

Omniflo®

Turbine Flowmeters

Description

Flow Technology's Omniflo® turbine flowmeter is a tangential flow transducer capable of measuring very low flow rates in either liquid or gas with excellent speed of response and repeatability.

A high resolution, volumetric flow sensing instrument, the Omniflo® offers repeatability which is better than $\pm 0.1\%$ in liquids and $\pm 0.2\%$ in gases. The flowmeter's unique, tangential rotor design allows it to operate effectively in low flow environments where standard axial turbine meters cannot be used. Flow rates as low as 0.001 GPM (3.78 mLPM) in liquids and 0.0015 ACFM (2.5 LPH) in gases can be measured. When paired with linearizing electronics, it is capable of overall accuracy of $\pm 0.25\%$ in liquids and $\pm 0.60\%$ in gas.

The Omniflo's® stainless steel construction makes it capable of withstanding pressures up to 400 BAR (5,800 psi). Optional configurations are available for operation up to 4,000 BAR (58,000 psi).

Applications

The Omniflo's® low flow sensing capability makes it an effective instrument for such low flow applications as fuel flow metering, mixing and blending of costly chemical additives, measuring of pharmaceutical products, purging of gases used in food packaging, liquid metering in automotive and aerospace applications, and numerous leak rate detection applications.

With its precision pivot sapphire bearing configuration, it can accurately measure flow rates significantly lower than other available techniques. Ball bearing and sleeve (journal) bearing configurations are used for more rugged or less demanding flow rate applications.

Operation

Based on its superior sensitivity to very low flows, the Omniflo® depends on a precision orifice, located within the flowmeter sensing element (capsule), which directs fluid past the underside of the tangential rotor. Since the rotor is freely suspended and of low mass, it responds almost instantaneously to changes in the process flow rate.



Omniflo®

Turbine Flowmeters

Features

- Operates in low flow ranges where standard axial turbine flowmeters cannot be used
- Accuracy of $\pm 0.25\%$ in liquids and $\pm 0.60\%$ in gas when paired with linearizing electronics
- Repeatability better than $\pm 0.1\%$ of reading in liquids and $\pm 0.2\%$ of reading in gas
- Measures flow rates as low as 0.001 GPM (3.78 mLPM) in liquids, and 0.0015 ACFM (2.5 LPH) in gas
- Standard configuration withstands pressures up to 400 BAR (5,800 psi), dependent on end connection. High pressure housings available up to 4,000 BAR (58,000 psi)
- Fast response time, up to 3–4 mSec in liquid applications
- Compact size, 3" face-to-face with NPT or MS end connections

FTO Sizing

		NORMAL 10:1 FLOW RANGE						EXTENDED FLOW RANGE					
FLOW RANGE - LIQUID - JEWEL BEARING (Bearing Code C)													
SERIES	RF		MIN		MAX		MAG		MIN		MAX		
	mLPM	GPM	mLPM	GPM	mLPM	GPM	mLPM	GPM	mLPM	GPM	mLPM	GPM	
FTO-1	7.57	75.7	.002	.02	N/A	N/A	3.78	303	.001	.08	N/A	N/A	
FTO-2	30.3	303	.008	.08	N/A	N/A	11.35	605	.003	.16	N/A	N/A	
FTO-3	94.6	946	.025	.25	151.4	1514	.04	.40	37.8	1514	.01	.40	
FTO-4	302.8	3028	.08	.80	378.5	3785	.10	1.0	75.7	4920	.02	1.3	
FTO-5	567.7	5677	.15	1.5	567.7	5677	.15	1.5	189.2	7570	.05	2.0	
FLOW RANGE - LIQUID - BALL BEARING (Bearing Code A)													
FTO-1	7.57	75.7	.002	.02	N/A	N/A	7.57	303	.002	.08	N/A	N/A	
FTO-2	30.3	303	.008	.08	N/A	N/A	18.9	605	.005	.16	N/A	N/A	
FTO-3	94.6	946	.025	.25	151.4	1514	.04	.40	75.7	1514	.02	.40	
FTO-4	302.8	3028	.08	.80	378.5	3785	.10	1.0	189.2	4920	.05	1.3	
FTO-5	567.7	5677	.15	1.5	567.7	5677	.15	1.5	378.5	7570	.10	2.0	
FLOW RANGE - LIQUID - JOURNAL BEARING (Bearing Codes D, E & G)													
FTO-3	151.4	1514	.04	.40	189.2	1514	.05	.40	113.5	1514	.03	.40	
FTO-4	492	4920	.13	1.3	567.7	4920	.15	1.3	378.5	4920	.10	1.3	
FTO-5	567.7	5677	.15	1.5	75.7	7570	.20	2.0	567.7	7570	.15	2.0	
FLOW RANGE - GAS - JEWEL BEARING (Bearing Code C)													
SERIES	RF		MIN		MAX		MAG		MIN		MAX		
	ALPH	ACFM	ALPH	ACFM	ALPH	ACFM	ALPH	ACFM	ALPH	ACFM	ALPH	ACFM	
FTO-1	2.55	25.5	.0015	.015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
FTO-2	4.25	42.5	.0025	.025	N/A	N/A	3.40	50.9	.002	.03	N/A	N/A	
FTO-3	8.49	84.9	.005	.05	N/A	N/A	5.95	101.9	.0035	.06	N/A	N/A	
FTO-4	20.39	203.9	.012	.12	50.9	339.8	.03	.20	13.59	339.8	.008	.20	
FTO-5	33.98	339.8	.02	.20	67.9	509.7	.04	.30	25.49	509.7	.015	.30	
FLOW RANGE - GAS - BALL BEARING (Bearing Code A)													
Less Than 10:1													
FTO-2	8.50	50.99	.005	.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
FTO-3	16.99	135.94	.01	.08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
FTO-4	59.47	424.80	.035	.25	84.9	339.8	.05	.20	N/A	N/A	N/A	N/A	
FTO-5	84.96	679.68	.05	.40	127.4	509.7	.075	.30	N/A	N/A	N/A	N/A	
PULSES PER UNIT OF VOLUME AND FREQUENCY													
SERIES	Liquid meters Based on normal range			Gas meters Based on normal range									
	Nominal K-factor	Max. Freq. Approx.	Hz	Nominal K-factor	Max. Freq. Approx.	Hz							
	P/mL	P/G	Hz	P/L	P/Ft ³	Hz							
FTO-1	211	800K	270	170K	4800K	1200							
FTO-2	119	450K	600	85K	2400K	1000							
FTO-3	48	180K	750	36K	1030K	860							
FTO-4	15	56K	650	14K	380K	760							
FTO-5	9	33K	825	8.5K	240K	800							

Blue = Metric (SI) Units
 Metric units in mLPM (liquid) & ALPH (gas)
 Black = English (US) Units
 English units in GPM (liquid) & ACFM (gas)

Abbreviations for Units of Measure:

- mLPM = Milliliters per Minute
- GPM = Gallons per Minute
- ALPH = Actual Liters per Hour
- ACFM = Actual Cubic Feet per Minute
- P/L = Pulses per Liter
- P/G = Pulses per Gallon
- P/Ft³ = Pulses per Cubic Foot
- P/mL = Pulses per Milliliter

Some combinations may be less than 10:1.

FTO-

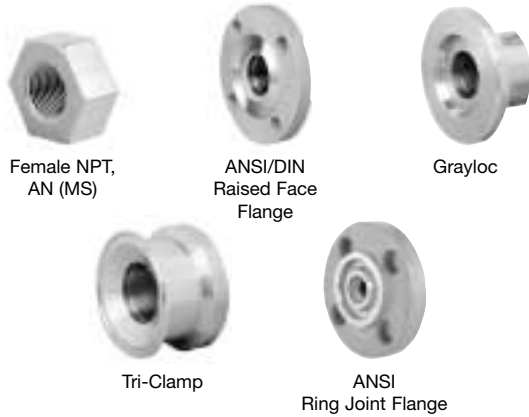
Series & Size

End Fittings

Model Numbering System

Cal

End Fittings



AI = AN (MS) internal straight threads 1/2" nominal size
NI = NPT internal threads 1/2" nominal size
BI = British Standard tapered pipe thread pn BS21:1973
C1 = 150# Raised Face Flange, 1/2"
C2 = 300# Raised Face Flange, 1/2"
C3 = 600# Raised Face Flange, 1/2"
C4 = 900# Raised Face Flange, 1/2"
J1 = 150# Ring Joint Flange, 1/2"
J2 = 300# Ring Joint Flange, 1/2"
J3 = 600# Ring Joint Flange, 1/2"
J4 = 900# Ring Joint Flange, 1/2"
G1 = 1GR4 Grayloc, 900 BAR
G2 = 1GR7 Grayloc, 460 BAR
G3 = 1GR11 Grayloc, 730 BAR
T1 = 3/4" Clamp Size
T2 = 1.5" Clamp Size
D1 = DN20, PN10-40
D3 = DN25, PN64-160
D5 = DN25, PN250
D7 = DN25, PN400
D9 = DN40, PN10-40
Other end fittings available upon request

CODE	DESCRIPTION
Note: A=Air, W=Water, S=Solvent, B=Oil Blend (Viscosity must be provided with oil blend calibrations "B")	
NA	10 point, normal 10:1 range, in air
NW	10 point, normal 10:1 range, in water
NS	10 point, normal 10:1 range, in solvent
NB	10 point, normal 10:1 range, in oil blend
XA	10 point, extended range, in air
XW	10 point, extended range, in water
XS	10 point, extended range, in solvent
XB	10 point, extended range, in oil blend
TA	20 point, normal 10:1 range, in air
TW	20 point, normal 10:1 range, in water
TS	20 point, normal 10:1 range, in solvent
TB	20 point, normal 10:1 range, in oil blend
YA	20 point, extended range, in air
YW	20 point, extended range, in water
YS	20 point, extended range, in solvent
YB	20 point, extended range, in oil blend

* The third digit of the calibration code is normally not used and occupied by a zero. When required, the following codes apply:

- U — To signify required units of measurement other than GPM or ACFM
- R — To signify special calibration other than normal 10:1 or 20:1
- B — To signify both changes in units and special flow range



Calibration



- = Standard R = Range
U = Units B = Both



L = Liquid G = Gas



Material

ibration

Materials of Construction

CODE	DESCRIPTION
FA	15 point, extended range, in air
FW	15 point, extended range, in water
FS	15 point, extended range, in solvent
FB	15 point, extended range, in oil blend
GA	30 point, extended range, in air
GW	30 point, extended range, in water
GS	30 point, extended range, in solvent
GB	30 point, extended range, in oil blend
U2	Universal Viscosity Curve, 2 Viscosities (specify minimum viscosity & maximum viscosity). 10 points each viscosity
U3	Universal Viscosity Curve, 3 Viscosities (specify minimum viscosity & maximum viscosity). 10 points each viscosity
SPECIFY TEMP. & PRESSURE, MIN./MAX., FOR REYNOLDS NO. CALIBRATIONS	
R1	10 points, 1 pressure, Reynolds No. Cal.
R2	10 points, 2 pressure, Reynolds No. Cal.
R3	10 points, 3 pressure, Reynolds No. Cal.
E1	20 points, 1 pressure, Reynolds No. Cal.
E2	20 points, 2 pressure, Reynolds No. Cal.
E3	20 points, 3 pressure, Reynolds No. Cal.

CODE	BEARING TYPE				
	A	C	D	E	G
H	X	X	X	X	X
U		X	X		X
Q				X	X
N			X	X	X

Available configurations of bearing types and materials of construction.

MATERIALS
 H = STANDARD, 316 Housing, 17-4 PH rotor, Teflon O-ring
 U = HIGH TEMPERATURE, 316 Housing, 17-4 PH rotor, Metal O-ring
 Q = PVC, PVC Housing, slugged PVC rotor, Teflon O-ring
 N = CORROSION RESISTANT, Hastelloy C housing and rotor, Teflon O-ring

Bearings

Bearing selection will affect flow range. Refer to sizing specification table for correct flow ranges.

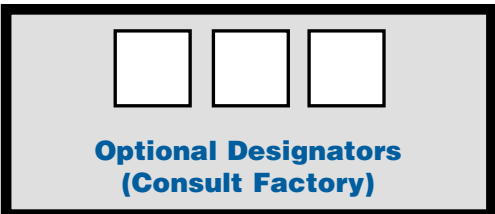
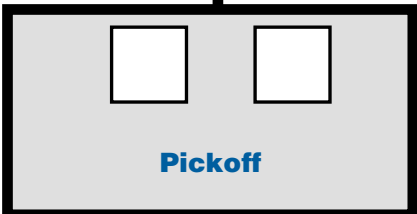
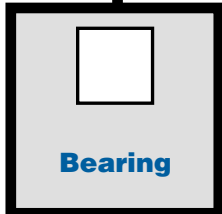
- C = SAPPHIRE PIVOT (Sapphire pivot, Carbide shaft)
- A = BALL BEARING (440 C balls, 316 shaft)
- D = CARBIDE JOURNAL (Carbide sleeve and shaft) liquid only
- E = GRAPHITE JOURNAL (Graphite sleeve, 316 shaft) liquid only
- G = CERAMIC JOURNAL (Ceramic sleeve and shaft) liquid only

Pickoffs

- 1 = Modulated Carrier, MS connector
- 2 = Magnetic, MS connector
- 3 = Magnetic, flying leads/threaded connection
- 5 = Modulated Carrier, flying leads/threaded connection
- 6 = Magnetic, MS connector, 400° C (750° F) max
- 7 = Magnetic, flying leads/threaded connection, 400° C (750° F) max
- L = Modulated Carrier, MS connector, 400° C (750° F) max
- M = Modulated Carrier, flying leads/threaded connection 400° C (750° F) max
- 8 = Modulated Carrier, MS connector, 11/16" thread, 330 µH coil
- 9 = Modulated Carrier, MS connector, 5/8" - 18 thread, 330 µH coil
- Y = Modulated Carrier, CSA X-Proof
- Z = Magnetic, CSA X-Proof
- T1 = Modulated Carrier w/RTD, MS connector
- T2 = Magnetic w/RTD, MS connector
- T3 = Magnetic w/RTD, flying leads/threaded connection
- T5 = Modulated Carrier w/RTD, flying leads/threaded connection
- X = Modulated Carrier, I.S. approved, MS connector
- SS = Modulated Carrier, I.S. approved, flying leads/smooth body
- XX = Modulated Carrier, I.S. approved, flying leads/threaded body
- U = Magnetic, I.S. approved, MS connector
- PP = Magnetic, I.S. approved, flying leads/smooth body
- TT = Magnetic, I.S. approved, flying leads/threaded body

Note: 1. Maximum temperature rating of pickoffs are 177° C (350° F) unless otherwise noted.
 2. See Amplifier Link literature for amplified pickoff codes.

Designator is by a dash (-).
 Des are used:
 f measure
 on flow range
 extended range
 units and



Please note:
 Highlighted areas indicate standard base price configuration.

Specifications

Applicable to Both Liquid and Gas Flowmeters

Materials Of Construction

Standard	316 SST Housing 17-4 PH Rotor Teflon O-Ring 15-7 Retaining Ring
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Other materials of construction optional (see model number chart).

Operating Temp. Range Defined by bearing and pickoff selection (see below)

Bearing Type Temperature Limits:

Sapphire jewel pivot bearing, with tungsten carbide shaft	-60° F to 300° F (-50° C to 149° C)
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Note: Standard maximum operating temperature of the jewel bearing is 300° F. Maximum operating temperatures up to 600° F are available as a special.

Ceramic journal bearing	-100° F to 800° F (-75° C to 425° C)
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Tungsten carbide journal	-60° F to 1200° F (-50° C to 650° C)
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Ball bearing 440 C stainless steel (not recommended for water service)	-450° F to 300° F (-270° C to 150° C)
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Pickoff Type Temperature Limits:

Magnetic	-430° F to 350° F (-260° C to 177° C)
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High Temp. Magnetic	-430° F to 750° F (-260° C to 400° C)
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Modulated Carrier (RF)	-300° F to 350° F (-185° C to 177° C)
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High Temp. (RF)	-300° F to 750° F (-185° C to 400° C)
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Water Cooled Mag & RF	Up to 1,100° F (593° C)
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Pickoff Mating Electrical Connections

MS Connector	
2-pin, standard pickoff	15-89515-101
3-pin, amplified pickoff	15-89515-102
4-pin, pickoff with RTD	15-93825-01
Threaded Connection with Leads	
Junction Box with Terminal	73-31836-105

Operating Pressure Range Defined by end connection selected. Pressures up to 400 BAR (5,800 psi) are standard. Consult factory for pressures up to 4,000 BAR (58,000 psi)

Filtration Recommendations 100 micron or better Jewel/Journal Bearing
10 micron or better Ball Bearing

Operation (cont'd)

The Omniflo's® modular design permits removal of the flowmeter's sensing element (capsule) for maintenance. This feature also facilitates replacement of the capsule for the purpose of obtaining a different flow range.

A Modulated Carrier (RF) or a Magnetic pickoff senses the rotation of the rotor and provides an electrical frequency output proportional to the process flow rate. The use of the RF pickoff optimizes the ability of the meter to measure minute flows since it does not produce any magnetic drag to the rotor motion, unlike magnetic pickoffs.

The Omniflo's® frequency output can be processed by complementary electronics, ranging from basic amplifiers, indicators and totalizers, to linearizers and more complex flow computers which compensate for all measurable process parameters for ultimate volumetric or mass flow measurement accuracy.

Liquid Service

Performance specifications are based on tests with water at normal conditions (viscosity of 1.0 centistoke) with Pivot Bearing.

Calibration Accuracy $\leq \pm 0.05\%$ of reading or better (accuracy of primary flow calibration standard directly traceable to NIST)

Repeatability $\leq \pm 0.1\%$ of reading

Linearity $\pm 0.1\%$ with linearizing electronics

Pressure Drop Less than 700 mBAR (10 psid) at maximum flow rate

Dynamic Response Less than 5 milliseconds for step change of flow rate

Viscosity Max. viscosity recommended 50 CST

Note: Universal viscosity calibrations may limit flow range (consult factory). Multiple viscosity calibrations available.

Gas Service

Performance specifications are based on air at normal conditions 14.7 psia and 68° F (1 BAR and 20° C) with Pivot Bearing.

Calibration Accuracy $\leq \pm 0.3\%$ of reading (accuracy of primary flow calibration standard directly traceable to NIST)

Repeatability $\leq \pm 0.2\%$ of reading

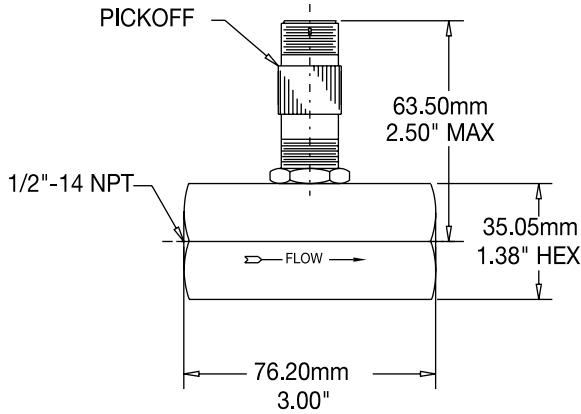
Linearity $\pm 0.1\%$ with linearizing electronics

Pressure Drop Less than 20 mBAR (8 INWC) at maximum flow rate

Note: Universal Reynolds Number calibrations may limit flow range (consult factory). Multiple Reynolds Number calibrations available.

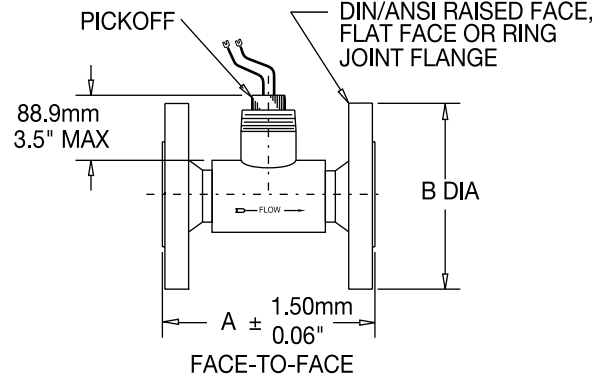
Dimensions

AN, NPT & BSP Connections



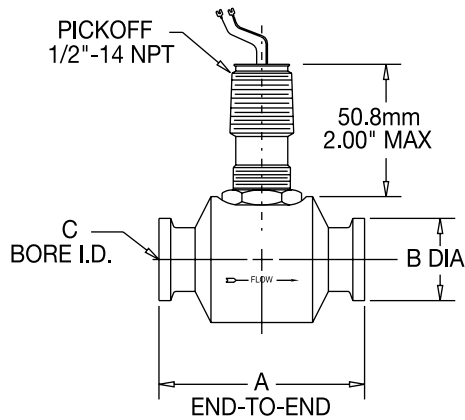
FTO Series flowmeter with internal thread end connectors (AN, NPT & BSP). Pickoff has 2-pin MS connector.

Flanged Connections



FTO Series flowmeter with flanged end connections. Pickoff is X-proof with flying leads and a 1" NPT spud for electronic enclosure mounting.

Tri-Clamp Connections



FTO Series flowmeter with Tri-Clamp end fittings. Pickoff is shown with NPT threads and flying leads for mounting electronic enclosures.

TRI-CLAMP END FITTING	"A" DIM.	"B" DIA.	"C" I.D.
T2	82.55mm 3.25"	50.29mm 1.98"	17.27mm .68"
T1	76.20mm 3.00"	24.89mm .98"	17.27mm .68"

ANSI FLANGE SIZE	"A" DIM.	"B" DIA.
1/2" - 150LB	102mm 4.00"	89mm 3.50"
1/2" - 300LB	108mm 4.25"	95mm 3.75"
1/2" - 600LB	118mm 4.63"	95mm 3.75"
1/2" - 900LB	133mm 5.25"	121mm 4.75"
1/2" - 1500LB	133mm 5.25"	121mm 4.75"
1/2" - 2500LB	149mm 5.88"	133mm 5.25"

DIN FLANGE SIZE	"A" DIM.	"B" DIA.
DN20, PN10-PN40	101.6mm 4.00"	105mm 4.13"
DN25, PN64-PN160	117.6mm 4.63"	140mm 5.51"
DN25, PN250	117.6mm 4.63"	150mm 5.90"
DN25, PN400	133.3mm 5.25"	180mm 7.086"
DN40, PN10-PN40	101.6mm 4.00"	150mm 5.905"

Blue = Metric (SI) Units

Black = English (US) Units

Specifications are for reference only and are subject to change without notice.

Note: Consult factory for Grayloc end fitting dimensions.

Local Representative:



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