Flow Line Options

SupraFlo™ P-72 Copolymer Flow Meter Manual

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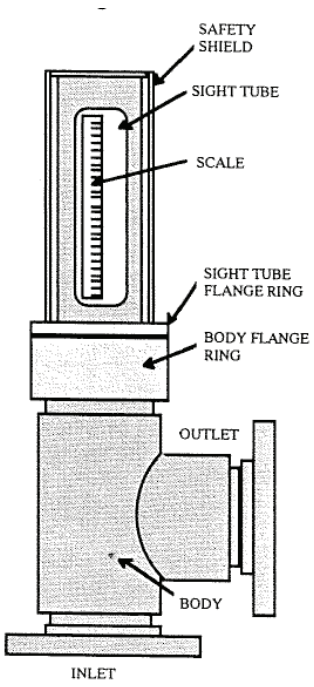
Installation



RECOMMENDED PIPING: MEMFlo SupraFlo™ Flow Meters generally have no special straight run or other piping requirements as long as they are installed on the same size pipe as the meter connections. Restrictive valves, reducing bushings, elbows, and other devices that cause contraction of the fluid stream or severe turbulence should not be mounted at the inlet. An effect on meter accuracy may occur at high flow velocities (over 5 fps liquid, 20 fps gas) if inlet piping guidelines are violated.

PREPARATION: MEMFlo SupraFlo™ Flow Meters are ready to install as-is, although the sight tube may need to be reoriented so the scale is visible after installation.

PLUMBING-IN: While MEMFlo SupraFlo™ Flow Meters should be vertical, exact plumbness is not necessary. A general rule is that if the meter appears plumb, it is close enough (even if off by 10°, the predictable reading error is usually less than 1%). Pipe should be cut to proper lengths to avoid stress on the meter used. Avoid over-tightening of the flange bolts.

Fig. 1: Typical SupraFlo™ P-72 Meter with shielded glass sight tube

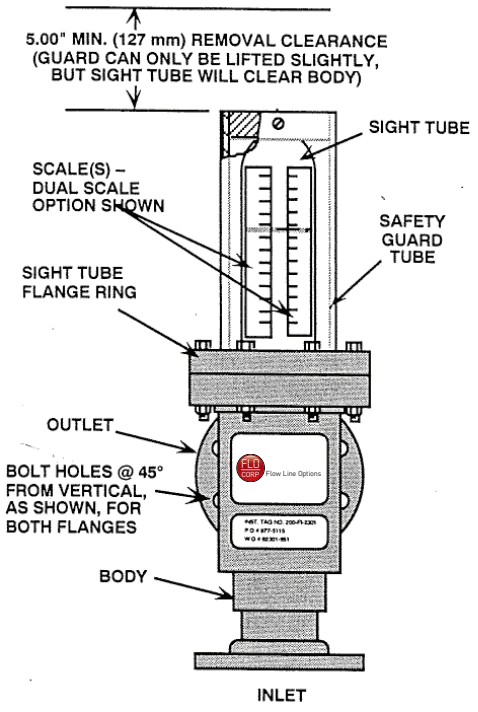
Safety Precautions

Personnel safety should be considered before pressurizing and operating the system. There are numerous possibilities for error in system operation and maintenance as well as component installation. If hazardous, toxic, or flammable fluids are being metered, recommended safegards should include methods to protect personnel from splash or rebound. A method of quick, safe removal of dangerous fluids should also be included.

SIGHT TUBE ROTATION

The sight tube assembly is designed for 360° rotation; however, the bolts must be loosened prior to rotation. Units with polysulfone sight tubes can be rotated to any position, but meters with glass sight tubes rotate in 30° increments.

POLYSULFONE SIGHT TUBE METERS: With the system shut-off and all pressure vented, remove the safety guard tube. Loosen the flange bolts without removing them. By hand only, grip the polysulfone sight tube, rotating it until the scale faces the desired direction. Snug the bolts only once repositioned-DO NOT OVER-TIGHTED. The body/sight tube gland uses an O-ring, and over-tightening the bolts does nothing to improve this seal. **OVER-TIGHTENING MAY DAMAGE THE BODY OR SIGHT TUBE.** Replace the safety guard.



GLASS SIGHT TUBE METERS: With the system shut-off and all pressure vented, remove the safety guard tube. Remove the flange bolts. By hand only, grip the P-72 shield portion of the sight tube, rotating it until the scale faces approximately the desired direction. Align the bolt holes in the top flange with those in the lower flange on the body (the body flange has holes every 30°, the top sight tube flange every 120°). Replace and snug the bolts only once repositioned— DO NOT OVER-TIGHTEN. The body/sight tube gland uses an O-ring, and over-tightening the bolts does nothing to improve this seal. **OVER TIGHTENING MAY DAMAGE THE BODY OR SIGHT TUBE.** Replace the safety guard.

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Start-Up

System flow should be started with the by-pass valve open and meter inlet and outlet valves closed. After system is operating, open meter inlet valve gradually to equalize internal pressure. Then slowly crack meter outlet valve and wait for float to stabilize. Finally, slowly open the meter outlet and/or flow regulating valve all the way and close the system by-pass valve. AVOID SUDDEN SURGES THAT CAUSE THE METER FLOAT TO SLAM INTO THE TOP OF THE SIGHT TUBE! Although not essential, the meter sight tube should be filled to a level above the float on liquid systems. The snorkel tube allows escape of entrapped gases except for a small shock. To assure complete filling and to flush any foreign particles from the meter, operate the system at full flow for a brief period at start-up.

READING FLOW

Read flow directly from the scale as the number nearest the top edge of the float indicator disk.

COMPENSATING FOR SYSTEM CHANGES

Most SupraFlo™ meters come with special scales for the fluid conditions given at time of order. However, should the fluid service change, you may calculate the corrected flow when the fluid differs from the scaled conditions.

To find the correct flow reading for a system whose fluid conditions vary from those for which the meter is scaled, use the conversion data below. You can also use the conversion factor calculator on our web site at: http://flowlineoptions.com/tools.php The method of applying the formulae is to calculate a conversion factor for the new system conditions, multiplying the scale reading by that factor. In the problems below, "Q_s" has been assigned a value of "1" to determine the conversion factor. (Flow Line Options can provide special scales at additional cost for other fluids and/or units).

CORRECTING READINGS FOR NEW LIQUID CONDITIONS

$$Q_a = Q_s \sqrt{\frac{P_s (P_f - P_a)}{P_a (P_f - P_s)}} \quad \text{OR} \quad Q_a = Q_s \sqrt{\frac{d_s (d_f - d_a)}{d_a (d_f - d_s)}}$$

Where:
Q_a = Actual flow, GPM (or same units as scale)
Q_s = Meter reading from scale, (scale units)
P_s = Specific gravity of calibration liquid related to water in std. atmosphere at 70° F. being 1.00
P_a = Specific gravity of metered liquid, same base
d_s = Density of calibration liquid, lbs/ft3
d_a = Density of metered liquid, lbs/ft3
P_f = Specific gravity of meter float
d_f = Density of the meter float

Example

EXAMPLE: Using a SupraFlo™ meter with a stainless float (8.05) scaled for water (ps = 1.00), what is the conversion factor for a caustic with a specific gravity of 1.30?

$$Q_a = 1 \times \sqrt{\frac{1.00\ (8.05 - 1.30)}{1.30\ (8.05 - 1.00)}} = 0.8582$$

Thus, actual flow of the caustic would be the observed scale reading times 0.8582

CORRECTING READINGS FOR NEW GAS CONDITIONS

$$Q_g = Q_a \sqrt{\frac{P_g \times T_s \times p_s}{P_s \times T_g \times p_g}}$$

Where:
Q_g = SCFM, corrected to new conditions.
Q_s = SCFM read on meter scale.
P_g = Operating pressure, psia (psig + 14.7)
P_s = Pressure stated on scale, psia (psig + 14.7)
T_g = Operating temperature, absolute (°F + 460)
T_s = Temperature stated on scale, absolute (°F + 460)
P_g = Specific gravity of metered gas.
P_s = Specific gravity stated on scale.

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MAINTENANCE

Occasional cleaning of the sight tube and internal sensing elements to assure float visibility and continued accuracy is the only maintenance suggested. Frequency will depend on the application — in most cases, an annual cleaning is adequate. It is not necessary to remove the MEMFlo Flowmeter from the pipeline for cleaning or replacing parts. The body remains plumbed into the pipe, allowing easy service and even installation of different sensing elements to accommodate new flow rates of fluids.

CAUTION: When changing operating conditions, make sure that the new system conditions are within the flowmeter operating limits, and all wetted materials are compatible with the fluid. If in doubt, consult flow line options before operating!

DISASSEMBLY

CAUTION: Be sure pressure is fully vented and fluids completely drained before disassembling the flowmeter. Wear safety glasses and protective clothing if there is any chance of exposure to hazardous chemicals!

First, remove the transparent safety cover which is held by a single screw from the sight tube. The sight tube may be withdrawn by removing the bolts from the body/sight tube flange rings. Using hands only, pull the sight tube straight up out of the body with a slight twisting motion, lifting it clear of the body and snorkel.

Remove the float assembly by lifting it up and away from the snorkel. Next, lifting up and tilting toward the outlet, remove the snorkel. Next, lifting up and tilting toward the outlet, remove the snorkel transition assembly (some rocking back and forth may be required to get the lower snorkel to clear the passage way). The core tube assembly may then by lifted out.

INSPECTION & CLEANING

Visually inspect parts for nicks, scratches, chips, wear, and contaminant build-up. The edges of the core tube slot, the ID for the core tube, and OD of the piston (largest section at the float assembly bottom) are precision machined, and damage to these areas can destroy the meter's accuracy. Also inspect the O-ring, the bottom section of the sight tube, and the inside of the upper body section. Damage to these areas may result in leaking. Clean, rinse, and dry all parts carefully, including the O-ring, with a mild detergent and water and a soft cloth or soft tube brush. If solvents are used, make sure they are compatible with all meter parts.

CAUTION: Do not scrape or use abrasive materials for cleaning!

ASSEMBLY: Replace all parts in reverse order of disassembly. Note the small key slot on the top portion of the core tube that must be aligned as shown below.

Do not force the snorkel transition assembly — tilt it toward the outlet slightly and rock gently to guide it down thru the snorkel passage way. Seat the O-ring on the sight tube before assembly — use a little lubricant that is compatible with the media and materials to facilitate replacement.

After replacing the internals, using hands only, press the sight tube firmly down into the meter body with a slight twisting motion. Rotate sight tube as necessary for scale visibility and/or alignment of bolt holes. Replace bolts, being sure not to over-tighten. If reassembled correctly, the top edge of the indicator disk should line up with the scale "zero" (dotted black or scribed line). If it does not, disassemble the meter completely and carefully reassemble it, making sure core tube is completely seated in the body. Slide the transparent safety guard cover over the sight tube, and replace the screw. If new flow internals are used, the scale may have to be remounted on the sight tube (new flow internals are shipped with a new scale).

REPLACEMENT PARTS

Because MEMFlo P-72 flowmeters are custom engineered products (usually built to order), complete meters are not inventoried. Flow Line Options does maintain a limited supply of some subassemblies such as sight tubes, O-rings, and other common components. Otherwise, parts only need to be replaced if damaged. Any visible damage to the entire surface of the O-ring or sight tube (particularly from the bottom edge) indicates need for replacement. To insure accuracy, the inside surface of the meter core tube, the slot edges, and the OD of the float piston should be free of nicks, chips, with no visible erosion of any surfaces. If abrasive particles are suspended in the metered fluid, it may be desirable to keep replacement core tube/float assemblied on hand.

Flow Line Options can inspect any suspect parts, or recheck calibration. Parts returned should include information regarding the application, suspected problem, and who to contact for an authorization on corrective measures.

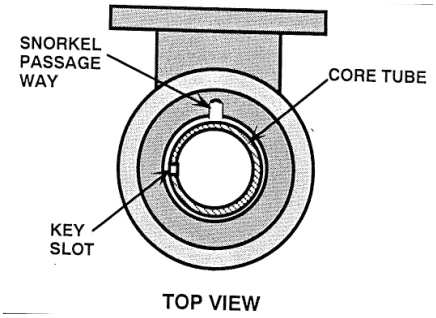

Fig. 3 (Depending on meter model and size, the key slot may be at the bottom of the core tube near the outlet, 180° from the outlet, or at the top of the tube as shown above.)

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Ordering Parts

To order parts, see the model and serial numbers of the units involved along with the instruction. Parts are ordered by combining the drawing number with the subassembly code shown on the table in the drawing.

If converting the meter to a new application, in addiction to the model and serial numbers, send Flow Line Options complete application data including fluid, maximum flow rate, maximum and operating pressures and temperatures, and any other application particulars or fluid characteristic. This information is essential for Flow Line Options to provide proper items, and verify that the new application is within the operating limits of the flowmeter.

The only storage or handling requirements for MEMFlo Flowmeters or parts is to keep them in a reasonably clean location away from excessive heat (over 120°F) or chemical or solvent fumes and vapors not compatible with the materials of construction.

Operating Limits, MFP72 Flowmeters*

BODY SIZE & DESCRIPTION	MAXIMUM NON-SHOCK WORKING PRESSURE, PSIG @ °F.							
	70°	80°	100°	120°	140°	160°	180°	210°
6 thru 8 — P-72 & Polysulfone, Threaded & Socket	300	300	280	230	180	130	80	50
6 thru 8 — P-72 & Polysulfone, Flanged	150	150	150	150	150	130	80	50
6 thru 8 — P-72 & Glass, Threaded & Socket	240	240	220	210	160	130	80	50
6 thru 8 — P-72 & Glass, Flanged	150	150	150	135	110	90	70	40
6 thru 8 — All P-72, Threaded & Socket Connections	270	270	250	200	150	130	80	50
6 thru 8 — All P-72, Flanged Connections	150	150	150	135	110	90	70	40
12 thru 32 — P-72 & Polysulfone, Flanged	150	150	150	135	110	90	70	40
12 thru 32 — P-72 & Glass, Flanged	150	150	150	135	110	90	70	40
12 thru 32 — All P-72, Flanged Connections	150	150	150	135	110	90	70	40

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Troubleshooting

SYMPTOM	USUAL CAUSE	SUGGESTED REMEDY
FLOAT HANG-UP	Caused by particles, slude, etc. (including failure to remove the plastic tubing used to block meter float during shipment) inside the core tube and/or sight tube holding float. A bent snorkel tube/guide rod (usually caused by careless disassembly or violent surges) may also be causing float to stick. Violent surges may also unseat the internals in extreme cases.	Remedies include tapping the meter gently to temporarily dislodge the float, but if problem occurs, meter should be disassembled & cleaned, and/or snorkel/guide rod straightened. If hang-up caused by sludge or pipe scale, clean lines & install a filter or other form of cleaner in supply line. If surges have caused the internals to unseat, install a desurger, accumulator, etc. You may also wish to order a buffer serves as a resilient cushion for the float, and prevents unseating.
FLOAT BOUNCE	Caused by pumping/compressor surges or other pulsation sources, loose valve disks or similar mechanical components, extreme violation of inlet piping recommendations, or for gas applications, harmonics commonly found in systems with low pressure, low density gas.	Modication of piping, such as addition of a desurger, receiver, accumulator, vibration eliminators, loops, hoses, etc. between the source and meter should remedy the problem. Severe vibration may ultimately damage the meter, and should be avoided. If "bounce" seems to be from some other source, or shocks such as "water hammer" (a potentially dangerous condition), discontinue using the meter and contact Flow Line Options.
APPARENT FALSE READING, GAS METERS	Gas density not according to calibration data(different pressure, temperature, gas, etc), high water vapor content, saturated gas going into vapor or condensation phases, partially clogged core tube slot or foreign matter interfering with float movement, and/or violation of piping recommendations at high flow velocities.	Remedies include checking meter pressure (Flow Line Options can install a pressure gage on the meter) & temperature, determining actual gas mixture density & correcting with appropriate formulae in this bulletin. Modifying inlet piping, relocating meter to point of higher temperature and/or lower pressure to eliminate vapor or condensation phase effects, and/or cleaning the mter (install filter or other form of cleaner if dirt repetitve problem) may also be required. If accuracy still questioned, return core tube/float assembly to Flow Line Options for calibration check.
APPARENT FALSE READINGS, LIQUID METERS	Liquid density not according to calibration data (different temperature or new liquid mixture), excessive dissolved or suspended solids or gases, partial clogging of core tube slot or foreign matter interfering with float movement, or viscosity levels above the meter's immunity index (V.I.C.). NOTE: If the MEMFlo meter is suspected of giving false readings, and none of the causes mentioned is found, please advice MEMFlo as to the method used in determining the suspected flow "error." Each MEMFlo flowmeter is individually calibrated by traceable methods, and carefully inspected. There may be some error in checking the MEMFlo meter against another standard.	By determining the actual density (due to changes in mixture, temperature, etc.), the correction formula may be applied. If dissolved gases are in the liquid, some elimination means should be provided on the supply side (also recxheck all piping, as improper seals at connection points are common sources of air in the liquid.) If the metered liquid is near the boiling point producing partial "flash gas" at the meter, relocate the meter to point of lower temperature and/or higher pressure, or cool lines and/or increase system pressure. Note: It is potentially dangerous to meter near the "flash point" of any fluid, and this practice should be avoided. Consult Flow Line Options for recommendations. The previous recommendations regarding cleaning the meter and/or filtration will also solve problems due to dirt. If metering liquids with high viscosities, consult Flow Line Options (may require special calibration). If none of these causes seem to be present, return meter core tube/float assembly to Flow Line Options along with the application data.
APPARENT METER READING MIGRATION (reading changes but flow appears constant)	Frequently caused by use of soft disc type valves, which may need to be replaced with a valve more suited to flow control. Can also be indicative of changing fluid conditions (density, viscosity, etc.) Problems with other elements of the flow system, including leaks, clogged filters, pump/compressor wear, etc. may first appear as a change in meter reading-one of the functions of a flowmeter.	Verifying the proper fluid conditions are known and applying correction formulae as needed will remedy problems associated with changing fluids. Cleaning, servicing, and replacement and/or repair of other system components may be required.
LEAKAGE	If at the junction of the body and sight tube, it is indicative of either (a) damaged "O" ring (most common); (b) damaged sight tube; or (c) damage to the gland section of the body. It may also be caused by improper reassembly of the flowmeter in the field. If there is leakage at the pipe connections to the meter, it is probably caused from over-tightening pipes on a prior installation (or the initial installation, particularly with PVC or CPVC flow meters).	Replace any damaged parts immediately, using the proper assembly procedures indicated in this instruction and the assembly detail drawings. Remove the body and inspect for damage—if none is visible, check pipe threads, reapply proper thread lubricant/sealant, and reinstall. If leak persists, replace meter body.

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