



**ONICON**  
Flow and Energy Measurement

# F-2700

**INSERTION  
VORTEX  
FLOW METER**

**ONICON's F-2700 Series Insertion Vortex Flow Meter is a flexible design that delivers accurate, reliable flow measurement in steam applications**



**Saturated Steam • Superheated Steam • High Temperature Hot Water**



*Insertion vortex flow meters detect the frequency of alternating low pressure vortices that are formed as flow is diverted around a bluff body. These swirling low pressure zones apply lateral pressure first to one side and then to the other of sensors located downstream of the bluff body. This causes the sensors to vibrate. The frequency of this vibration is directly proportional to the flow velocity.*

## DESCRIPTION

The ONICON F-2700 Series Insertion Vortex Flow Meter is a flexible design that delivers accurate, reliable flow measurement in a wide variety of applications. The integral temperature sensor and optional integral pressure sensor allow for direct mass flow measurement in steam and compensated flow measurement in compressed air and gases. A volumetric flow version of the meter is also available for liquid flow applications.

ONICON insertion style vortex meters can be installed without disrupting flow, making them ideal for retrofit applications. They are also a cost effective option in larger pipes as they are priced independent of the pipe diameter.

The flexible design offers multiple options for connectivity. This includes 4-20mA and pulse outputs with BACnet or Modbus via RS485 or Ethernet/IP. HART is also available with the loop powered meter.

## APPLICATIONS

- Saturated steam
- Hot water to 500°F (260°C)

*Applications with optional pressure sensor*

- Superheated steam to 500°F (260°C)
- Compressed air

## FEATURES

- Mass flow measurement from a single instrument
- Optional steam energy flow measurement
- Integral 1,000  $\Omega$  platinum RTD for precise temperature measurement
- Optional integral pressure transducer for accurate pressure readings at the meter location
- DC loop powered operation
- Power Over Ethernet (POE)
- Maintenance free non-moving parts design
- Wear-resistant bluff body/sensor design
- Advanced signal processing algorithms ensure stable flow readings and reject noise.
- Easy-to-install meter arrives fully programmed and ready to use.
- Optional multi-analog output versions available
- HART® serial communication
- BACnet MS/TP, BACnet IP, MODBUS RTU, or MODBUS TCP/IP serial communication available

## CALIBRATION

Every ONICON flow meter is wet calibrated in a flow laboratory against standards that are directly traceable to NIST.\* A certificate of calibration accompanies every meter.



\*NIST - National Institute of Standards and Technology

**SPECIFICATIONS\***

<b>F-2700 TRANSMITTER</b>		
PERFORMANCE	STEAM and GAS ACCURACY (Reynolds number $\geq 10,000$ )	$\pm 1\%$ Volumetric flow rate $\pm 1.5\%$ Mass flow rate
	LIQUIDS ACCURACY	$\pm 0.7\%$ Volumetric flow rate
	REPEATABILITY	$\pm 0.2\%$
	LONG TERM STABILITY	$\pm 0.2\%$ over a period of 1 year
OPERATING CONDITIONS	AMBIENT TEMPERATURE	-40°F to 185°F
	PROCESS TEMPERATURE	-330°F to 500°F
INPUT POWER	AVAILABLE OPTIONS	<ul style="list-style-type: none"> <li>• Loop Power: 12-36 VDC, 25 mA max</li> <li>• External DC Power: 12-36 VDC, 300 mA max</li> <li>• External AC Power: 100-240 VAC, 50/60 Hz, 5W max</li> </ul>
I/O SIGNAL	DC LOOP POWER	One (1) 2-wire, 4-20 mA output
		One (1) 2-wire scaled pulse, 50 ms duration, 5 - 36 VDC @ 40 mA maximum
		HART serial communications
		Power Over Ethernet (POE) or External 12-28 VDC
	EXTERNAL DC or EXTERNAL AC	Up to three (3) 2-wire, 4-20 mA outputs One (1) 2-wire scaled pulse output, 50 ms duration, 5-36 VDC @ 40 mA maximum Up to three (3) opto-coupled relay alarm outputs MODBUS RTU or BACnet MS/TP serial communications
POWER OVER ETHERNET (POE) or EXTERNAL 12-28 VDC	Up to three (3) 2-wire, 4-20 mA outputs One (1) 2-wire scaled pulse output, 50 ms duration, 5-36 VDC @ 40 mA maximum Up to three (3) opto-coupled relay alarm outputs MODBUS TCP/IP or BACnet IP serial communications	
ELECTRONICS ENCLOSURE	NEMA 4X (IP 66) epoxy painted aluminum	
	AVAILABLE OPTIONS	<ul style="list-style-type: none"> <li>• Integral mount</li> <li>• Remote mount (standard cable length 50 ft, maximum 100 ft)</li> </ul>
	DISPLAY	2-line, 16 character alphanumeric LCD with backlighting option.
APPROVALS	SENSING METHOD	Class I, Division 1, Group B, C, D Class II, Division 1, Group E, F, G Type 4X and IP66, Ta = -40 to 60°C
<b>F-2700 FLOW SENSOR</b>		
PERFORMANCE	SENSING METHOD	Vortex shedding with integral piezoelectric sensors Integral 1,000 $\Omega$ platinum RTD provides instantaneous temperature Integral pressure transducer (optional) provides instantaneous pressure.
OPERATING CONDITIONS	MAXIMUM OPERATING PRESSURE	$\leq$ Flange rating
	PRESSURE LOSS	Pressure loss varies with meter size and flow rate. Please contact ONICON for detailed information
FLOW SENSOR DESIGN	316L Stainless Steel	

\* SPECIFICATIONS subject to change without notice.

**FLOW METER OPERATING RANGES**

**Insertion Meter Flow Rates For Saturated Steam**

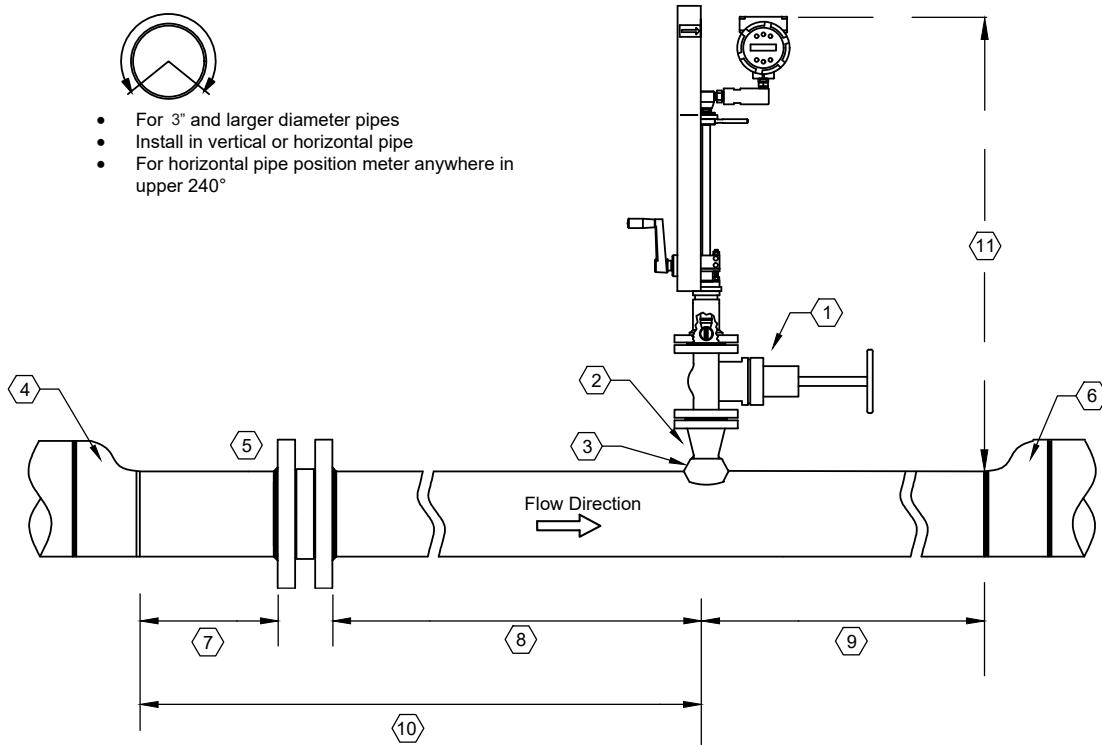
<b>Minimum and Maximum Saturated Steam Flow Rates @ Specific Operating Pressures</b>									
<b>Insertion Meter Flow Rates in lb/hr Nominal Diameter (in), Schedule 40</b>									
	<b>Pressure (psig)</b>	<b>5</b>	<b>15</b>	<b>50</b>	<b>75</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>300</b>
<b>Nominal diameter in inches</b>	<b>Density (lb/ft<sup>3</sup>)</b>	<b>0.0479</b>	<b>0.071</b>	<b>0.1497</b>	<b>0.2042</b>	<b>0.2578</b>	<b>0.3633</b>	<b>0.4680</b>	<b>0.6784</b>
		<b>lbs / hr</b>							
3"	Minimum	205	248	357	417	468	557	632	762
	Maximum	2721	3995	8295	11288	14246	20111	25948	37652
4"	Minimum	353	427	616	718	807	958	1089	1311
	Maximum	4685	6880	14284	19438	24532	34631	44683	64838
6"	Minimum	800	969	1397	1629	1831	2175	2470	2976
	Maximum	10633	15614	32417	44112	55674	78592	101405	147145
8"	Minimum	1385	1679	2419	2822	3170	3766	4278	5153
	Maximum	18412	27038	56135	76385	96407	136092	175595	254799
10"	Minimum	2184	2646	3813	4447	4996	5936	6743	8123
	Maximum	29022	42618	88481	120401	151960	214513	276779	401623
12"	Minimum	3099	3756	5412	6313	7092	8426	9572	11530
	Maximum	41196	60495	125597	170907	215703	304495	392880	570093
14"	Minimum	3746	4539	6541	7630	8571	10184	11568	13935
	Maximum	49788	73112	151792	206551	260691	368001	474820	688994
16"	Minimum	4893	5930	9967	1470	11197	13303	15111	18203
	Maximum	65039	95508	269822	39801	340546	480728	620268	900047


**FLOW RATES FOR WATER**

<b>Water Minimum and Maximum Flow Rates (GPM)</b>									
<b>Rate</b>	<b>Nominal Diameter (in)</b>								
	<b>3</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>24</b>
Min GPM	20.6	35.9	81.3	142	224	317	383	502	1140
Max GPM	618	1076	2440	4274	6724	9514	11486	15062	34184

### TYPICAL METER INSTALLATION

(for pipes  $\geq 3''$  in diameter)



- 
- For 3" and larger diameter pipes
  - Install in vertical or horizontal pipe
  - For horizontal pipe position meter anywhere in upper 240°

**Note: Refer to the F-2600 and F-2700 IOM for detailed information about minimum upstream straight pipe run to first obstruction.**

1. 2" flanged gate valve (full port)
2. Weld neck flange
3. 2" weld-on outlet
4. Upstream obstruction (Note: Provide eccentric where requires reducer)
5. Flow straightener (if used)
6. Downstream obstruction (Note: Provide eccentric where requires expander)
7. Two (2) pipe diameters, minimum
8. Upstream straight pipe run from flow straightener to flow meter
9. Minimum downstream straight pipe run  $\geq 5$  diameters
10. Minimum upstream straight pipe run from first obstruction to flow meter
11. 60" minimum clearance required for installation

## METER ORDERING INFORMATION

### Meter Model Number Coding = F-2700-CDE-FGHI

#### F-2700 = Insertion Vortex Flow Meter

##### C = Process Connection

- 4 = Packing gland with 2" ANSI Class 150 flange and retractor
- 5 = Packing gland with 2" ANSI Class 300 flange and retractor

##### D = Electronics Enclosure Mounting Configuration

- 1 = Integral mount, NEMA 4X enclosure
- 2 = Remote mount transmitter with 50' of cable
- 3 = Remote mount transmitter with 100' of cable

##### E = Temperature/Pressure Compensation

- 0 = Integral temperature compensation
- 2 = Integral temp and pressure compensation, 100 psia max
- 3 = Integral temp and pressure compensation, 300 psia max
- 4 = Integral temp and pressure compensation, 500 psia max

##### F = Input Power

- 0 = Loop power (Requires G=0)
- 1 = External 12-36 VDC
- 2 = External 100-240 VAC
- 3 = Power Over Ethernet (POE) External 12-28 VDC

##### G = Output Signals

- 0 = Loop powered 4-20 mA and scaled pulse (Requires F = 0)
- 1 = (1) 4-20mA, (1) scaled pulse, (1) alarm contact and MODBUS RTU (Requires F=1 or 2)
- 2 = (1) 4-20mA, (1) scaled pulse, (1) alarm contacts and BACnet MS/TP (Requires F=1 or 2)
- 3 = (3) 4-20mA, (1) scaled pulse, (3) alarm contacts and MODBUS RTU (Requires F=1 or 2)
- 4 = (3) 4-20mA, (1) scaled pulse, (3) alarm contacts and BACnet MSTP (Requires F=1 or 2)
- 5 = (1) 4-20mA, (1) scaled pulse, (1) alarm contact and MODBUS TCP/IP (Requires F=3)
- 6 = (1) 4-20mA, (1) scaled pulse, (1) alarm contacts and BACnet IP (Requires F=3)
- 7 = (3) 4-20mA, (1) scaled pulse, (3) alarm contacts and MODBUS TCP/IP (Requires F=3)
- 8 = (3) 4-20mA, (1) scaled pulse, (3) alarm contacts and BACnet IP (Requires F=3)

##### H = Max Operating Temperature

- 0 = 500°F

##### I = Energy Meter Configuration

- 0 = None
- 1 = Gross energy
- 2 = Net energy (requires remote temperature sensor and installation kit)

## REMOTE TEMPERATURE SENSOR AND THERMOWELL INSTALLATION KIT

(Required for Net Energy Meter)

Model Number	Description
TSI-RKP-1461	4 wire 1000 Ω RTD Sensor, 0.25" X 2.8", 32 - 250°F temperature range with 10" leads
INSTL204S-TSI	Temperature sensor installation kit for pipe size range from 1.5"- 8". Wetted materials are SS, for use in carbon steel piping systems

**Note: Net energy meter requires one temperature sensor and one thermowell installation kit sized to pipe.**

