

F-4600 INLINE ULTRASONIC FLOW METER Installation and Operation Guide



SAFETY INFORMATION

This meter was calibrated at the factory prior to shipment. To ensure correct use of the meter, please read this manual thoroughly.

Regarding this Manual:

- This manual should be passed on to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without ONICON's written permission.
- ONICON makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors are found, please inform ONICON.
- ONICON assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, ONICON assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

Safety Precautions:

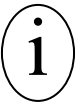
The following general safety precautions must be observed during all phases of installation, operation, service, and repair of this product. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. ONICON Incorporated assumes no liability for the customer's failure to comply with these requirements. If this product is used in a manner not specified in this manual, the protection provided by this product may be impaired.

The following symbols are used in this manual:



CAUTION

Messages identified as "Caution" contain information regarding potential damage to the product or other ancillary products.



IMPORTANT NOTE

Messages identified as "Important Note" contain information critical to the proper operation of the product.

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SECTION 1.0: INTRODUCTION

1.1 PURPOSE OF THIS GUIDE

The purpose of this guide is to provide installation and commissioning procedures, and basic operating and servicing instructions for the blind version of the ONICON F-4600 Flow Meter.

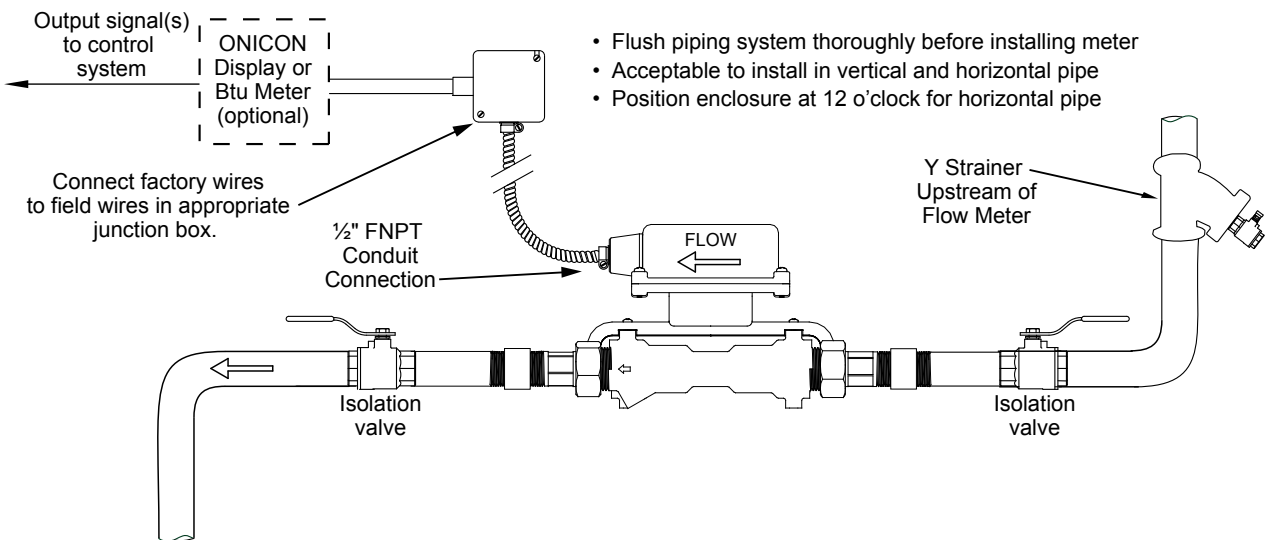


CAUTION

Only qualified service personnel should attempt to install or service this meter. The improper installation or use of this product may result in a loss of integrity in the piping system.

1.2 TYPICAL F-4600 FLOW METER

The F-4600 Inline Flow Meter utilizes direct path wetted ultrasonic transducers for measuring the volumetric flow of liquids in a wide variety of applications.



1.3 STANDARD FEATURES AND SPECIFICATIONS

- 4-20 mA output for flow rate
- Scaled pulse output for totalization
- All weather NEMA4 enclosure
- ANSI/NSF 61 & 372 compliant

GENERAL SPECIFICATIONS

ACCURACY

FLOW

- ± 1% of reading over 25:1 turndown
- ± 2% of reading over 100:1 turndown
- Repeatability: $\leq \pm 0.2\%$

OVERALL FLOW RANGE

500:1 turndown

SENSING METHOD

Direct beam path wetted ultrasonic sensors utilizing differential transit time velocity measurement

METER SIZES (Nominal diameter in inches)

½, ¾, 1, 1¼, 1½, 2 and 2½

PIPING SYSTEM CONNECTIONS

- Male NPT threads
- 2½" meter provided with ANSI Class 150 raised face flanges
- Optional PN16 or ANSI Class 300

FLUID TEMPERATURE RANGE

32°F to 250°F

AMBIENT TEMPERATURE RANGE

-13°F to 131°F

MAXIMUM OPERATING PRESSURE

400 PSI

PRESSURE DROP

Less than 1 PSI at 4 ft/sec, decreasing at lower velocities

POWER SUPPLY REQUIREMENTS

20-28V AC/DC, 50/60 Hz, 5 VA maximum

PULSE OUTPUT and ANALOG OUTPUT

Analog output: 4-20 mA (non-isolated)

Scalable pulse output:

- Isolated solid state dry contact
- Contact rating: 50 mA, 30V dc
- Contact duration: 1000ms

APPROVALS

- FCC: Part 15, Subpart B
- CE
- Conforms to ANSI/NSF 61 & 372

NOTE: Specifications subject to change without notice

Meter Size	Process Connection Type	Typical Design Flow	1% of Rate Flow Range	2% of Rate Flow Range	Minimum Flow	C _v
(Nominal)	(Nominal)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)
½"	Male NPT	6.6	0.6 – 15	0.15 – 15	0.03	6.08
¾"	Male NPT	6.6	0.6 – 15	0.15 – 15	0.03	6.08
¾" (high flow)	Male NPT	11	1 – 25	0.25 – 25	0.05	8.81
1"	Male NPT	11	1 – 25	0.25 – 25	0.05	8.81
1" (high flow)	Male NPT	15.4	1.4 – 35	0.35 – 35	0.07	12.17
1¼"	Male NPT	26.4	3 – 60	0.6 – 60	0.12	36.95
1½"	Male NPT	44	5 – 100	1 – 100	0.2	51.20
2"	Male NPT	66	8 – 150	1.5 – 150	0.3	101.2
2½"	Class 150 Flange	110	12 - 225	2.5 - 250	0.5	156.2

1.4 WORKING ENVIRONMENT

The on-display version of the F-4600 was designed for indoor or outdoor installation and use in residential, commercial and light industrial environments that are free of corrosive liquids and fumes, temperature extremes and excess vibration. Avoid installing the meter in direct sunlight.

The operating ambient air temperature range is -13°F to 131°F. Electrical power should be relatively clean, free of excess high frequency noise and large voltage transients.

1.5 SERIAL NUMBER

Serial Number

The serial number of your F-4600 is located on the side of the enclosure. The serial number is a unique identifier for the product. Please have this number available when contacting ONICON for assistance.

SECTION 2.0: UNPACKING

The F-4600 is generally shipped in one package unless optional hardware or equipment is ordered. Notify the freight carrier and ONICON if any items are damaged in transit.

2.1 CHECKING THAT YOU HAVE RECEIVED EVERYTHING

The following items have been provided with your F-4600 Flow Meter:

- (2) Line size process connection meter couplings* with male NPT threads and sealing gaskets (shipped attached to meter)
- (1) F-4600 Meter Installation and Operation Guide
- (1) F-4600 Meter Certificate of Calibration

Please notify ONICON if any of these items are missing.

* NOTE: The 2½" version of the meter is provided with flanges.

SECTION 3.0: INSTALLATION

The F-4600 Flow Meter should be installed by experienced plumbers, electricians, and others with related knowledge and experience in the heating, cooling, and fluid metering fields. ONICON technical support personnel are available via telephone or e-mail to provide technical assistance before, during and after installation. On-site field engineering, installation, and service are also available at an additional cost. The installer should use good trade practices and must adhere to all applicable state and local building or other codes.

3.1 SITE SELECTION

Careful attention to the site selection for the meter will help the installers with the initial installation, reduce start-up problems, and make future maintenance easier. For example, do not install the meter where it will be difficult for personnel to perform periodic maintenance. When selecting a site, consider the criteria under Section 1.4: WORKING ENVIRONMENT, as well as the information below.

The following limitations apply to the installation of the meter:

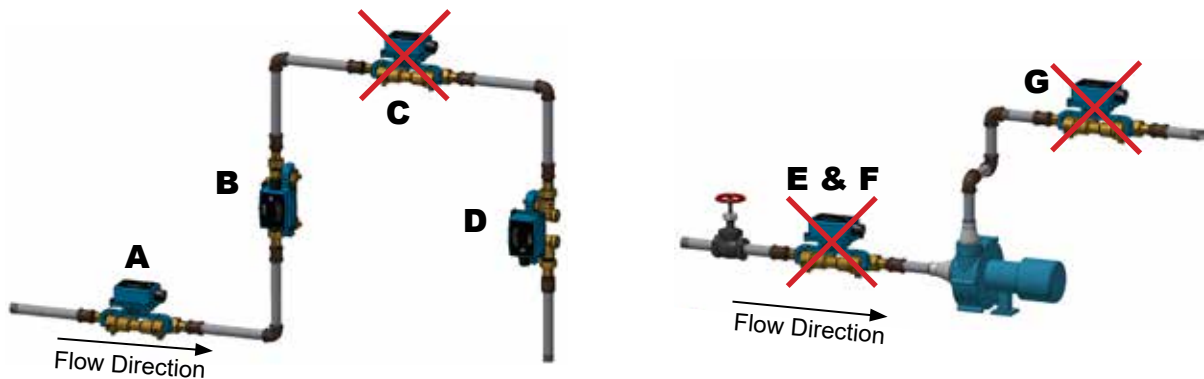
- The flow meter must be correctly oriented with respect to the direction of flow in the pipe. Meters installed with reversed flow will not function.
- The maximum operating pressure for the flow meter is 400 psi.
- Do not install the meter in close proximity to strong sources of electromagnetic interference (e.g. electric motors, VFD's, fluorescent light fixtures, etc.)

3.2 INSTALLING THE FLOW METER

Before you install the meter, the entire piping system should be flushed and free of debris. Please refer to the diagrams below when selecting the installation location. Upstream straight unobstructed pipe requirements vary considerably based on the nature of the upstream obstructions. As a general rule, ONICON recommends a minimum of 10 diameters of straight unobstructed pipe whenever possible; keeping in mind that it is always recommended that the meter be located with as much straight pipe upstream as possible.

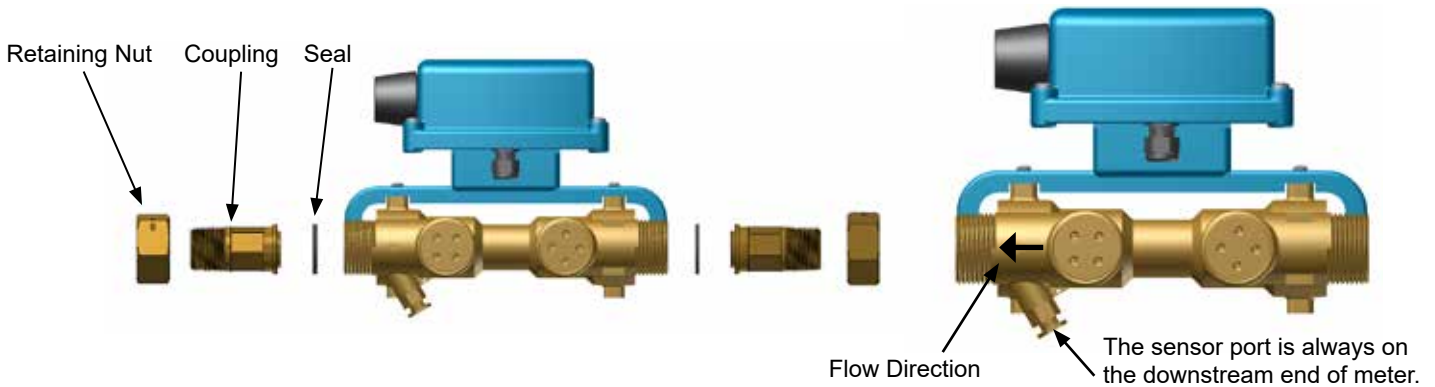
STRAIGHT RUN REQUIREMENTS

Upstream Obstruction	Minimum Upstream Straight Run Required (Pipe Diameters)	
	Meter Size	
	0.5 - 1.0"	1.25 - 2.5"
Single Elbow	0	0
Expander / Reducer	0	0
Coil, Upstream	3	3
Isolation Valve, 2 Position	3	5
Control Valve	10	15
Notes:		
1	Straight run is based on use of manufacturer provided couplings	
2	Avoid the following obstructions where possible: Modulating valves, pump discharge, multiple elbows out of plane.	



- A. This is a recommended position for the flow meter.
- B. This is a recommended position for the flow meter.
- C. Avoid installation locations where air can become trapped in the piping system.
- D. This is an acceptable installation location for closed loop pressurized systems.
- E. Do not install the meter downstream of modulating valves or partially open valves. Fully open isolation valves (e.g. ball valves) are OK.
- F. Do not install the flow sensor at the inlet of a pump. To prevent cavitation, the minimum operating pressure at the inlet of the meter must always exceed the pressure drop across the meter. Refer to Appendix A-1 for calculating pressure the drop at different flow rates.
- G. Avoid installing the meter downstream of multiple bends out of plane with each other where there are less than 10 diameters of straight unobstructed pipe between bends.

The flow meter is installed with threaded meter couplings and flat sealing gaskets as shown below. Orient the sensor body by aligning the flow direction arrow with the direction of flow in the pipe.



Model	Meter Size	Min. Compression	Min. Turn Past Initial Contact	Degrees of Rotation
F-4600-050	1/2"	30%	1/2	180°
F-4600-340	3/4"	30%	1/3	120°
F-4600-341	3/4"	30%	1/3	120°
F-4600-010	1"	30%	2/5	140°
F-4600-011	1"	30%	2/5	140°
F-4600-130	1 1/4"	30%	2/5	140°
F-4600-150	1 1/2"	30%	4/9	160°
F-4600-200	2"	30%	1/2	180°

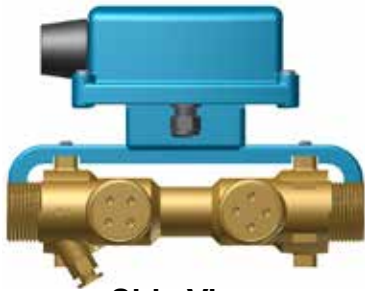
INSTALLING METER COUPLINGS

- Inspect seating surfaces on the meter's body and tail piece prior to assembly. Surfaces should be clean and free of any burrs or markings.
- Install the gasket in tail piece. Thread union onto meter's body, by hand, until gasket and mating surfaces make first contact. Mark coupling nut and tail piece.
- Place a corresponding mark on the coupling nut, # of degrees (based on table above) counter clockwise. Hold meter body while rotating coupling nut clockwise until marks line up. **DO NOT** over-tighten.
- Repeat process on opposite side of flow meter body.
NOTE: Torque setting is not an accurate means of gaging compression on gasket due to the lack of resilience in the gasket material.
- Pressurize system and check for leaks. If any leak is present, **DO NOT** over-tighten. Relieve pressure and loosen coupling nuts. Remove and inspect the gasket for damage. Repeat installation process.

Orient the meter as shown below. The meter may be installed with upward or downward flow in vertical pipes in closed loop pressurized systems. Avoid any installation locations where the pipe may not be completely full.

Meter Sizes 1/2 - 1"

Preferred Orientation for Horizontal Pipes



Side View

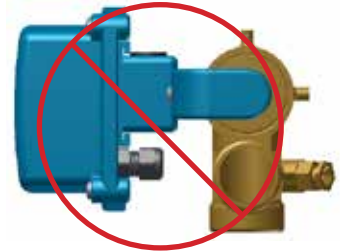


Side View

Do not orient meter as shown below



Side View



Side View

Meter Sizes 1 1/4 - 2.5"

Preferred Orientation for Horizontal Pipes

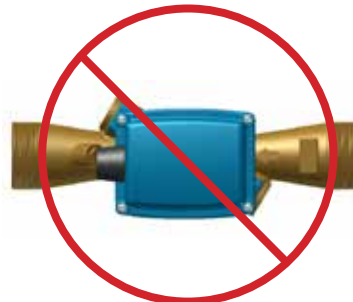


Side View



Side View

Do not orient meter as shown below



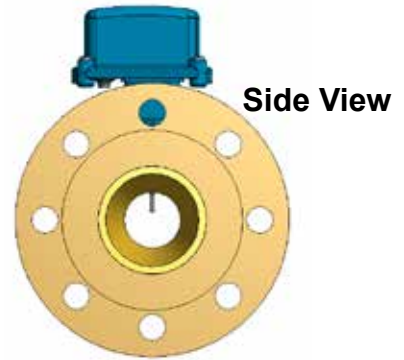
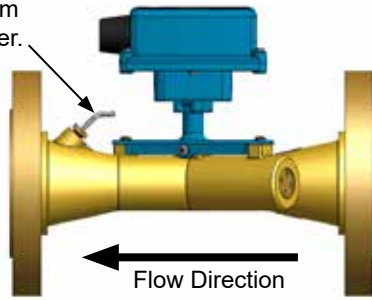
Side View



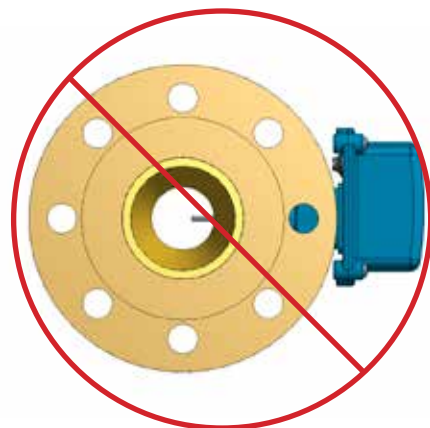
Side View

Preferred Orientation for Horizontal Housing

The sensor port is always on the downstream end of meter.



Do not orient meter as shown below



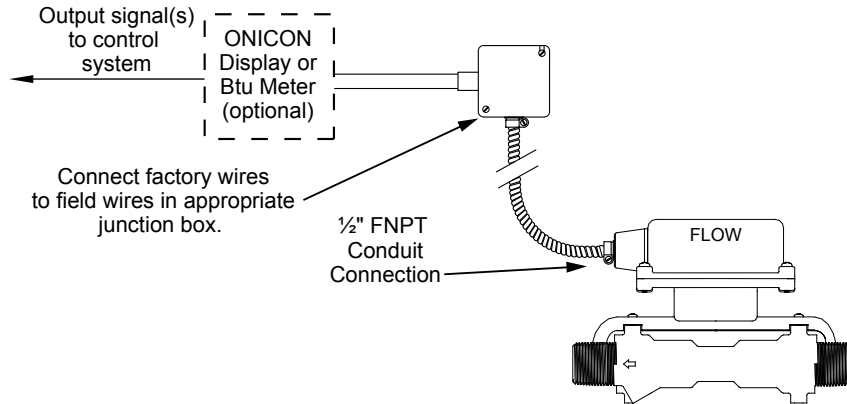


IMPORTANT NOTE

Open isolation valves, leak test and purge the piping system of air prior to wiring the meter.

3.3 POWER AND SIGNAL WIRING CONNECTIONS

The F-4600 is provided with an unterminated 10 foot PVC jacketed cable for power and signal connections. Do not attempt to remove this cable. Doing so will damage the weather-tight seal and may void the product warranty. Use AWG 18 - 22 shielded cable for power and signal connections.



F-4600 Wiring Information		
Wire Color	Description	Notes
Red	(+) 24V AC/DC	Positive (+) supply connection
Black	(-) Common ground	Negative (-) supply connection
Blue	(+) Analog 4-20 mA signal	Active 4-20 mA (non-isolated) output*
Brown	(-) Analog 4-20 mA signal	
Orange	Non polarized dry contact switch output	Scaled to provide one pulse per unit volume
White		

*4-20 mA signal is active. Do not connect external voltage to the blue & brown wires.

F-4600 WIRING DIAGRAM

Flow meter into control system (no display or BTU meter)

