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SA SERIES
SANITARY SERVICE
TURBINE FLOWMETERS

Installation, Operation
and
Maintenance Manual

SERIAL NUMBER________________________________

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 Otherwise, the manufacturer assumes no responsibility for the use of specifications that have been changed and are no longer in effect.

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1 INTRODUCTION

This manual provides information and guidance for the installation, operation and maintenance of the SA Series Sanitary Service Turbine Flowmeter, manufactured by Flow Technology, Inc., Phoenix, Arizona.

2 SA SERIES SANITARY SERVICE TURBINE FLOWMETER

The Flow Technology, Inc. turbine type Sanitary Service Line Flowmeter is a volumetric flow measuring instrument. The flow sensitive element is a freely suspended, bladed rotor positioned axially in the flow stream with the flowing fluid pushing against the blades. The rotational speed of the turbine is proportional to the velocity of the fluid. Since the flow passage is fixed, the turbine's rotational speed is also a true representation of the volume of fluid flowing through the flowmeter. The rotation of the turbine rotor generates electrical pulses in the pickoff that is attached to the flowmeter housing in close proximity to the turning rotor. Each of these pulses represents a discrete volume of fluid. The sum of the output pulses corresponds to the total volume of the fluid being measured. These pulses can be fed into digital totalizers, frequency to DC converters, or any of the many frequency indicating, recording, and control devices available within the field.

The Sanitary Service Line Flowmeter consists of 3 basic assemblies (Refer to Figure 1). The model number completely describes the characteristics of the meter. Meters provided for liquid applications are not interchangeable with meters provided for gas applications. All requests for information concerning a specific meter should contain the flowmeter model number and the flowmeter serial number.

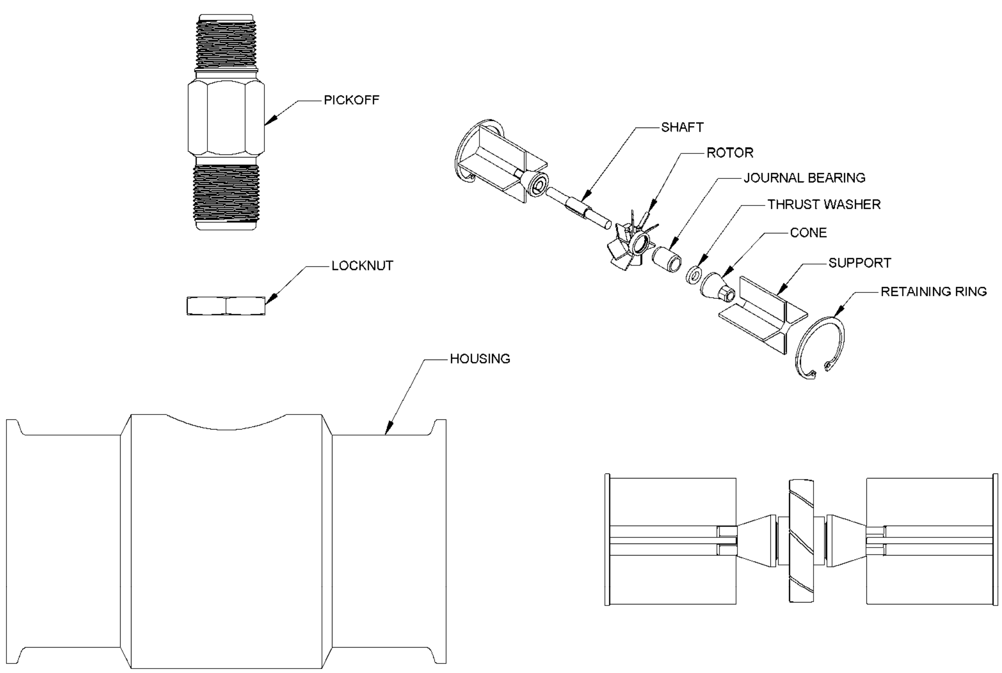

Figure 1 - Flowmeter Basic Parts

3 INSPECTION UPON RECEIPT

The flowmeter should be unpacked carefully and inspected to verify that no damage occurred during shipment. Make certain that the internal parts are clean and free from packing materials or debris.

C A U T I O N
The flowmeter is a precision instrument and may be damaged if pressurized air is used for cleaning the flowmeter or for checking the rotation of the rotor.

4 MECHANICAL CONNECTIONS

4.1 Flow Pulsations

Piping and system components should be arranged to minimize pulsations entering the turbine meter. Pulsations may cause the meter to read high, and excessive pulsations may cause permanent bearing damage. Pulsations should be kept below 10% of the current flow rate at the meter location.

C A U T I O N
Pressure should be built up gradually at start-up to avoid possible damage by over-speeding the rotor. Any severe water hammering from improper start-up or flow surges during operation must be avoided to prevent over-speeding, shaft or rotor blade breakage.

N O T E
Water hammering is a term used during start-up (introducing fluid into the piping) to describe a high velocity flow impact on the turbine rotor. This must be avoided to prevent damage to the mechanical parts.

4.2 Purging

All flow lines in the meter system should be purged prior to installation of the meter. This will remove pipe dope, metal shavings, slag and debris that may damage the turbine meter. Control valves should be located downstream from the turbine meter. System start-ups with upstream control valves in an unfilled system can result in a hydraulic shock on the meter, causing damage and a change in calibration in liquid systems, or can cause over-speed conditions in gas meter systems.

4.3 Installation Recommendations

For liquid flowmeters, it is recommended that the flowmeter be installed so that it remains full of fluid when the flow ceases. When the flowmeter is left installed in a line that is temporarily out of service and has been partially or fully drained, severe bearing corrosion may occur. The type and corrosiveness of the fluid being metered, the type of bearing used in the flowmeter and the length of time the line will be out of service are factors which may affect the life and operation of the flowmeters. If it is economically feasible and conditions permit, the flowmeter should be removed, cleaned and stored when there is any doubt about the fluid level in the line during these out-of-service periods. See Section 9 for detailed information regarding maintenance and care of your FTI flowmeter.

4.4 Orientation and Calibration

The orientation of the turbine flowmeter will influence the nature of the load on the rotor bearings, and thus, the performance of the meter at low flow rates. For optimum accuracy a turbine meter should be installed in the same orientation in which it was calibrated. Standard calibration orientation is with the meter axis horizontal.

5 PICKOFFS

5.1 Installation

Pickoffs should bottom in the well of the flowmeter housing but should only be finger tightened to approximately 4 in-lb (4500 gm-cm max) to prevent distortion of the coil housing. The pickoff is secured in position by tightening the lock nut to approximately 25 in-lb (30000 gm-cm). The pickoff is removed by loosening the hex lock nut and unscrewing the pickoff from the housing.

C A U T I O N
Meter pressure ratings are established with a pickoff installed. Do not operate a flowmeter under pressure without a pickoff installed.

5.2 Magnetic Pickoff

The magnetic pickoff output is a low level signal that ranges from 10 mV to several volts peak-to-peak. A pulse amplifier may be needed to convert the pickoff low level signal to a 10 V peak-to-peak pulse signal suitable for process instrumentation. Typical resistance of magnetic pickoffs is 2275 Ω ± 20%.

5.3 RF Pickoff

The modulated carrier (RF) pickoff must be installed with an appropriate amplifier (consult factory). The amplifier is needed to convert the modulated carrier signal to a 10 V peak-to-peak pulse signal suitable for process instrumentation. Typical resistance of modulated carrier pickoffs is 10 Ω ± 10%.

6 ELECTRICAL CONNECTIONS

6.1 Connections

Standard pickoffs are available with a two-contact type MS3102A-10SL-4P connector or with NPT threaded body and pigtail connectors.

6.2 Connection Cable

The connecting cable between the flowmeter and the electronic instrumentation should be a two conductor, 22 AWG, shielded and twisted cable with a vinyl jacket (Belden 8761 or equivalent). The cable should not be installed in a conduit or tray containing power lines, or close to strong electromagnetic sources such as electric lines, electric motors, transformers, welding machines, or high voltage lines. These sources may induce transient electrical noise in the coil and cause false pulse signals. Connections from standard pickoffs are not polarized and may be connected in either position. For non-standard pickoffs please refer to manufacturer's specifications.

6.3 Grounding Considerations

The shield of the cable is to be grounded at only one point in accordance with the instruction of the display instrument. Flow Technology, Inc. display instruments specify where the shield is to be grounded.

6.4 Signal Processing

An electronic signal conditioning circuit is required to either convert the frequency output of the flowmeter into a visual presentation on a display or to provide process control signals. Flow Technology, Inc. manufactures a complete line of electronic packages, which include rate and total displays, rate converters and microprocessor based units for linearization and temperature / pressure compensation.

Table 1 – Signal Processing Specifications

Pickoff	Connector	Specifications
Standard	2 Pin MS	Non-polarized Pins Mating Connector FTI P/N:15-89515-101
Amplified Pickoffs 27-94057	3 Pin MS Wire Leads	A = Power B = Ground C = Pulse Mating Connector FTI P/N: 15-89515-102 Red = Power Black = Ground White = Pulse Input Power = 8 to 30 VDC @ 10 mA Output = 0 to 5 VDC Pulse Output Impedance = 2.2 kΩ Mag Amp: Frequency Range = 10 Hz to 10 kHz Input Sensitivity = 20 mV p-p RF Amp: Frequency Range = 10 to 3200 Hz Oscillator Carrier Frequency = 45 kHz Junction Box with Terminal Strip FTI P/N 73-31836-105

7 OPERATION

7.1 Over Range

In general, turbine flowmeters remain quite linear when they are over ranged, and may not provide any indication that the instrument is being misused. However, the pressure drop will become excessive and over-speeding of the bearings could cause permanent damage. Bearings may also be damaged by excessive downstream thrust load. The probability of an over-speed condition for a liquid meter usually occurs during system start up when there is still air in the lines. Air should be bled carefully from the lines before high flow range is established. The flow rate or output frequency should be monitored to insure maximum capability is not exceeded.

7.2 Under Range

When used below the minimum specified range, turbine meters may become very non-linear. The repeatability of the meter may also be reduced due to bearing and magnetic pickoff drag.

Table 2 –Journal Bearing Operating Conditions

Meter Size	Standard Range 10:1 RF& MAG Pickoff (GPM)	Extended Range		Nominal K Factor (PULSE/ GALLON)	Maximum Frequency (Hz)
		RF Pickoff (GPM)	MAG Pickoff (GPM)		
SA4-8	.25-2.5	.1-3	.12-3	48000	2000
SA6-8	.5-5	.15-5	.2-5	25000	2000
SA-08	1-10	.25-10	.3-10	12000	2000
SA-10	1.25-12.5	.3-15	.4-15	9600	2000
SA-12	2-20	.5-25	.5-25	6000	2000
SA-16	5-50	1-60	1-60	2400	2000
SA-20	9-90	1-100	1.5-100	1300	1950
SA-24	15-150	1.6-160	2.5-160	600	1500
SA-32	22-220	2.5-250	3.5-250	350	1300

Notes:

1. Repeatability = ± .1% for SA-12 and smaller, ± .05% for SA-16 and larger.
2. Linearity = ± .5% of reading except as noted.
   Values are valid for viscosities of 3 centistokes or less based upon standard 10:1 range.
3. Linearity is ± 2% of reading for SA4-8.

7.3 Liquid Turbine Flowmeter Characteristics

7.3.1 Introduction

Optimum performance of a turbine meter system depends upon a valid calibration as well as the correct selection of supporting equipment. The rotational speed of a turbine rotor depends upon fluid properties as well as the fluid velocity. The most significant fluid property for a liquid meter is the kinematic viscosity. As liquid viscosity increases, the slip of the turbine rotor due to viscous drag is increased, and the rotational speed and hence pick-off frequency is decreased. Due to these effects, the kinematic viscosity of the calibration fluid should approximate the service conditions as closely as possible.

7.3.2 Standard Calibration

Standard liquid calibrations at FTI are done with at room temperature. The viscosity of the fluid is approximately 1 centistoke. The standard calibration consists of 10 data points distributed over the normal 10:1 range of the flowmeter. If viscosities or flow ranges other than this is required, they must be specified.

7.3.3 Single Viscosity Calibration

If the flowmeter is to be used at a viscosity other than the standard calibration viscosities, an oil blend calibration should be done on the meter to simulate the operating conditions. The calibration curve produced will represent the flowmeter's output characteristics for that specific viscosity. If the flowmeter is used with liquids having viscosities greater than 3 centistokes, the linearity of the K-factor will be reduced.

Table 3 – SA Model Numbering System

SA❑❑❑ ❑❑ ❑❑ ❑ L❑❑ ❑❑ ❑❑❑

BASE MODEL
4–8 through –32
(1/2" through 2")

END FITTINGS
Refer to Section 8.1

CALIBRATION
Refer to Section 8.2

NON STANDARD UNITS
– = STANDARD UNITS OF MEASURE
U = To signify required units of measure other than GPM
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

SERVICE
L = Liquid

CONSTRUCTION MATERIALS
Refer to Section 8.3

BEARINGS
D = CARBIDE JOURNAL
E = GRAPHITE JOURNAL
G = CERAMIC JOURNAL
REFER TO SECTION 8.4

PICKOFFS
Refer to Section 8.5

SPECIAL CODE
Special meter configurations will not be addressed in this manual.
Please contact the factory for a description of the special code.

8.1 End Fittings

T1 = 3/4” SANITARY CLAMP
T2 = 1 1/2” SANITARY CLAMP
T3 = 2” SANITARY CLAMP

8.2 Calibration

NW = 10 Point, normal 10:1 range, in Water
NB = 10 Point, normal 10:1 range, in Oil blend
XW = 10 Point, extended range, in Water
XB = 10 Point, extended range, in Oil blend
YW = 20 Point, extended range, in Water
YB = 20 Point, extended range, in Oil blend

8.3 Construction Materials

E = 316 Housing, 430F Rotor
H = 316 Housing, 17-4 Rotor

8.4 Bearing Codes

D = Carbide Journal - Carbide Shaft and Bearing.
E = Graphite Journal - 316 SST Shaft and Graphite Bearing
G = Ceramic Journal - Ceramic Shaft and Bearings

Table 4 – Bearing Application Guide

Code	**Bearing Material**	**Bearing Temperature Rating**	**Material**
D	Carbide	Up to 1200°F	C-2 Carbide
E	Graphite	Up to 500°F	316 Shaft/Graphite Bearing
G	Ceramic	Up to 1200°F	Aluminum-based Ceramic

Meter temperature rating may be limited by the pickoff temperature rating.

8.5 Pickoffs

Table 5 - Pickoff Codes

Code	Type	Connection	Max Temp (°F)	Part Number
–1	RF	MS Connector	350	27-31199-101
–2	MAG	MS Connector	350	27-30880-101
–3	MAG	Leads EP	350	27-30880-102 27-30931-102
–5	RF	Leads EP	350	27-31199-102 27-31949-101
–6	MAG	MS Connector	750	27-80666-104
–7	MAG	MS Connector EP	750	27-80666-104 27-82333-102
S8	RF (F & P)	MS Connector	350	27-31386-101
–L	RF	MS Connector	750	27-88628-102
–M	RF	NPT Threaded	750	27-88826-103
–U	MAG	MS Connector	350	27-32400-101
–X	RF	MS Connector	350	27-32404-101
PP	MAG	Leads	350	27-32400-103
SS	RF	Leads	350	27-32404-103
TT	MAG	Leads/Threaded Connection	350	27-32400-102
XX	RF	Leads/Threaded Connection	350	27-32404-102
S1	MAG, Amplified	MS Connector	185	27-94057-101
S2	MAG, Amplified	Leads	185	27-94057-102
S3	MAG, Amplified	NPT Threaded	185	27-94057-103
S4	RF, Amplified	MS Connector	185	27-94057-110
S5	RF, Amplified	Leads	185	27-94057-111
S6	RF, Amplified	NPT Threaded	185	27-94057-112

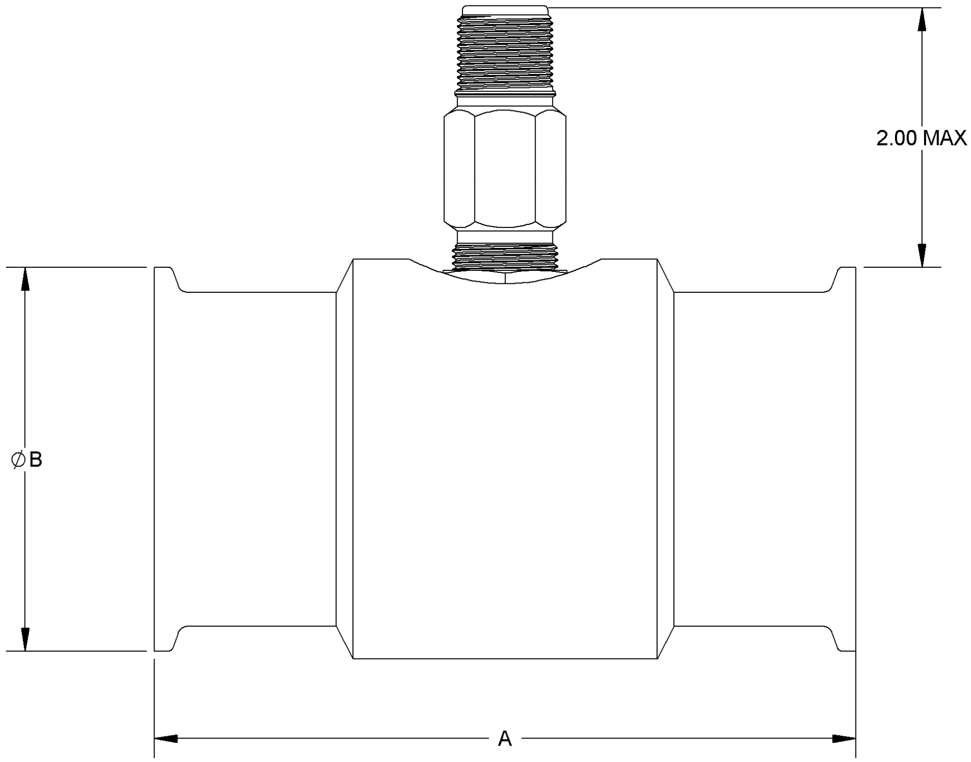

Figure 2 – Overall Dimensions

Table 6 – Overall Dimensions

Meter Size	A	Standard Configuration			Optional Configuration		
		Code	Line Size	B	Code	Line Size	B
	in.			in.			in.
SA4-8	2.45	T1	.50	.984	T2	1.00	1.984
SA6-8	2.45	T1	.50	.984	T2	1.00	1.984
SA-08	2.45	T1	.75	.984	T2	1.00	1.984
SA-10	3.25	T2	1.00	1.984	T1	.75	.984
SA-12	3.25	T2	1.00	1.984	T1	.75	.984
SA-16	3.56	T2	1.00	1.984	T3	2.00	2.516
SA-20	4.06	T2	1.50	1.984	T3	2.00	2.516
SA-24	4.59	T2	1.50	1.984	T3	2.00	2.516
SA-32	6.06	T3	2.00	2.516	N/A	N/A	N/A

8.6 Specifications

Frequency Range	200 to 2000 Hz approximately (depends on model)
Output Level	
RF Pickoff	10 volt peak-to-peak from Amplifier
Nominal Resistance	10 ohms pickoff coil (RF)
Magnetic (optional)	5mV peak-to-peak sine wave
End Connections Available	3/4 inch (19.0mm), 1-1/2 inch (38.1mm), or 2 inch (50.8mm) Sanitary Style Clamp
Pickoff Connection	2-pin, threaded connection which mates with MS3106A-10SL-4S. Pigtail Leads (Optional).
Temperature	-60° F to +350° F (-51° C to 177° C)
(Optional)	-430° F to 750° F (-257° C to 399° C)
Pressure	Limited by End Connection rating

Construction Material (Standard):

Housing	316 Stainless Steel
Rotor	430F Stainless Steel 17-4 Stainless Steel (optional)
Rotor Support	303 SST
Bearings/Shaft	Ceramic Journal Tungsten Carbide Journal (optional) Carbon Graphite Journal (optional)

Liquid Measurement Characteristics:

Repeatability	± 0.1% of reading within normal 10:1 flow range in water
Linearity	± 0.5% of reading within normal 10:1 flow range in water
Flow Rate Range	0.25 to 250.0 GPM (.946 to 946.458 LPM) in 10:1 segments
Pressure Drop	less than 10 psi for maximum normal flow rate based on 1.0 centistoke fluid with S.G. = 1.00
Viscosity Range	0.1 to 100 centistokes depending on flow range

9 PERIODIC MAINTENANCE

9.1 Routine Maintenance

9.1.1 Maintenance of the SA Series consists of periodic inspection to insure that the internal parts have not been fouled or suffered any corrosion. Should the assembly be damaged in any fashion, it should be returned to the factory for exchange or repair.

9.1.2 Turbine type flowmeters are precision devices and must be treated as such. The freedom with which the rotor is allowed to rotate is the dominant factor in determining this precision.

C A U T I O N
Do not use a solvent that will conflict with industry standards.

9.1.3 Many of the liquids measured by turbine meters contain impurities, which if allowed to remain within the flowmeter after use, would form hard or gummy residues. When these residues are deposited within the flowmeter, the unit's freedom of rotation will be severely degraded. Therefore, it is highly recommended that the turbine meter be THOROUGHLY FLUSHED with an appropriate cleaning solution immediately after use.

C A U T I O N
DO NOT OVERSPEED BEARINGS

Care must be taken when flushing the turbine flowmeter, not to overspeed or otherwise damage the bearings and rotor assembly.

9.2 Repairs

Repairs of the SA Series are generally limited to the replacement of the internal assembly. The complete internal assembly must be removed and replaced, as described in this Section. The malfunctioning internal assembly may be replaced with a new one or returned to the factory for repair.

When ordering parts, it is necessary to provide the complete model number and serial number of the flowmeter.

9.2.1 Journal Bearing Replacement

Flow Technology, Inc. has bearing replacement kits available for turbine flowmeters equipped with journal bearings. The use of a replacement kit will allow the customer to repair the flowmeter in the field. To maintain accuracy it is necessary that the meter be recalibrated or the entire internal assembly be replaced with a compete set of calibrated internals. Replacement kits are ordered by specifying the flowmeter model number and serial number.

Flow Technology, Inc. however does NOT recommend field replacement of journal bearings. Replacing the journal bearing often requires special tools and can easily result in damage to other components.

N O T E
The flowmeter will require calibration after installing a new journal bearing kit.

For epoxy impregnated graphite and non-metallic (Teflon, Torlon, etc.) journal bearings; the replacement kit consists of a journal bearing and rotor and shaft assembly that replaces the existing rotor subassembly. The rotor, the journal bearing, and the shaft are a factory matched set of components designed for a specific flowmeter. (Refer to Figure 1).

The replacement kit for tungsten carbide or ceramic journal bearings are factory matched components which consists of a journal bearing, a shaft, two thrust washers that are fitted in the cones, and a rotor.

10 TROUBLESHOOTING GUIDE

The following guide shows some of the common problems that may occur during the operation of turbine flowmeters. Various causes are given for each problem including a description of the cause and the corrective action to be taken.

Table 7 – Meter Reads High

Probable Cause	Corrective Action
Line not full of fluid Jetting through meter.	Fill and bleed system.
Cavitation, fluid vaporizes as it slips over rotor blades. Cavitation of the fluid as it passes through the meter.	Check for insufficient back pressure and insure that the flow rate is throttled down stream of the meter. Increase static pressure of system if it is safe and feasible.
Meter installed backwards.	Check to see if the flow direction arrow on the flowmeter is aligned with the direction of flow.
Internals installed backwards.	Verify internals are installed properly.
Meter installed in different orientation than when calibrated.	Insure meter is installed in horizontal position unless otherwise specified on data sheet.
Flowmeter is not mated to proper electronics.	Check data sheets and assemble system correctly.
Operating fluid has a different kinematic viscosity than the original calibration.	Recalibrate meter at correct kinematic viscosity.
Electronics picking up noise. A.C. signals override flowmeter signals and are detected as pulses.	Separate power cables from signal cables and check for noise signal of sufficient amplitude to be mistaken as a flowmeter signal. Check for improper connection of ground shield. Shield to be connected at only one end of system.
Foreign material upstream or in flowmeter creating jetting.	Remove material, install manufactures recommended filtration.
Input line to flowmeter has a much smaller opening than meter, creating jetting.	Check input line connections and size per manufacturers recommendations.
Swirl in flow stream created by valves, line geometry, fittings and insufficient flow straightening causing rotor to have artificially high frequency.	Check the geometry of the line, install appropriate flow straighteners.
Diagnostic equipment used to check the turbine meter is incorrect.	Check calibration and accuracy of diagnostic equipment used to check turbine flowmeter.

Table 8 – Meter Reads Low

Probable Cause	Corrective Action
Corroded or worn bearings.	Replace bearings.
Bearing misapplication.	Use proper bearings.
Improper flowmeter assembly after installing bearing kit.	Check for proper internal component assembly.
Fluid contamination.	Clean internals and check location, size and condition of filter and/or replace fluid.
Meter installed backwards.	Check to see if the flow direction arrow on the flowmeter is aligned with the direction of flow.
Internals installed backwards.	Verify internals are installed properly.
Meter installed in different orientation than calibration.	Insure meter is installed in horizontal position unless otherwise specified on data sheet.
Bent rotor blades.	Visually inspect and replace rotor if necessary.
Fluid pulsations.	Provide damping in the system.
Shift in fluid viscosity.	Insure the operating condition remains equivalent with the calibration conditions. If the viscosity cannot be stabilized contact the factory for additional information.
Swirl in flow stream created by valves, line geometry, fittings and insufficient flow straightening causing rotor to have artificially low frequency.	Check the geometry of the line, install appropriate flow straighteners.
Electronics not detecting some pulses.	Adjust amplifier gain.
A.C. signals override flowmeter signals and are detected as pulses.	Check for A.C. signals that override flowmeter signals. Insure signal and power cables are not run together.
Flowmeter is not mated to proper electronics.	Check data sheets and assemble system correctly.
Loose pickoff.	Verify that the pickoff bottoms in the housing and secure locknut.
Improper hook-up of cable shield.	Check for improper connection of ground shield. Shield to be connected at only one end of system.

Table 9 – Zero Output

Probable Cause	Corrective Action
Pickoff not connected or not properly installed.	Check connection between pickoff and amplifier or readout. Verify that the pickoff bottoms in the housing and secure locknut.
Pickoff defective. Impedance mismatch.	Perform resistance test on pickoff. Insure that amplifier has been matched to flowmeter. Some amplifiers require tuning for non-standard pickoffs. Verify proper type of amplifier is used.
System temperature above meter rating.	Insure the fluid temperature is not above the operational temperature of the meter.
Amplifier overheated.	Insure that the temperature range of the amplifier is not exceeded.
Flowmeter and readout device are not connected properly.	Check wiring connections of system and verify connections are correctly installed.
Broken wire in system.	Check continuity of interconnecting wires between components.
Excessive distance from flowmeter to readout device.	Check distance between pickoff and amplifier. Distance should not exceed 300 feet for magnetic pickoffs and 30 feet for RF pickoffs.
Flowmeter rotor locked and will not turn.	Disassemble flowmeter and inspect for debris lodged in rotor. Inspect for damaged bearings or other internal components.
Flow rate below minimum required for meter operation.	Check flowmeter and electronic data sheet for low cutoff frequency.
No flow in system.	Check for closed valves in system or a by-pass valve in an open position.

Table 10 – Intermittent Operation

Probable Cause	Corrective Action
Loose electrical connections.	Check and tighten connections.
Improperly seated pickoff.	Verify that pickoff is bottomed and retighten lock nut.
Intermittent electromagnetic noise.	Separate power cables from signal cables and check for noise signal of sufficient amplitude to be mistaken as a flowmeter signal.
Electronic malfunction.	Troubleshoot electronics. Consult electronics manual.
Fluid temperature exceeds range of pickoff.	Replace with high temperature pickoff or reduce operating temperature.
Ambient temperature exceeds range of electronics.	Relocate the electronics to reduce temperature to an acceptable level.
Bearings are worn, broken or contaminated.	Replace bearings and recalibrate meter. Provide appropriate filtration.
Uneven flow, flow surging or pulsating.	Increase system back pressure or provide damping.

Table 11 – Non-repeatable Meter Output

Probable Cause	Corrective Action
Bearings have become worn, damaged or corroded.	Replace bearings as necessary and recalibrate meter. Check for appropriate filtration and material / fluid compatibility.
Internals have become contaminated with foreign material.	Clean or replace meter internals including supports, cones, rotor and/or bearings and recalibrate meter. Check for appropriate filtration as necessary.
Damaged internals.	Replace internals and recalibrate meter.
Line not full of fluid - bubbles or froth present.	Check plumbing for source of bubbles or froth and correct. Bleed line of foreign gas.
Cavitation of the fluid as it passes through the meter.	Check for insufficient back pressure and insure the flow rate is throttled down stream of the meter. Increase static pressure of the system if it is safe and feasible.
Shift in fluid viscosity.	Insure the operating condition remains equivalent to the calibration conditions. If viscosity cannot be stabilized, contact the factory for additional information.
Internals not properly secured.	Inspect retaining rings for proper seating. Inspect bore for signs of scoring. Reseat retaining ring(s) and/or replace internals if necessary.
Piping configuration changed.	Insure the operational piping configuration is the same as that with which the meter was calibrated. If not, recalibrate meter with the new piping configuration.
Intermittent operation.	Intermittent operation will cause non-repeatable meter output. Refer to the trouble shooting section on intermittent operation.

Table 12 – Constant Non-Zero Output

Probable Cause	Corrective Action
Improper oscillation of amplifier circuit.	Pickoff and amplifier mismatch, replace with compatible component.
Electronics picking up noise.	Separate power cables from signal cables and check for noise signal of sufficient amplitude to be mistaken as a flowmeter signal.
Improper wiring.	Check for appropriate wiring configuration and connections.
Electronic malfunction.	See electronic manual troubleshooting guide to correct problem.