in accordance with OSHA standards before it is returned to the manufacturer. A *Material Safety Data Sheet* (MSDS) must accompany units or materials that were used in any type of media. All return shipments to the factory must be by done via prepaid transportation. All product replacements will be shipped F.O.B. manufacturer.



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