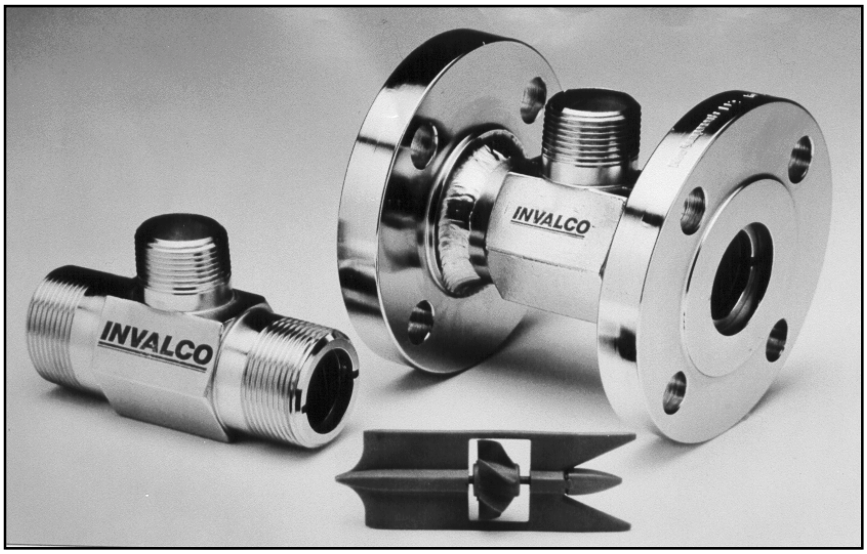
GUIDANT

Turbine Flow Meter

Installation/Operation Manual

February 2005

MNIT001



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Introduction

The INVALCO Turbine Flowmeter is a device used to measure the volumetric flow of a fluid. The flowmeter consists of the body, a multiblade rotor (usually 6 to 10 blades depending on size), bearings and supports for the rotor. As a fluid passes through the flowmeter the rotor spins. The speed of the rotor is directly proportional to the fluid velocity or flow rate.

As the rotor spins, the balde tips pass through a magnetic field generated by permanent magnets in a pickup coil mounted in close proximity to the rotor but separated from it and the process fluid by the wall of the flowmeter body. Each time a blade passes the magnet, it generates a small alternating current in the pickup coil. (See Figure 7) The pickup coil is attached to the pickup by two terminals or wires.

Each rotor blade passing through the magnetic pickup flux lines produce one alternating current cycle. Depending on the flowmeter size, a certain number of pulses are produced for each volumetric unit of liquid passing through the turbine flowmeter. This is known as the "K-Factor" of the turbine flowmeter. The variation of this factor over the specified flow range is the Linearity or accuracy of the flowmeter.

Mechanical Installation

Turbine Flowmeters are affected by upstream and downstream piping configurations. Upstream piping has a pronounced effect on flowmeter performance making it necessary to have ten (10) straight pipe diameters upstream of the turbine flowmeter and five (5) pipe diameters downstream of the turbine flowmeter. Flowmeters should be installed with the arrow marked on the body pointing in the direction of flow.

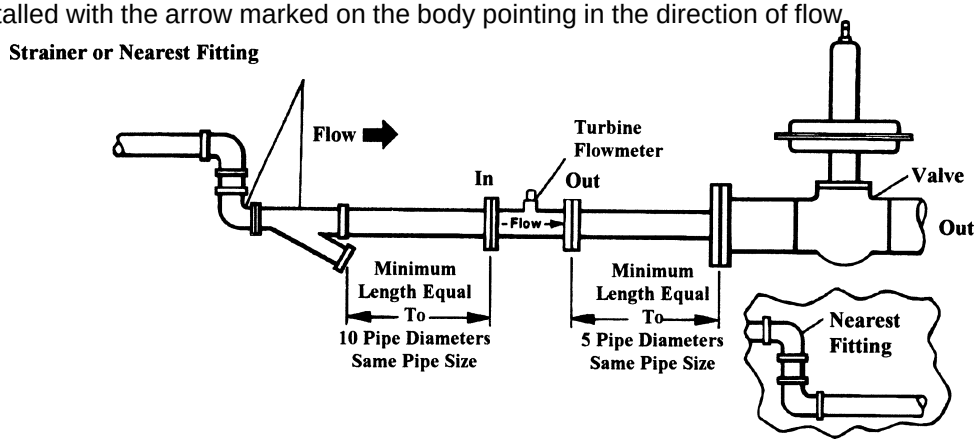


Figure 1

Control valves should always be located downstream from the flowmeter. If a line is empty and a valve is opened, the high velocity fluid stricking the flowmeter can cause severe damage. Air eliminators should be used in cases where gases are flowing in the process stream. Air in the liquid will cause the flowmeter rotor to spin at a different rate than the liquid giving incorrect readings.

Spools should be installed in the flowmeter position during start up to prevent damage to the flowmeter from solids (welding slag, rust, scale, etc.) in the process liquid.

Note: Meter should be installed with ten diameters of straight pipe the same size as turbine meter bore up and 5 straight pipe diameters downstream of meter.

Note: If valve is to be used, it must be downstream from the meter. This is necessary not only to keep the line full for accuracy in batching applications, but to prevent damage caused by striking an empty meter with a high velocity stream.

Note: Sleeved bearings used in INVALCO flowmeters are lubricated with the process fluid. Never spin the flowmeter at high speeds with air. Always confirm that the flow line contains fluid at start up.

The life of the flowmeter can be extended by using a mesh filter in the flow line. Table I shows the recommended filter for various sizes of flowmeters.

Table 1

Turbine Flowmeter Size	Mesh Size	Opening Size
1/2"	40	0.015
3/4"	40	0.015
1"	40	0.015
1-1/2"	18	0.0386
2"	14	0.051

Installation (con't)

Electrical Installation (Figure 2)

Thread the magnetic pickup into the mounting boss located on the top of the flowmeter. If the pickup does not have wire leads included, connect the signal cable to the pickup by threading on the keyed connector.

Note: Hand Tighten Only. Use of tools to tighten the pickup can damage the flowmeter and pickup.

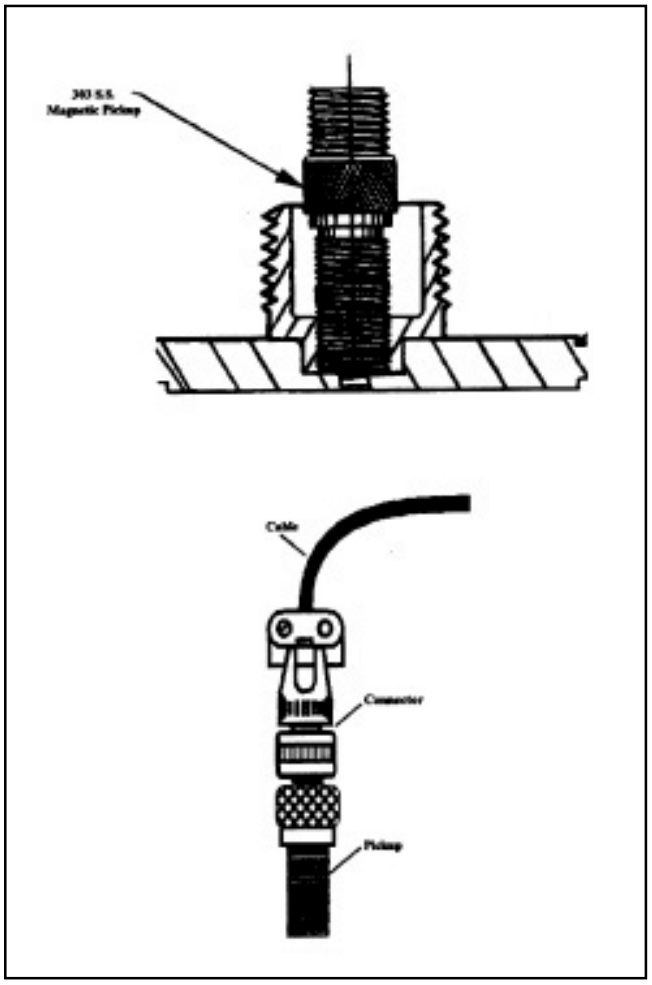


Figure 2

Turbine Meter Maintenance

Removal of Flowmeter Internals

Cartridge Type Sizes 3/4 Inch through 2" (Figure 3)

The cartridge type turbine flowmeter utilizes internals assembled into a single part, eliminating the need for the three part internals kit.

Note: This type of internals is not interchangeable with any other body type.

1) Remove the magnetic pickup.
2) Identify the upstream end of the meter by locating the two grooves visible from the outside of one end.
3) Remove the retaining ring from the end of the flow meter identified by the grooves.
4) Slide the internals out of the flowmeter. It may be necessary to push the internals out by gently applying pressure to the opposite end.
5) Inspect the internal bore of the flowmeter for defects. The internal surface of the flowmeter should be smooth. If the surface is damaged, the flowmeter body should be replaced.
6) Inspect the internals kit for damage or wear. If it appears to be damaged, replace it with a new internals kit.

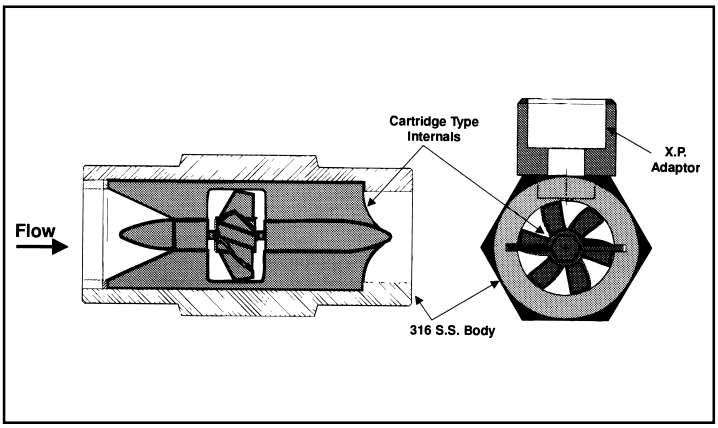


Figure 3

Replacement of Flowmeter Internals
Cartridge Type Sizes 3/4 Inch through 2 Inch

1) Identify the upstream end of the turbine flowmeter by locating the two grooves visible from the outside of one end.
2) Identify the upstream end of the turbine flowmeter internals by locating the end with a cone recessed between two supports forming a "V".
3) Insert the end opposite of the recessed cone into the groooves located in the upstream end of the turbine flow meter body.
4) Slide the flowmeter internals into the turbine flowmeter body until it seats firmly against the downstream end.
5) Insert the retaining ring into the upstream end of the turbine flowmeter, pushing it far enough into the flowmeter body to engage the retaining ring slot directly above the turbine flowmeter internals.

Removal and Replacement of Flowmeter Internals Size 4 Inch (Shipped Before April 1990) and Size 3 Inch Shipped Before January 1989

1) Locate the flow direction arrow on the turbine flow meter body, or the words “Inlet” or “Outlet” stamped near the ends. Set the flowmeter body on end with the outlet map.
2) Assemble the rear support assembly, giving attention to aligning the grooves in the pinion bolt with the slots in the cage.
3) Install the lock washer and nut. The threads on the pinion bolt should only extend halfway through the nut, (about 2-1/2 turns).
4) Insert three vanes with the tapered bottom edges matching the sloping bottom of the grooves in the pinion bolt.
5) Locate the three wide and shallow grooves running in a length-wise direction in the turbine flowmeter body.
6) Insert the support assembly into the body, bearing end first, with the vanes sliding down the shallow grooves. The assembly will come to rest against a shoulder.
7) Rotate the entire support assembly about 60 degrees, so that the vanes are no longer lines up with the access grooves in the body.
8) Tighten the nut slowly, working the assembly back and forth so the vanes will seat properly. Tighten the nut secruely.
9) Turn the body over and slip the rotor onto the rear bearing just installed.
10) Assemble and install the front support in the same manner. It may be necessary to pull or push on the pinion bolt to workt he assembly in far enough to read the shoulder, before rotating.

As the pinion bolt is pulled back, the vanes are forced outward.

The rear pinion bolt can be identified by the 1/2 inch diameter carbide bearing which protrudes 1-7/32 inches.

The rear pinion body, or cage, can be identified as follows:

4 inch flowmeter front and rear cages are identical.

3 inch (shipped before January 1989) front cage overall length is 2-21/32 inches and the slots begin 3/8 inches from the open end.

Rear cage overall length is 2-15/16 inches and the slots begin a little over 3/4 inch from the open end.

Removal of Flowmeter Internals

Size 4 Inch (Figure 5)

1) Remove the internals by retracting the set screw and rap the sliding vane, if necessary, to relieve the locking pressure.
2) If spirolox rings are installed, remove them before attempting to remove the supports.
3) Remove the rotor support fromt he flowmeter.
4) Remove the rotor from the flowmeter.
5) Repeat steps 1 through 3 to remove the second support.

Replacement of Flowmeter Internals

Size 4 Inch (Figure 5)

1) If your flowmeter body is grooved for spirolox rings, it is recommended that the rings be installed.

   Note: Lock rings are provided to absorb shock and should be replaced when replacing the internals.
2) Advance the sliding vane with the set screw until the whole support assembly fits closely in the bore of the flowmeter body.
3) Position the support assembly against the shoulder in the flowmeter body and tighten the set screw.
4) Install a spirolox ring if a groove has been provided for.
5) Meter bodies shipped after December 1, 1970 have three gooves machined in each end. The sliding vane has an “ear”, detail “B”, to engage one of these grooves. The front support assembly should be positioned so that the sliding vane engages the upper-left-hand groove. The sliding vane on the rear support should engage the up per-right-hand groove. Both sliding vanes should be in line.
6) For installation in older bodies (prior to December 1, 1970), which are not grooved, the sliding vane can be turned upside down (Figure 5) so the ear is buried in the support.

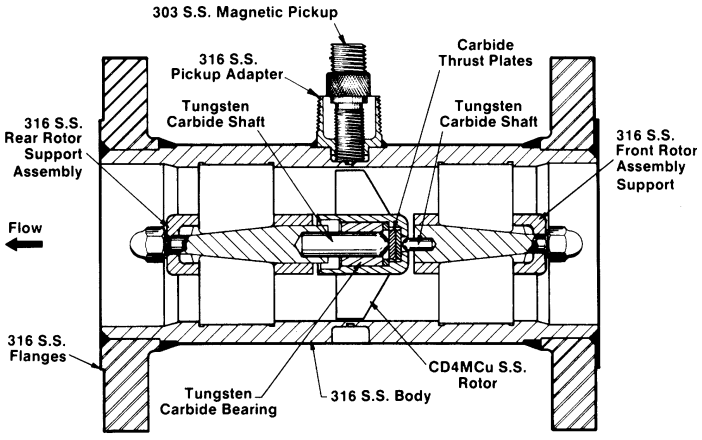


Figure 5

Magnetic Pickups

Flow in the turbine flowmeter is sensed by a non-wetted sensor called a variable reluctance magnetic pickup. The magnetic pickup is an assembly consisting of a permanent magnet and a coil bobbin on which several hundred turns of wire are wound (Figure 6). This combination produces a magnetic field at the top of the pickup. The pickup is placed in close proximity to the rotor blades, but is separated from it and the process fluid by the wall of the flowmeter housing. As the rotor turns, the blades disrupt the magnetic field of the pikcup and generate a sine wave voltage signal across the terminals of the magnetic pickup coil. Each time a rotor blade passes through the magnetic field, one alternating current (AC) cycle is generated (Figure 7). The number of pulses produced by a turbine flowmeter per gallon of water is known as the "K-Factor".

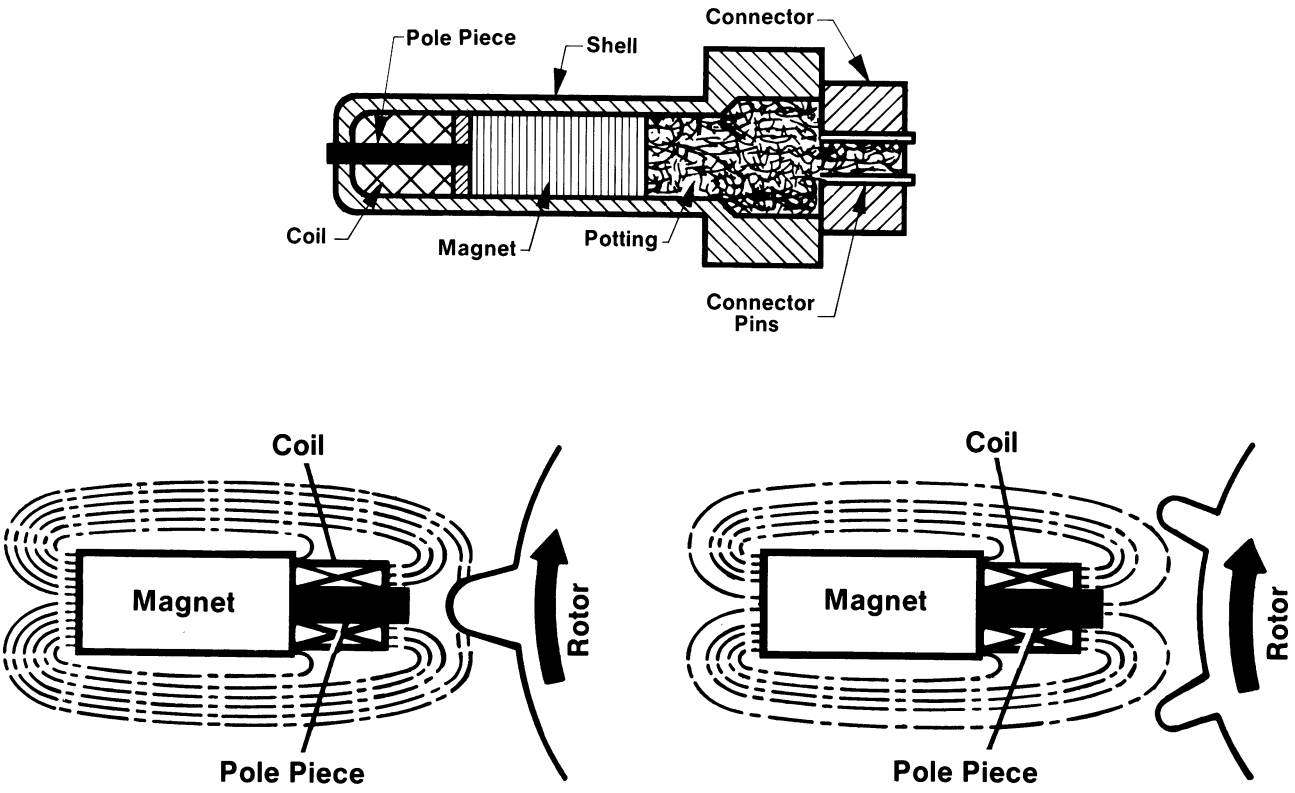
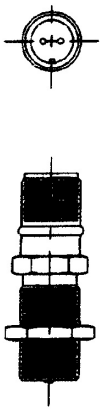


Figure 6

Standard Magnetic Pickup
Stock No. 64908265

Temp. Range: -65° to 225°F
Coil Resistance: 975 OHMS
Coil Inductance: 400 mH
Housing: Stainless Steel
Mating Connector: 10SL-4S



Extended Temperature Magnetic Pickup
Stock No. 64919755

Temp. Range: -450° to 450°F
Hermetically Sealed
Coil Resistance: 975 OHMS
Coil Inductance: 400 mH
Housing: Stainless Steel
Mating Connector: 10SL-4S

Wire Lead
Magnetic Pickup Kit
Stock No. 49020839

Use with all meter mounted readout devices.

Temp. Range: -65° to 225°F
Coil Resistance: 975 OHMS
Coil Inductance: 400 mH
Housing: Stainless Steel
Signal Connection: 7" Wire Leads

Low Drag
Magnetic PIckup
Stock No. 64920774

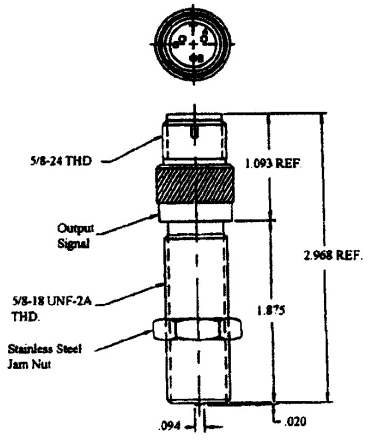
For special applications

Temp. Range: -65° to 225°F
Coil Resistance: 975 OHMS
Coil Inductance: 400 mH
Housing: Stainless Steel
Mating Connector: 10SL-4S

NEMA 6 Watertight
Magnetic Pickup
Stock No. 64920920

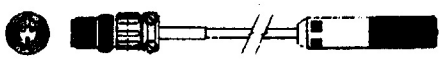
Molded 15' thermo-plastic rubber cable and connector, ozone and ultraviolet resistant, excellent heat aging/abrasion resistance. Suitable for outdoor applications and installations that require hose down cleaning of meter.

Temp. Range: -65° to 225°F
Housing: Stainless Steel



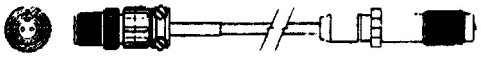
Pre-Amp Magnetic
Pickup Kit
Stock No. 49016811

Temp. Range: -40° to 180°F
Housing: Stainless Steel
Output: Square Wave
Supply Voltage: 5 to 26 VDC
Output Impedence: 2.2K OHMS
Load Current: 15mA (NOM)
Output Voltage: 90% Supply
Mating Connector: 10SL-3P



RF (Radio Frequency) Pickup Kit
Non Magnetic
Stock No. 49020795

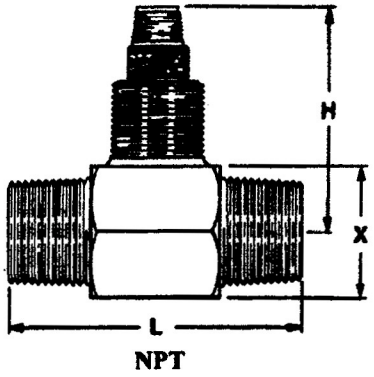
Temp. Range: -40° to 212°F Continuous
250°F Intermittant
Housing: Plastic
Output: Square Wave
Supply Voltage: 5-26 VDC
Load Current: 20mA (NOM)
Output Voltage: 5 VDC Regulated
Mating Connector: 10 SL-3P
This pickup must be used with the 1/2" Turbine Meter to achieve stated accuracy over the 10:1 range of the meter.



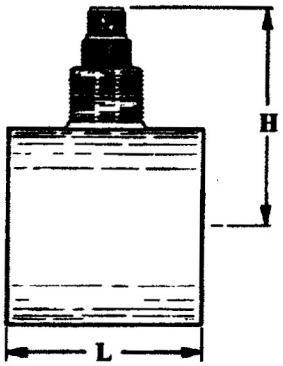
Special Extended High Temp. Magnetic Pickup
Stock No. 64917721

Temp. Range: -450° to 800°F Continuous
+1000°F Intermittent
Housing: Stainless Steel
Supplied with 3' Stainless Steel Shielded Overbraid Cable with connector
Mating Connector: 10 SL-4P
Requires Turbine Flow Meter Modification.

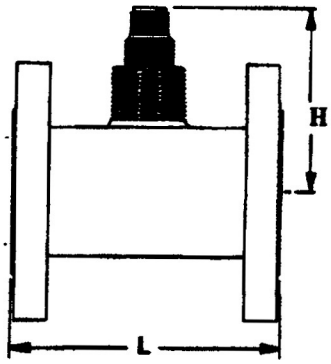
Dimensions



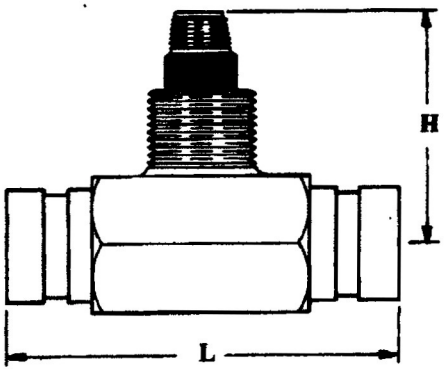
NPT



WAFER



FLANGED



GROOVED

Size	NPT		Wafer		Grooved			Flanged 150#	
	H(IN)	L(IN)	H(IN)	L(IN)	Connection	H(IN)	L(IN)	H(IN)	L(IN)
1/2”	2.688	2.750							
3/4”	2.688	3.250							
1”	2.812	3.562	2.688	2.500				1.750	3.88
1-1/2”	3.000	4.594	2.812	2.500	2”	2.75	5.875	1.880	4.13
2”	3.250	6.063	3.000	2.500	2”	2.93	5.875	2.130	5.25
3”			3.250	3.250	2”	3.25	5.875	2.250	6.75
4”			3.888	3.500	3”	3.88	9.875		
6”			4.310	3.250	4”	4.31	11.960		

Magnetic Pickup Enclosures

Magnetic pickup assemblies may require an enclosure to assure protection against the environment. Three types of enclosures are available. These are:

WAK-2 Weatherproof Adapter (Figure 8)

This kit provides an enclosure for the magnetic pickup to protect it from physical damage, weather, hose down or high humidity environments. A one inch (1") NPT outlet is provided at the top for the adapter for a conduit connection. The adapter is provided with a factory installed cable clamp designed to squeeze the cable for weather-proofing. When conduit is used, the cable clamp is removed.

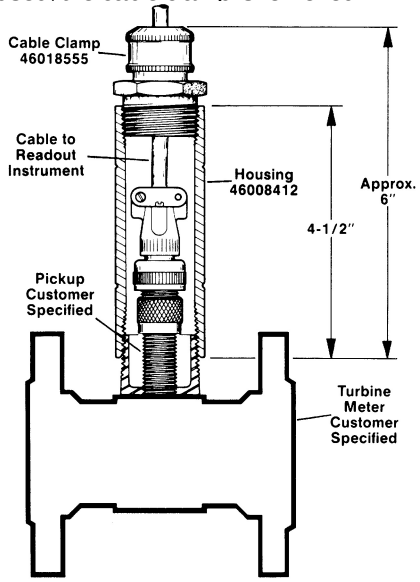


Figure 8 - Model WAK-2 Weather-Proof Adapter
Stock No. 81001808

EAK-2 Explosion-proof Adapter (Figure 9)

This kit provides an explosion-proof enclosure for the magnetic pickup. The enclosure is rated Class I, Division I, Group D. The enclosure is provided with a one and a quarter inch (1-1/4") NPT connection for conduit.

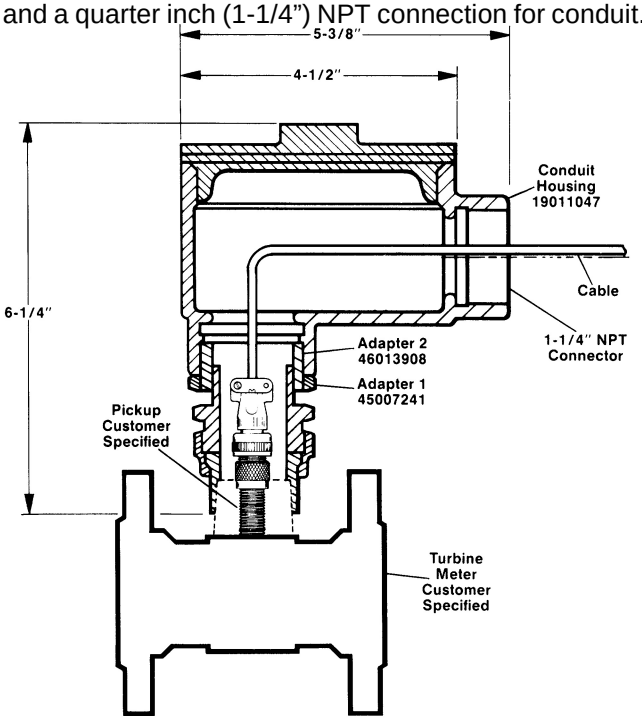
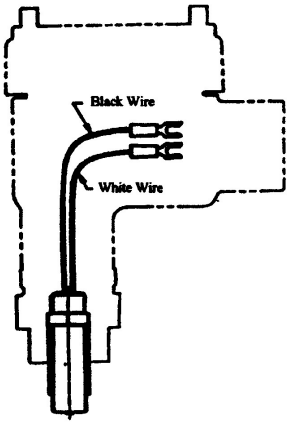


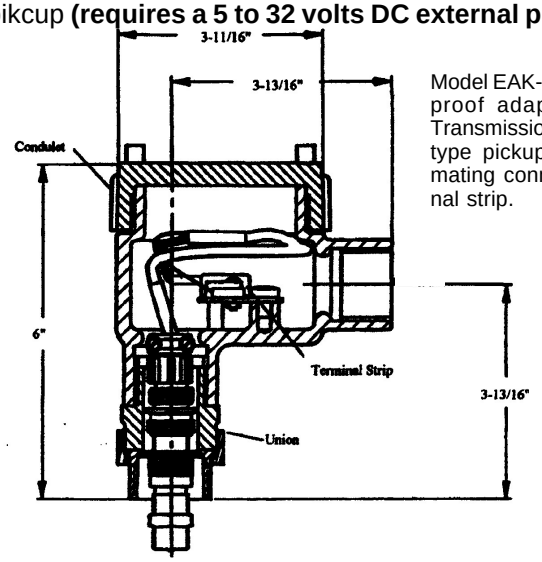
Figure 9 - Model EAK-2 Explosion-Proof Adapter
Stock No. 81014217

EAK-2AX-P Explosion-proof Adapter with Terminal Block (Figure 10)

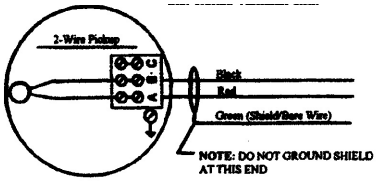
This kit provides an explosion-proof enclosure with a 3 point terminal strip. The enclosure is provided with either a two wire lead magnetic pickup, a pre-amp magnetic pikcup **(requires a 5 to 32 volts DC external power)** or an RF pickup **(requires 5 to 26 volts DC external power)**.

Model EAK-2AX-P Explosion-proof adapter with wire lead magnetic pickup and 3 point terminal strip.

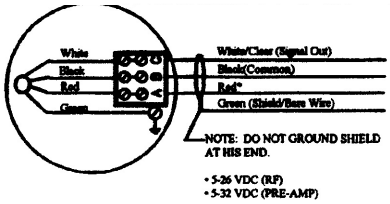




Model EAK-2BX-P Explosion-proof adapter with RF or Transmission Signal Pre-amp type pickup. 8" cable with mating connector and terminal strip.



2-Wire Pickup



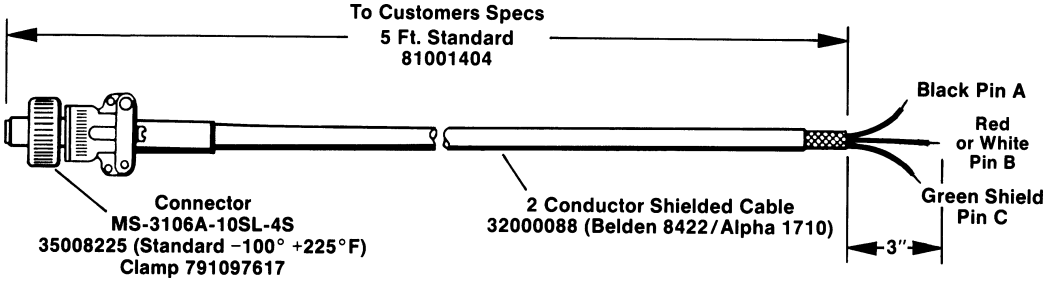
RF or Pre-Amp Pickup

Turbine Flowmeter Cable Assemblies

Turbine flowmeter cables are 18 gauge shielded, heavy duty neoprene-jacketed complete with mating connector for magnetic pickup and terminated for interconnection to a readout or junction box.

Standard Cable Assembly (Figure 11)

The standard cable is made up of two conductor cables with a 10SI-4S connector for mating with the standard magnetic pickup or the low drag magnetic pickup. **Maximum Temperature: +225°F**

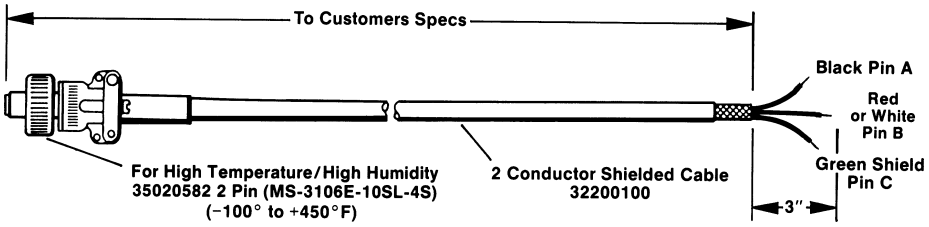


Length	Part No.
8”	81001471
15’	81001483
25’	81001484
50’	81001479

Standard Turbine Meter Cable Assembly

High Temperature Cable Assembly (Figure 12)

The high temperature cable is made up of two conductor cable with a high temperature version of the 10SL-4S connector for mating with the extended temperature magnetic pickup. **Maximum temperature: +450°F**

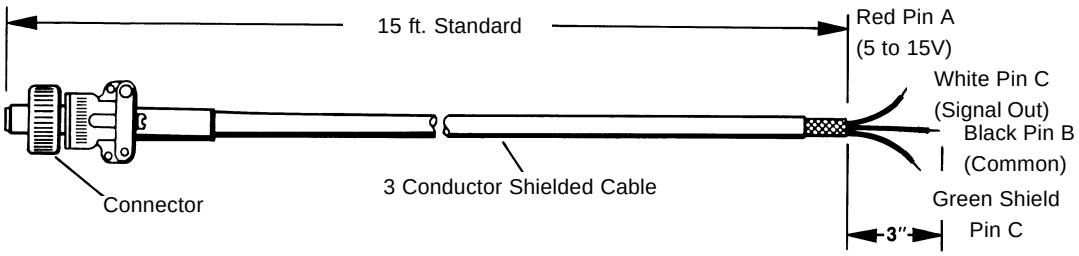


Length	Part No.
8”	81001471
15’	81001483
25’	81001484
50’	81001479

High Temperature Turbine Meter Cable Assembly

Pre-Amplifier and RF Cable Assembly (Figure 13)

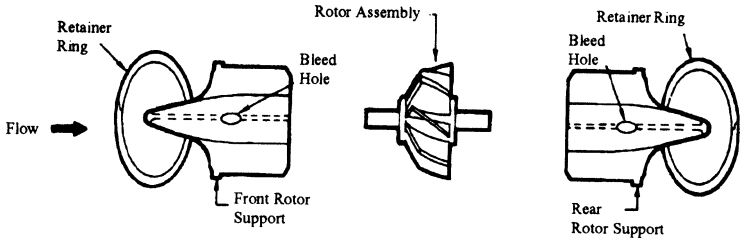
The pre-amp/RF cable is made up of three conductor cable with a 10SL-3S connector for mating with the pre-amplifier or RF pickup. **Maximum temperature: +225°F**



Length	Part No.
8”	81001485
15’	81001494
25’	81001507
50’	81001510

Repair Parts Kits

All INVALCO repair parts kits include all flowmeter internal components. The assembly is calibrated on water at 70°F, with a viscosity of 1 centistoke. Each repair kit has a K-factor guaranteed to be within +/-1 percent of the original.



							Cartridge Internals	
"W" Series - Tungsten Carbide Bearings								
Meter Size	**Flow Range**	**W2 Stock No.**	**W3 Stock No.**	**W4 Stock No.**	**W6 Stock No.**	**W9 Stock No.**	**WC-1/2% Stock No.**	**WC-1% Stock No.**
1/2"	0.6 to 6	81001901	81001901	-	-	-	-	-
3/4"	1.5 to 15	81001904	81001904	81001904	-	81003747	81014400	81004400
3/4"	3.2 to 23	81004044	81004044	81004044	-	81003749	-	-
1"	6.5 to 65	81001905	81001905	81001905	81001905	81003735	81014401	81004401
1-1/2"	17.5 to 175	81001906	81001906	81001906	81001906	81003733	81014402	81004402
2"	33 to 330	81001907	81001907	81001907	81001907	81003731	81014403	81004403
3"	60 to 600	-	81004048	81004050	81004048	81004095	-	-
3"*	60 to 600	-	-	81004240	-	-	-	-
4"	110 to 1100	-	81004049	81004051	81004049	81004096	-	-
4"**	110 to 1100	-	-	81004244	-	-	-	-
6"	300 to 3000	-	-	81014474	81003112	-	-	-

*3" Internal kit for turbine flowmeters purchased after January 1989.

**4" Internal kit for turbine flowmeters purchased after April 1990.

							Cartridge Internals
"WFP" Series -Rulon 641 Bearings							
Meter Size	**Flow Range**	**W2 Stock No.**	**W3 Stock No.**	**W4 Stock No.**	**W6 Stock No.**	**W9 Stock No.**	**WC-1/2% Stock No.**
1/2"	0.6 to 6	81001901	81001901	-	-	-	-
3/4"	1.5 to 15	81001904	81001904	81001904	-	81003747	81014400
3/4"	3.2 to 23	81004044	81004044	81004044	-	81003749	-
1"	6.5 to 65	81001905	81001905	81001905	81001905	81003735	81014401
1-1/2"	17.5 to 175	81001906	81001906	81001906	81001906	81003733	81014402
2"	33 to 330	81001907	81001907	81001907	81001907	81003731	81014403
3"	60 to 600	-	81004048	81004050	81004048	81004095	-
3"*	60 to 600	-	-	81004240	-	-	-
4"	110 to 1100	-	81004049	81004051	81004049	81004096	-
4"**	110 to 1100	-	-	81004244	-	-	-
6"	300 to 3000	-	-	81014474	81003112	-	-

*3" Internal kit for turbine flowmeters purchased after January 1989.

**4" Internal kit for turbine flowmeters purchased after April 1990.

"WSP" Series -3A Sanitary Approved Carbide Bearings

Meter Size	Flow Range	W2 Stock No.
3/4"	1.5 to 15	81003845
1"	6.5 to 65	81003846
1-1/2"	17.5 to 175	81003847
2"	33 to 330	81003848

General Specifications

Response Time

1/2" to 2"

2-5 milliseconds for step change in flow rate

3" to 6"

10-25 milliseconds for step change in flow rate

Temperature Range of Pickups

Standard Pickup

-100° F to 248° F (-73° C to 120° C)

Hi-Temp Pickup

-450° F to 450° F (-268° C to 268° C)

Extended Temp Pickup

-450° F to 800° F (-268° C to 426° C)

Pre-Amp Pickup

-40° F to 248° F (-40° C to 120° C)

RF Zero Drag Pickup

-20° F to 160° F (-29° C to 71° C)

Sanitary Options Available

Frequency Output Over Linear Flow Range

1/2" to 1-1/2" - 100 Hz to 1000 Hz

2" - 100 Hz to 900 Hz

3" to 6" - 50 Hz to 500 Hz

Voltage Output

1/2" to 2"

Approximately 100 MV @ 100 Hz to 1.5 Volts (rms) 1000Hz

3" to 6"

Approximately 80 MV @ 50 Hz to 800 MV (r.m.s.) 500 Hz

Pressure Rating

The working pressure of W Series Turbine Meters is limited to a maximum of 7500 psig on 3/4" bore and to 5000 psig on 1/2", 1", 1-1/2" and 2" bores. Flanged meters are limited by flange rating.

Performance Specifications

Linearity: +/- 0.5%

WG Series: +/-1.0%

GT Series: +/-1.0%

Repeatability

Within +/- 0.1% of indicated flow throughout the linear range.

Maximum Overrange

To 125% of maximum flow rate for intermittent periods.

Standard Materials of Construction

Body

316 S.S.

Rotor

CD4MCu

Rotor Shaft

Tungsten Carbide or 316 S.S.

Bushings

Tungsten Carbide or High Performance Polymer

Thrust Ball

316 S.S. or Tungsten Carbide

Rotor Support Retainers

302 S.S.

Rotor Supports

316 S.S.

Temperature Rating of Bearing Structure

Tungsten Carbide

-40° F to 300° F (-40° C to 149° C)

High Performance Polymer

-40° F to 250° F (-40° C to 121° C)

Extended Temperature

-200° F to 800° F (-130° C to 426° C)

Turbine Flowmeter Sizing

	Flow Range		Nominal K-Factor*		
Meter Size	GPM	BPH	P/GAL	P/BBL	Freq. Output (Hertz)
1/2"***	0.6 to 6.0	.86 to 8.6	10,500	441,000	100-1,000
1/2"	0.8 to 6.0	1.14 to 8.6	10,500	441,000	
3/4"	1.5 to 15	2.1 to 21	4,605	193,410	150-1,000
3/4"**	3.2 to 23	4.6 to 46	1,875	78,750	100-1,000
1"	6.5 to 65	9.3 to 93	953	40,026	100-1,000
1-1/2"	17.5 to 175	25 to 250	341	14,322	100-1,000
2"	33 to 330	47.1 to 471	185	7,770	100-1,000
3"	60 to 600	85.7 to 857	50	2,100	100-1,000
4"	110 to 1100	157 to 1571	28	1,176	50-500
6"	300 to 3000	428 to 4286	10	420	50-500

*Actual K-Factor will be within +/- 1% of Nominal Value. Data based on water calibration at 25C.

**Extended range.

***RF Pickup is required when using a flow range below 0.8 GPM

3-A Sanitary Meters/Internals

The INVALCO 3-A (28-03) Sanitary Turbine Flow meter is certified for use in the food and beverage industry where 3-A is required. The meter has been specially designed to have the same characteristics, flow ranges, and life as all the Invalco industrial meters, and also meet or exceed the requirement of 3-A (28-03). The meter has a maximum surface finish of 32ra on all internal parts; all components are manufactured out of 3-A approved material, and can be cleaned in place to save time and money in disassembling cleaning and reassembling the meter. The wear surfaces are made from FDA (3-A) approved carbide for superior wear resistance.

The meter can be cleaned as long as the following conditions are met:

- Caustic solutions that are acceptable with 316 stainless steel components
- Temperatures of less than 275ºF (135ºC) for less than a 60 minute duration
- Instantaneous flow Ranges of the fluids must never exceed the chart below.

Meter Size	Flow Range (GPM)
3/4	1.5-15
1	6.5-65
1 1/2	17.5-175
2	33-330
3	60-600

- Air purging must be done with care not to create severe shock loading to the meter, and velocity through the meter must not exceed the instantaneous published flow ranges of the meter.
- Radii at ends of meters and the thrust bearing pockets (see figure 14) must be periodically checked for cleanliness and adjustments in cleaning may be required to clean these areas. If areas do not clean in place the meter may need to be disassembled from the line and cleaned by hand or other method to insure proper cleanliness is being achieved**. If the meter is disassembled for cleaning or inspection, care must be taken not to lose the thrust bearings located at either end of the shaft.** All replacement internals utilize a sanitary paste to ensure that the bearings remain in place during assembly.

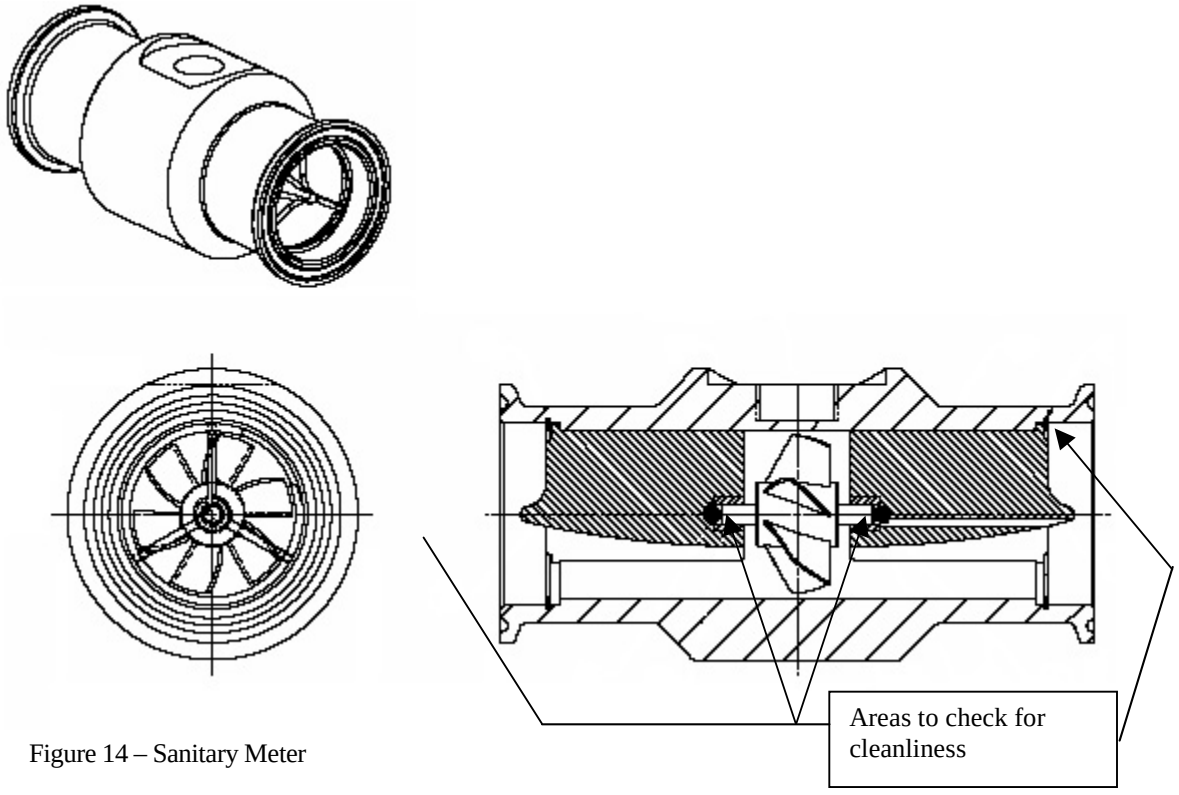


Figure 14 – Sanitary Meter

Flow Related Formulas

$$GPM = \frac{Hz \times 60}{K}$$

$$HZ = \frac{GPM \times K}{60}$$

$$K = \frac{Hz \times 60}{GPM}$$

$$GPM = \frac{GPD}{1440}$$

$$\text{Pulses Per Liter} = \frac{K}{3.785}$$

Pulses Per Barrel = K x 42

$$\text{Pulses per Cubic Meter} = \frac{K}{.003785}$$

$$\text{Pulses Per Pound} = \frac{K}{\text{Pounds per Gallon}}$$

$$GPM = \frac{\text{Pounds Per Hour}}{500 \times \text{S. G.}}$$

LPM (liters per min) = 3.785 x GPM

$$GPM = \frac{LPM}{3.785}$$

U.S. GPM = Imperial GPM x 1.200955

Pounds Per Hour = 500 x S.G. x GPM

Pounds Per Gallon = S.G. x 8.33 (water)

BPH = GPM x 1.42857

BPD = GPM x 34.286

BPM = GPM x 0.0238

GPS = GPM x .01666

GPD = GPM x 1440.0

GPM = BPH x 0.7

CFM = GPM x .13368

GPM = GPH x .01666

GPM = CC/MIN x .000264173

$$\text{Specific Gravity} = \frac{LBS/GAL}{8.33}$$

The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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