• F-1500 SERIES • INSERTION TURBINE FLOW METER

ONICON
Flow and Energy Measurement

Insertion turbine flow meters are ideal for use in larger steam lines where downsizing the line size to improve flow measurement is not desirable. In these applications, the pitch of the turbine rotor is selected to match the expected steam flow velocity range in the pipe. This optimizes the operating range of the flow meter for the application.

DESCRIPTION

The ONICON F-1500 Series Insertion Turbine 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 turbine meters for steam and gas flow are provided with rotors that are optimized for the expected flow range in the pipe. This makes them ideal for retrofit applications where low flow rates are often the norm. They can also be installed without disrupting flow, and they are priced independent of the pipe size. This makes them very cost effective option.

APPLICATIONS

- Saturated steam
- Hot water to 450°F (232°C) standard
- 850°F (454°C) optional

Applications with optional pressure sensor

- Superheated steam to 450°F (232°C) standard
- 850°F (454°C) optional
- Compressed air
- Industrial gases

CALIBRATION

Every ONICON flow meter is wet calibrated in a flow laboratory against standards that are directly traceable to N.I.S.T. A certificate of calibration accompanies every meter.

FEATURES

- Mass flow measurement from a single instrument
- Improved flow operating range when compared to insertion vortex meters
- Interchangeable rotors optimize meter performance for the expected flow range
- Integral 1,000 Ω platinum RTD for precise temperature measurement
- Optional integral pressure transducer for accurate pressure readings at the meter location
- DC loop powered operation
- 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
- Optional BACnet MS/TP or MODBUS RTU RS485 serial communication

GENERAL SPECIFICATIONS

ACCURACY

Steam and gases Reynolds Number ≥ 10,000
Percent of reading accuracy to within:
± 1.5% for steam and gases (volumetric)
± 2.0% for steam and gases (mass)
± 0.1% Volumetric Flow Rate Repeatability
± 0.2% Mass Flow Rate Repeatability

Liquids
± 1.2% for liquids (volumetric)
± 1.5% for liquids (mass)
± 0.1% Volumetric Flow Rate Repeatability
± 0.2% Mass Flow Rate Repeatability

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GENERAL SPECIFICATIONS (cont.)

VELOCITY RANGE
Maximum velocity, liquid: 30 ft/s (9 m/s)
Minimum velocity, liquid: 0.5 ft/s (0.15 m/s)
Maximum velocity, gas or steam: 43 to 205 ft/s (13 to 62 m/s) depending on rotor pitch
Minimum velocity, gas or steam ft/s (m/s): 3.5 to 12 ft/s (1 to 3.7 ms/s) depending on rotor pitch

SENSING METHOD
- Axial mounted rotating turbine utilizing inductive sensing
- Integral 1,000 Ω platinum RTD (optional) provides instantaneous temperature
- Integral pressure transducer (optional) provide instantaneous pressure

OPERATING TEMPERATURE RANGE
Ambient: -40°F (-40°C) to +140°F (+60°C)
Process: -67°F (-55°C) to +450°F (+232°C)
Optional high process temperature range -488°F (-289° C) to +850°F (+454°C)

MAXIMUM OPERATING PRESSURE
≤ Flange rating or 1500 psi (103 bar)

PRESSURE LOSS
Pressure loss varies with meter size and flow rate. Please contact ONICON for detailed information.

CONNECTION TYPE
- 2" NPT threads with packing gland(water only)
- 2" ANSI Class 150 Flange with packing gland
- 2" ANSI Class 300 Flange with packing gland

MATERIALS
- Wetted Metal Parts 316L stainless steel
- Electronics Enclosure: Epoxy painted aluminum

INPUT POWER OPTIONS
- Loop Power: 14-36 VDC, 22 mA maximum current
  Optional External DC Power: 18-36 VDC, 300 mA maximum current
- Optional External AC power: 100-240 VAC 50/60 Hz, 5W. maximum power

ENCLOSURE
NEMA 4X (IP66)

DISPLAY
2-line, 16 character alphanumeric LCD with backlighting option. Standard saturated steam display menu provides: Mass Flow Rate, Temperature, Pressure (calculated), Mass Total and Alarms (if active).

Optional remote mount transmitter version available (Standard cable length 50 ft., maximum 100 ft.)

OUTPUT SIGNALS PROVIDED

- DC loop powered version

  Analog Rate: 2-wire, 4-20 mA,

  Totalization: 2-wire scaled pulse, 50 ms duration, 5-36 VDC @ 40 mA maximum

  Frequency: 2-wire, open collector, 10 kHz maximum, 5 - 36 VDC and 40 mA maximum

  Digital: HART® serial communications

- Optional outputs (requires External Input Power Options)
  Analog Rate: Up to three (3) 2-wire, 4-20 mA outputs

  Totalization: One (1) 2-wire scaled pulse output, 50 ms duration, 5 - 36 VDC and 40 mA maximum

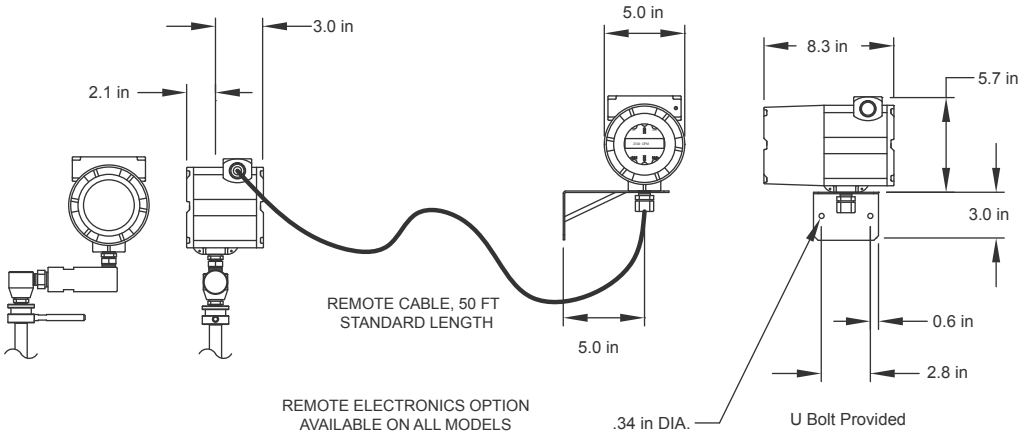
  Alarm: Up to three (3) opto-coupled relay alarm outputs

- MODBUS RTU RS485 or BACnet MS/TP serial communications in place of HART®

APPROVALS
FM/FMC Approvals
Class I, Division 1, Groups B, C, & D
Class II/III, Division 1, Groups E, F, & G
Type 4X and IP66, T6, Ta = -40 to 60°C

Note: Specifications subject to change without notice.

REMOTE MOUNT INSTALLATION DIMENSIONS



FLOW METER OPERATING RANGES

Meter Flow Rates for Saturated Steam

Minimum and Maximum Saturated Steam Flow Rates @ Specific Operating Pressures

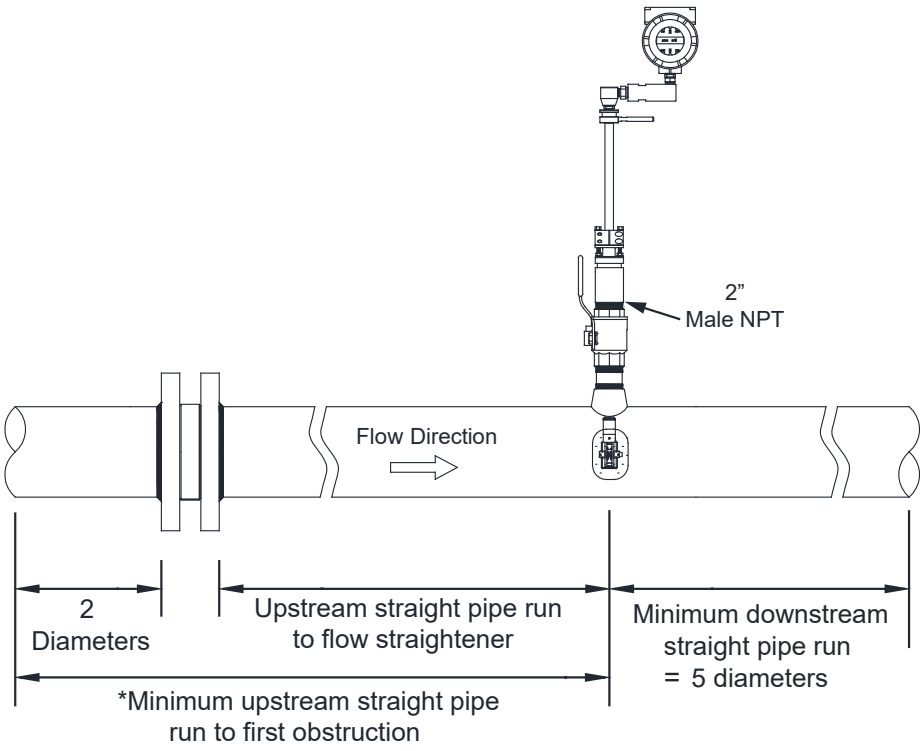
Insertion Meter Flow Rates in lb/hr Nominal Diameter (in), Schedule 40

	Pressure (psig)	5			15			50			75		
Nominal Diameter in inches	Density (lb/ft3)	0.0491			0.0721			0.1496			0.2036		
	Rotor	R10	R25	R40	R10	R25	R40	R10	R25	R40	R10	R25	R40
		lbs/hr											
3"	Minimum	90	36	25	109	44	31	158	65	45	185	76	52
	Maximum	1405	540	287	2073	797	424	4337	1672	890	5922	2284	1217
4"	Minimum	158	64	45	192	78	54	279	114	79	326	133	92
	Maximum	2464	948	504	3635	1399	745	7602	2932	1562	10378	4005	2135
6"	Minimum	373	152	105	453	185	128	657	268	186	768	314	218
	Maximum	5790	2230	1187	8539	3291	1753	17847	6891	3673	24355	9410	5018
8"	Minimum	660	270	187	802	328	228	1162	476	330	1359	556	386
	Maximum	10227	3942	2098	15078	5816	3098	31499	12170	6491	42977	16616	8865
10"	Minimum	1057	432	300	1284	526	365	1860	762	529	2175	891	619
	Maximum	16342	6302	3357	24089	9298	4955	50305	19447	10375	68622	26546	14169
12"	Minimum	1551	635	441	1870	766	532	2708	1110	771	3165	1298	902
	Maximum	23736	9162	4883	34976	13512	7205	72999	28244	15078	99557	38544	20585
14"	Minimum	1892	775	538	2299	942	654	3328	1365	948	3889	1596	1109
	Maximum	29115	11246	5997	42891	16581	8847	89476	34642	18502	122006	47266	25255
16"	Minimum	2536	1039	722	3081	1264	878	4459	1831	1273	5211	2141	1489
	Maximum	38897	15044	8029	57279	22170	11838	119399	46278	24736	162762	63121	33752

	Pressure (psig)	100			150			200			300		
Nominal Diameter in inches	Density (lb/ft3)	0.2569			0.3627			0.4680			0.6791		
	Rotor	R10	R25	R40	R10	R25	R40	R10	R25	R40	R10	R25	R40
		lbs/hr											
3"	Minimum	209	85	59	249	101	70	283	116	80	342	140	97
	Maximum	7490	2890	1540	10608	4097	2184	13719	5301	2827	19966	7721	4120
4"	Minimum	367	150	104	437	179	124	497	203	141	601	246	171
	Maximum	13123	5068	2702	18583	7181	3830	24028	9290	4957	34961	13528	7222
6"	Minimum	864	354	245	1030	421	293	1172	480	333	1415	580	403
	Maximum	30791	11902	6350	43586	16861	8999	56341	21807	11643	81946	31743	16958
8"	Minimum	1529	626	435	1821	746	518	2073	850	590	2503	1026	713
	Maximum	54325	21014	11216	76881	29761	15892	99362	38486	20558	144481	56008	29934
10"	Minimum	2447	1003	697	2914	1195	831	3316	1360	945	4004	1643	1142
	Maximum	86731	33568	17923	122718	47533	25391	158579	61458	32842	230539	89422	47810
12"	Minimum	3561	1461	1015	4240	1741	1210	4825	1981	1377	5824	2393	1664
	Maximum	125807	48732	26034	177963	68985	36871	229926	89178	47681	334180	129717	69392
14"	Minimum	4375	1796	1249	5210	2140	1488	5927	2435	1693	7154	2941	2045
	Maximum	154154	59750	31935	218021	84564	45218	281645	109300	58464	409278	158953	85066
16"	Minimum	5861	2409	1675	6977	2869	1996	7937	3265	2271	9578	3942	2743
	Maximum	205605	79772	42668	290706	112863	60393	375467	145841	78064	545477	212020	113540

STRAIGHT RUN REQUIREMENT

Typical Installation



Obstruction	*Minimum Upstream Straight Pipe Run Requirements	
	Straight pipe run without flow straightener	Straight pipe run to flow straightener
Single bend preceded by ≥ 9 diameters of straight pipe	10 Dia	NA
Outflowing tee	10 Dia	NA
Pipe size reduction before meter	10 Dia	NA
Single bend preceded by ≤ 9 diameters of straight pipe	15 Dia	8 Dia
Expansion before meter	20 Dia	8 Dia
Multiple bends out of plane	30 Dia	13 Dia
Partially open valve	30 Dia	13 Dia
Control valve / P.R.V.	50 Dia	23 Dia

Flow Meter Rates for Water

Water Minimum and Maximum Flow Rates							
Rate	Nominal Pipe Size						
	2	3	6	8	12	16	24
GPM Min	5	12	54	109	247	386	877
GPM Max	314	691	2701	4678	10575	16524	37950

METER ORDERING INFORMATION
Meter Model Number Coding = F-1ABB-CDEF-GHIJ(-SPC)

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Flow and Energy Measurement

F-1ABB= Industrial Turbine Flow Meter

A = Flow Meter Type

5	Industrial Turbine

BB = Meter Size

00	Insertion Style

C = Process Connection

2	Packing gland with 2" NPT male threads and retractor, water only
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 4 enclosure, Class 1 Div 1
2	Remote mount transmitter with 50' of cable
3	Remote mount transmitter with 100' of cable

E = Temperature / Pressure Compensation

0	Integral temperature compensation
1	Integral temperature and pressure compensation, 30 psia max
2	Integral temperature and pressure compensation, 100 psia max
3	Integral temperature and pressure compensation, 300 psia max
4	Integral temperature and pressure compensation, 500 psia max
9	No compensation, volume only

F = Rotor Selection

0	Liquid
1	R40 - Steam or gas
2	R30 - Steam or gas
3	R25 - Steam or gas
4	R20 - Steam or gas
5	R15 - Steam or gas
6	R10 - Steam or gas

G = Input Power

0	Loop power
1	External 12-36 VDC
2	External 85 - 240 VAC

H = Output Signals

0	Loop powered 4-20mA and scaled pulse (only available for input power selection G = 0)
1	(1) 4-20mA, (1) scaled pulse, (1) alarm contact and MODBUS
2	(1) 4-20mA, (1) scaled pulse, (1) alarm contacts and BACnet
3	(3) 4-20mA, (1) scaled pulse, (3) alarm contacts and BACnet
4	(3) 4-20mA, (1) scaled pulse, (3) alarm contacts and BACnet

I = Max Operating Temperature

0	450°F
1	850°F

J = Energy Meter Configuration

0	None
1	Gross energy
2	New Energy

SPC = Special Configuration

REMOTE TEMPERATURE SENSOR AND THERMOWELL INSTALLATION KIT

(Required for Net Energy Meter)

Model Number	Description
TSI-RKP-1461	4 wire 1000 OHM RTD Sensor, .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 1 temperature sensor and 1 thermowell installation kit sized to pipe.