AW-LAKE COMPANY | LAKE MONITORS

FlowStat Turbine Flow Meter

Installation, Operating & Maintenance Manual

Mechanical Specifications

Flow Meter with Polypropylene Body (ES version)

Maximum Operating Pressure:
150 PSIG

Maximum Operating Temperature:
20–150°F

Flow Measuring Range:
0.5–15 GPM (2–60 LPM)
with optional low-flow adapter: 0.25–4.5 GPM (1–17 LPM)

Turn Down Ratio:
10:1

Wetted Components	
Component	**Materials**
Casing	Glass-Filled Polypropylene
Cover	Clear Polycarbonate
Seal	Buna-N (Other options available)
Turbine	Acetal Copolymer
Bearing	PEEK (Polyetheretherketone)
Shaft	Stainless Steel

Non-Wetted Components	
Component	**Materials**
Encapsulant	Epoxy
Strain Relief	Nylon
Lock Ring	Glass-Filled Polypropylene
Wire Insulation	High-Temperature PVC

Flow Meter with Stainless Steel Body

Maximum Operating Pressure:

With Clear Cover:
to 200 PSIG (14 bar)
With Optional Stainless Steel Cover:
to 500 PSIG (34 bar)

Fluid Temperature Range:

20–225°F (–7° to 107°)

Flow Measuring Range:

1/2" porting: 0.5–15 GPM (2–60 LPM)
1/2" porting low flow option: 0.25–4.5 (1–17 LPM)
3/4" – 1" porting: 1.5–50 GPM (60–200 LPM)

Turn Down Ratio:

10:1

Wetted Components

Component	Materials
Casing	Stainless Steel 316
Cover	Stainless Steel 316 (optional clear polycarbonate)
Seal	Buna-N® (other options available)
Turbine	Acetal Copolymer
Bearing	PEEK (Polyetheretherketone)
Shaft	316 Stainless Steel

Non-Wetted Components

Component	Materials
Encapsulant	Epoxy
Strain Relief	Nylon
Lock Ring	Stainless Steel
Wire Insulation	High-Temperature PVC

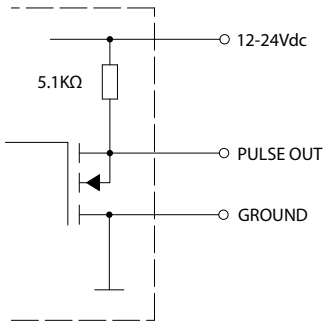
Buna-N is a registered trademark of Chemische Werke Huls.

Electronic Specifications

4-20 mA Version	
Power Requirements	12-24 VDC, loop powered
Load Driving Capacity	Use the following equation to calculate maximum load resistance: Max Loop Load (Ⱨ) = 50 (Power supply volts – 12).
Standard Cable Length	10 ft., 2-wire 22 AWG
Maximum Transmission Distance	Limited only by wire resistance & supply voltage
Response Time	2 seconds to 90% (step change)
Resolution	Infinite
Over-Current Limit	Self limiting at 35 mA
Other protection	Reverse polarity

Pulse Output Version	
Power Requirements	12-24 VDC
Response Time	<100 mS
Maximum Current	25 mA DC
Standard Cable Length	10 ft., 3-wire 22 AWG
Maximum Transmission Distance	200 feet recommended
Minimum Load Resistance	1000 Ohms
Protection	Short circuit & reverse polarity
K-Factor	1/2” port ≈ 200 pulses/gallons 3/4” & 1” ports ≈ 60 pulses/gallons

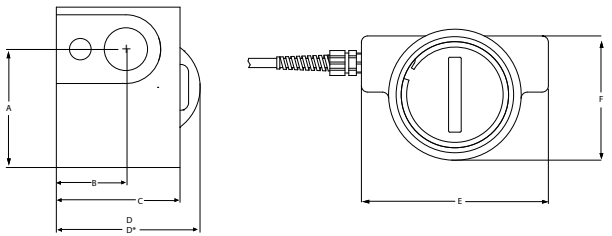
OPEN DRAIN OUPTUT W/ 5.1Kohm
INTERNAL PULLUP RESISTOR



Relay Output Version	
Power Requirements	12-24 VDC
Standard Cable Length	10 ft., 5-wire 18 AWG
Maximum Transmission Distance	200 feet recommended
Switch Contact	Form C, 5A max 120 or 240 VAC
Set Point Repeatability	1% of full scale

0-5 VDC Version	
Power Requirements	12-24 VDC
Maximum Current	25 mA DC
Minimum Load Resistance	1000 Ohms
Standard Cable Length	10 ft., 3-wire 22 AWG
Maximum Transmission Distance	200 feet recommended
Resolution	Infinite
Response Time	< 5 seconds to 90% (step change)

Mechanical Dimensions



DIM	1/2" NPTF	3/4" NPTF - 1" NPTF
A	1.94" (49mm)	3.06" (78mm)
B	1.13" (29mm)	1.33" (34mm)
C	2.00" (51mm)	2.46" (62mm)
D	2.45" (62mm)	2.78" (71mm)
D*	2.45" (62mm)	2.88" (73mm)
E	3.70" (94mm)	5.25" (133mm)
F	2.63" (67mm)	3.80" (97mm)

**Dimensions with clear polycarbonate cover installed.*

Introduction

This manual is a service guide produced by the manufacturer. The manual provides specific procedures and/or illustrations for installation, inspection, cleaning and filtration of all FlowStat and FlowStat ES flow meters. When properly followed, these procedures will keep your FlowStat flowmeter operating dependably for many years.

It is important for operators and maintenance personnel to be safety conscience when operating or repairing equipment. Developing a thorough knowledge of the precautionary areas and following safe operating procedures, can prevent equipment damage and/or personal injury.

Before making any repair, read all of the repair procedures to learn the correct method and all precautions.

General

The FlowStat flow rate meters integrates rugged tangential turbine technology with a precision digital to analog conversion circuit hermetically encapsulated within the body of the meter. The flow meter is ideal for measuring flow rates in cooling circuits, HVAC systems and batching operations.

Additional features are:

- Simple in-the-field serviceability of its moving components
- The integral 4-20mA circuit design eliminates the need for separate signal conditioning modules
- Units come factory calibrated to your system requirements
- The low impedance 4-20mA circuit can transmit a “clean” signal over low cost wire for several thousand feet without degradation
- Accurately measures flow in both directions

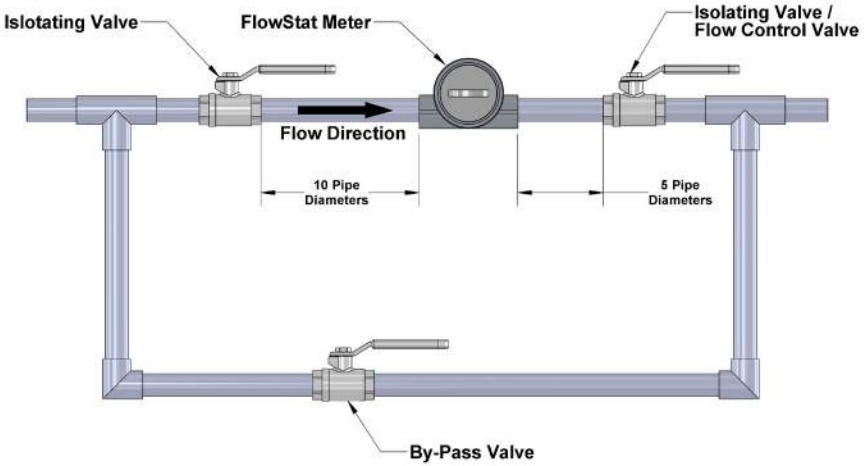
Installation - Mechanical

1. The FlowStat has NPT (National Pipe Thread) plumbing connections. AW-Lake Company recommends that a paste type pipe sealant be used on these threads. [Thread sealant can be used as long as it is applied in such a way that it will not enter the flow stream. Pieces of thread seal tape can wrap around the turbine and impede its rotation.]
2. The recommended mounting orientation would be any plane that will place

the axis of the turbine horizontal with respect to the ground. See Illustration 1. The unit will operate satisfactorily with its axis at angles other than horizontal, but side loading of the bearing surfaces will lead to premature wear of the rotating parts.

3. For the best flow measurement results, place the inlet (See Note 1) of the flow meter at least 10 straight pipe diameters downstream from any fitting, valve, elbow, reducer, etc. that causes non-stable flow conditions. Ideally, 5 straight pipe diameters should be placed at the outlet of the meter. If the meter must be placed closer to a source of non-stable flow than these recommended distances, some instability of the output signal may result. The average signal will be accurate.

Illustration 1:
Mounting Instructions



4. It is recommended that the meter be placed in such a position that the round access cover can be removed for cleaning and turbine servicing. It is also recommended that a union be placed near the meter to allow easy removal.

Note[1]: The FlowStat is a bi-directional measuring device. References to “inlet” and “outlet” refer to uni-directional systems.

Installation - Electronic (4-20mA Only)

The FlowStat current circuit is a two-wire loop-powered design that transmits a 4-20mA signal that is proportional to flow rate. The noise-immune current transmission from the meter can be routed with low cost two conductor twisted-pair cable. The circuit operates on 12-35 VDC and requires a source capable of supplying at least 20mA of current. The circuit has built in polarity protection and over-current limiting to protect both the meter and what the meter is connected to.

1. Connect the red wire (pin 1 for units with the electronic disconnect option) from the meter to the positive 12-35 VDC power supply output.
2. Connect the black wire (pin 2 for units with the electronic disconnect option) from the meter to the positive side of the loop load (resistor, chart recorder, data acquisition board, meter, etc.). This connection may be labeled "4-20mA Input" or "4-20mA (+)" on some devices.
3. If applicable, connect the negative side of the loop load to negative side of the power supply.
4. Apply power to the system.
5. If everything is operating correctly, the green LED on the meter will dimly illuminate and 4mA will be flowing in the loop. If there is fluid flowing through the meter, the current will be higher than 4mA and the LED will have a brighter Illumination.

If the LED does not illuminate:

- Check wiring terminations for good connections
- Check wiring polarity
- Verify correct supply voltage
- Ensure that the load impedance is within allowable limits
- Apply the DC supply voltage directly across the meter wires. If the LED does illuminate, the load is either: too great of impedance or an open circuit. If the LED does not illuminate, the meter's lead wires or circuit are defective.

Installation - Electronic (0-5VDC Output Only)

1. Connect the red wire (pin 1 for units with the electronic disconnect option) from the meter to the positive terminal of the 12-35 VDC power supply.
2. Connect the black wire from the meter (pin 2 for units with the electronic disconnect option) to the negative terminal of the 12-35 VDC power supply.
3. Connect the green wire from the meter (pin 3 for units with electronic disconnect) to the (+) 0-5 VDC input of the data acquisition device. This connection may be labeled "Voltage Input" or "Analog Input" on some devices.

4. If applicable, connect the negative side of the power supply to the negative side of the pulse input.
5. Apply power to the system.
6. If everything is operating correctly, the green LED will illuminate brightly and the data acquisition device should show an increase in flow rate as fluid starts flowing through the meter.

If data acquisition device does not show an increase in flow rate:

- Check wiring terminations for good connections
- Verify that the LED is illuminated
- Verify that the DC supply voltage is between 12 and 35 VDC

Installation - Electronic (Pulse Output Only)

The FlowStat pulse output circuit is a three-wire DC-powered design that transmits a frequency proportional to flow rate. The circuit operates on 5-24 VDC and will consume a maximum of 25 mA from the power supply.

Each meter comes with its unique K-Factor.

1. Connect the red wire (pin 1 for units with the electronic disconnect option) from the meter to the positive terminal of the 5-24VDC power supply.
2. Connect the black wire from the meter (pin 2 for units with the electronic disconnect option) to the negative terminal of the 5-24 VDC power supply.
3. Connect the green wire from the meter (pin 3 for units with electronic disconnect) to the (+) pulse input of the data acquisition device. This connection may be labeled “Pulse In” or “DC Input” on some devices.
4. If applicable, connect the negative side of the power supply to the negative side of the pulse input.
5. Apply power to the system.
6. If everything is operating correctly, the data acquisition device should begin “counting” pulses when fluid starts flowing through the meter.

If the data acquisition device is not “counting”:

- Check wiring terminations for good connections
- Verify correct supply voltage and current

7. The relationship between the frequency output and flow rate is shown in the graphs below.

Installation- Electronic (Relay Output Only)

1. Connect the red wire from the meter to the positive terminal of the 12-35 VDC power supply. (PIN 1 for units with electronic disconnect option)
2. Connect the black wire from the meter to the negative terminal of the 12-35 VDC power supply. (PIN 2 for units with the electronic disconnect option)
3. Wire the appropriate relay contacts to the load that is to be switched per Table 1 below.
4. If the unit is operating correctly, the green power indication LED and the red relay status LED should illuminate after the DC supply voltage is turned on. As fluid flow is increased above the factory adjusted set point, the red relay status LED should turn off.

If the LEDs do not illuminate when power is applied:

- Check wiring terminations for good connections
- Verify that the DC supply voltage is between 12 and 35 VDC

Set Point Adjustment (Relay Output Only)

1. Adjust the flow rate through the line in which the FlowStat meter is installed to the rate that corresponds to the desired relay trip point.
2. If the red LED on the back side of the meter is not illuminated, use a small flat bladed screwdriver to slowly turn the adjustment screw on the set point potentiometer counter-clockwise until the red LED illuminates.
3. If the red LED is already illuminated, turn the adjustment screw on the potentiometer clockwise until red LED turns off. Next, slowly rotate the adjustment screw counter-clockwise until the red LED illuminates.
4. Once the set point has been adjusted, the relay will operate as shown in the Truth Table illustrated in Table 2 below.

Table 1: Wiring Connections

Wire Color	Connection
Red	+12-35 VDC
Black	DC Ground
Green	Relay Common
White	Relay Normally Closed Contact
Brown	Relay Normally Open Contact

Table 2: Truth Table - Relay Operation				
Condition	**Relay NC Contact**	**Relay No Contact**	**RED LED**	**Green LED**
Flow rate < set point	Open	Closed	Illuminated	Illuminated
Flow rate > set point	Closed	Open	Not Illuminated	Illuminated
Loss of Power to Meter	Open	Closed	Not Illuminated	Not Iluminated

Service and Maintenance

The meter is designed to provide years of low maintenance service in industrial environments. As with all mechanical rotating devices, the bearing surfaces will wear with use. The life of the parts will depend on factors such as cleanliness of the fluid media, mounting orientation, temperature, fluid velocity and frequency of operation. The FlowStat meter was designed with simple field-replacement of the rotating parts in mind. To inspect or replace the rotating components:

1. Relieve pressure in the piping system.
2. Remove the retainer ring that secures the turbine access cover.
3. Remove the access cover with a pliers, taking care not to damage the o-ring seal.
4. Pull out the turbine assembly and the shaft.
5. Inspect the shaft for things that may have wrapped around it.
6. Inspect the turbine bearing surface for wear and elongation.Replace as necessary.
7. Clean any rust off of the magnets that may have accumulated.
8. Reassemble the unit by placing the turbine into the body cavity with the two magnet pockets facing inward. Place the shaft into the turbine hole and guide it into the retaining hole in the body cavity. Lubricate the o-ring seal with some glycerin or other lubricant and press it into the pocket of the body. Replace the retaining ring securely before applying pressure to the system.

Circuit recalibration (4-20mA version)

1. Place a milliamp meter into the current loop.
2. Turn off the flow going though the meter. Adjust the OFFSET control for a reading of 4mA on the milliamp meter.

3. Adjust the flow rate though the meter to full flow rate. Adjust the SPAN control for a reading of 20mA on the milliamp meter. The two controls are not interactive, so further adjustment should not be necessary.

Circuit recalibration (0-5VDC version)

1. Place a voltmeter across the black & green wires of the meter pigtail.
2. Turn off the flow going though the meter. Verify a reading of less than 50 mVDC on the voltmeter.
3. Adjust the flow rate though the meter to full-scale flow rate. Adjust the SPAN control for a reading of 5 VDC on the voltmeter.

WARNING: Never hit a flow meter or empty fluid with full fluid flow. This fluid shock or hammering effect on the internals of the flow meter can permanently damage the internal components.

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