



# 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

## 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
----------	--

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)
---	--

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)
-------------------------	---

Tungsten carbide journal	-60° F to 1200° F (-50° C to 650° C)
--------------------------	---

Ball bearing 440 C stainless steel (not recommended for water service)	-450° F to 300° F (-270° C to 150° C)
--	--

**Pickoff Type** Temperature Limits:

Magnetic	-430° F to 350° F (-260° C to 177° C)
----------	--

High Temp. Magnetic	-430° F to 750° F (-260° C to 400° C)
---------------------	--

Modulated Carrier (RF)	-300° F to 350° F (-185° C to 177° C)
------------------------	--

High Temp. (RF)	-300° F to 750° F (-185° C to 400° C)
-----------------	--

Water Cooled Mag & RF	Up to 1,100° F (593° C)
-----------------------	-------------------------

#### 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.



# Model Numbering System

## Calibration

CODE	DESCRIPTION	CODE	DESCRIPTION
<b>Note: A=Air, W=Water, S=Solvent, B=Oil Blend (viscosity must be provided with oil blend calibrations "B")</b>		FA	15 point, extended range, in air
KA	3 point, K-factor average in air @ 60°, 1 atmosphere	FW	15 point, extended range, in water
KW	3 point, K-factor average in water	FS	15 point, extended range, in solvent
KS	3 point, K-factor average in solvent	FB	15 point, extended range, in oil blend
KB	3 point, K-factor average in oil blend	GA	30 point, extended range, in air
NA	10 point, normal 10:1 range, in air	GW	30 point, extended range, in water
NW	10 point, normal 10:1 range, in water	GS	30 point, extended range, in solvent
NS	10 point, normal 10:1 range, in solvent	GB	30 point, extended range, in oil blend
NB	10 point, normal 10:1 range, in oil blend	U2	Universal Viscosity Curve, 2 Viscosities (specify minimum viscosity & maximum viscosity). 10 points each viscosity
XA	10 point, extended range, in air	U3	Universal Viscosity Curve, 3 Viscosities (specify minimum viscosity & maximum viscosity). 10 points each viscosity
XW	10 point, extended range, in water	<b>SPECIFY TEMP. &amp; PRESSURE, MIN./MAX., FOR REYNOLDS NO. CALIBRATIONS</b>	
XS	10 point, extended range, in solvent	R1	10 points, 1 pressure, Reynolds No. Cal.
XB	10 point, extended range, in oil blend	R2	10 points, 2 pressure, Reynolds No. Cal.
TA	20 point, normal 10:1 range, in air	R3	10 points, 3 pressure, Reynolds No. Cal.
TW	20 point, normal 10:1 range, in water	E1	20 points, 1 pressure, Reynolds No. Cal.
TS	20 point, normal 10:1 range, in solvent	E2	20 points, 2 pressure, Reynolds No. Cal.
TB	20 point, normal 10:1 range, in oil blend	E3	20 points, 3 pressure, Reynolds No. Cal.
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 designator is normally not used and occupied by a dash (-).  
When required, the following codes are used:

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



# Model Numbering System

## Materials of Construction

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.

**Please note:**

Highlighted areas indicate standard base price configuration.

### 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

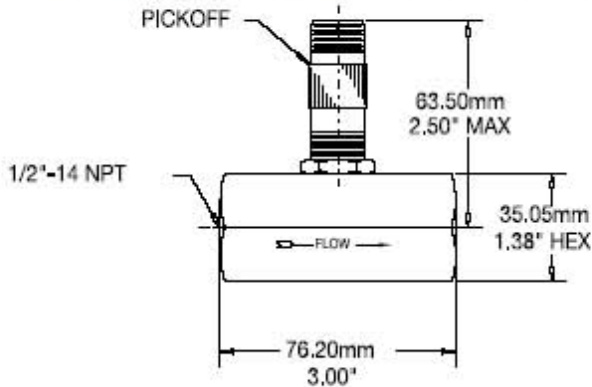
- 1 = Modulated Carrier, MS connector
- 2 = Magnetic, MS connector
- 3 = Magnetic, flying leads/threaded connection
- 5 = Modulated Carrier, flying leads/threaded connection
- 6 = Magnetic, MS connector, 400° C (750° F) max
- 7 = Magnetic, flying leads/threaded connection, 400° C (750° F) max
- L = Modulated 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.



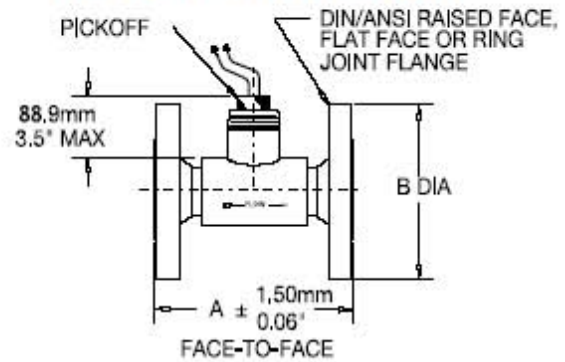
# Dimensions

## AN, NPT & BSP Connections



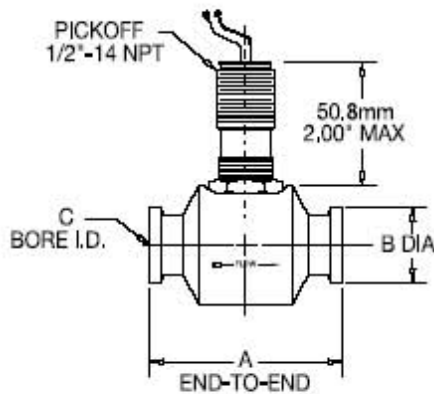
FTO Series flowmeter with internal thread end connectors (AN, NPT & BSP). Pickoff has 2-pin MS connector.

## Flanged Connections



FTO Series flowmeter with flanged end connections. Pickoff is X-proof with flying leads and a 1\"/>

## 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	62.55mm 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.



4250 E. Broadway Road, Phoenix, Arizona 85040 USA

