Technical Information

General Flowmeter Guidelines

FLOWMETER SELECTION

To select a flowmeter, the following information is required:

- Media (fluid to be monitored)
- Desired minimum and maximum flow range
- Desired set point
- Specific gravity
- Viscosity
- Temperature
- Pressure
- Port sizes
- Configuration

FLOWFINDER FLOW PREDICTION SOFTWARE

Futurestar also offers Flowfinder™ Flow Prediction Software to assist in flowmeter selection. Simply enter your process requirements and the appropriate flowmeter will be selected. Contact Futurestar your local Futurestar representative to receive a copy.

SPECIFIC GRAVITY / DENSITY AND VISCOSITY

Flowmeter operation is dependant on specific gravity /density and viscosity.
For factors other than 1.0 contact Futurestar.

SET POINT

For optimum performance, the flowmeter set point should be between Mark 4 and Mark 9 for standard float tapered tube flowmeters and between Mark 1 and Mark 9 on tapered float designs, typically for lower flow applications.

TAKING A FLOW READING

Flow readings are taken from the **top** of the float.

Futurestar is committed to proving complete and accurate technical support to assist you in using our products in your applications. For more info on any of our products, please contact Futurestar at 952-942-8388 or your local Futurestar representative.

ESTABLISHING THE SET POINT

The set point should be approached from below by slowly opening the metering valve. If the desired set point is exceeded, the metering valve should be closed slightly to allow the float to drop below the desired set point and the process started again.

FITTING TORQUE

PFA material has low tensile and compaction strength. Only minimal hand tightening is required on PFA fittings.

Conversions and Formulas

FLOW COEFFIENTS

- C_v flow coefficient is the number of gallons of water that can pass through a given orifice area in one minute at a pressure drop of one PSI.
- K_v flow coefficient is the number of liters of water that can pass through a given orifice area in one minute at a pressure drop of one bar.

Formulas

$$\text{Flow (GPM)} = C_v \sqrt{\frac{\text{Pressure Drop (PSI)}}{\text{Specific Gravity}}}$$

TEMPERATURE CONVERSIONS

$$°F = \frac{9 \times °C}{5} + 32$$

$$°C = \frac{5 \times (°F - 32)}{9}$$

BASIC CONVERSIONS

ml/min	1 cc/min
	0.001 l/min
	0.000264 GPM
l/min	1000 ml/min
	0.264 GPM
GPM	3.785 l/min
	3,785 ml/min
SCFM	SCFH / 60
SLM	SCFM x 28.317
SLM	SCFH / 2.119
kPa	PSI x 6.895
bar	PSI x 0.07
K_v	C_v x 14.28

Chemical Compatibility

	MATERIALS 68°F (20° C)								
CHEMICALS	**PFA**	**FEP**	**PTFE**	**CTFE**	**ECTFE**	**ETFE**	**PVDF**	**HDPE**	**PP**
INORGANIC ACIDS			**TFA**						
hydrochloric (conc)	OK	OK	OK	OK	OK	OK	OK	OK	NR
sulfuric (conc)	OK	OK	OK	OK	OK	OK	OK	NR	NR
hydrofluoric (40%)	OK	OK	OK	OK	OK	OK	OK	OK	OK
aqua regia	OK	OK	OK	OK	OK	OK	NR	OK	NR
chromic (50%)	OK	NA	NA	OK	OK	OK	OK	OK	OK
nitric (50%)	OK	OK	OK	OK	OK	OK	OK	OK	OK
fuming nitric	OK	OK	NA	OK	NA	NR	NR	NR	NR
phosphoric	OK	OK	OK	OK	OK	OK	OK	OK	OK
INORGANIC BASES									
sodium hydroxide	OK	OK	OK	OK	OK	OK	NR	OK	OK
potassium hydroxide	OK	OK	OK	OK	OK	OK	NR	OK	OK
ammonium hydroxide	OK	OK	OK	OK	OK	OK	NR	OK	OK
hydrogen peroxide	OK	OK	OK	OK	OK	OK	OK	OK	OK
ORGANIC ACIDS									
glacial acetic	OK	OK	OK	NA	OK	NR	NR	OK	OK
trichloroacetic	OK	OK	OK	OK	OK	OK	OK	NA	OK
Hydrocarbons									
toluene	OK	OK	OK	OK	OK	OK	OK	NR	OK
isooctane	OK	OK	NA	OK	OK	OK	OK	NR	NR
Alcohols									
benzyl	OK	NR	NA	OK	OK	OK	NR	OK	OK
ethyl	OK	NA	NA	OK	OK	OK	OK	OK	OK
isopropanol	OK	OK	OK	NA	OK	OK	OK	OK	OK
methyl	OK	OK	OK	OK	OK	OK	OK	OK	OK
Amines									
aniline	OK	NR	NA	OK	OK	NR	OK	NR	OK
ethylenediamine	OK	NA	NA	NA	OK	OK	NR	OK	OK
Ether									
tetrahydrofuran	OK	OK	OK	OK	OK	NR	NR	NR	NR
Ketones / Aldehydes									
acetone	OK	OK	NA	OK	OK	NA	NR	NR	OK
benzaldehyde	OK	OK	NA	OK	OK	OK	OK	OK	NR
cyclohexanone	OK	NA	NA	OK	OK	OK	OK	NR	NR
methylethylketone	OK	OK	OK	OK	OK	NR	NR	NA	OK
Esters									
dimethylphthalate	OK	NA	NA	OK	OK	NA	OK	NA	NA
Chlorinated Slovents									
methylene chloride	OK	OK	OK	OK	OK	OK	NR	NR	NR
perchloroethylene	OK	OK	OK	OK	NA	OK	OK	NR	OK
trichloroethylene	OK	OK	OK	OK	OK	NA	OK	NR	OK
carbon tetrachloride	OK	OK	OK	OK	OK	NR	OK	NR	OK
Freon®									
freon TF, 113	OK	OK	OK	NA	OK	OK	OK	OK	OK
freon TMC	OK	NA	NA	NA	NA	OK	NR	NA	OK
freon TMS	OK	OK	NA	NA	OK	OK	OK	NA	OK
freon TE	OK	NA	NA	NA	NA	OK	OK	NA	OK
OK: Compatible		**NR: Not recommended**			**NA: No data available**				

NOTE: Data is taken from information supplied by material manufacturers. Futurestar is not responsible for the accuracy of this data and disclaims any obligation or liability in connection with its use in buyer's applications. Contact Futurestar if questions concerning applications arise.

Glossary

ANALOG VARIABLE AREA FLOWMETER

These flowmeters incorporate the attributes of variable area flowmeters and flow indicators while providing electronic output signals based on flow. Available with or without a metering valve incorporated. Viscosity and density of fluids to be monitored does impact meter model selection.

CONFIGURATION

This term describes the format of variable area or analog variable area flowmeter available. Various options include panel mount, inline and inline panel mount. Selection options also include inclusion or exclusion of a metering valve and definition of the type and size of connection desired.

DENSITY

Concentration of matter measured by the mass per volume. Generally measured in kilogram/liter values. Density is measured in our Flowfinder™ Software in grams/cc values.

FLOW COEFFICIENT (Cv)

Flow coefficient (Cv) is defined as the number of gallons per minute (GPM) of water at room temperature that will flow through a valve with a pressure drop of 1 PSI across the valve.

FLOW RANGE

The upper and lower limits of a process flow.

PADDLEWHEEL FLOWMETER

This is a turbo type flowmeter with a rotor that turns through the flow path. Most conventional paddlewheel flowmeters incorporate magnets in the wheel and a magnetic proximity sensor counting the rotations. Futurestar paddle wheel flowmeters utilize rotor movement to interrupt a fiber optic light source yielding a pulsed output that corresponds with flow.

SPECIFIC GRAVITY (LIQUID)

The ratio of weight for a liquid divided by the weight of water for an equal volume at an identified temperature.

SET POINT

The desired flow level that is identified as optimum for specific process requirements.

VARIABLE AREA FLOWMETER

A device for visually indicating fluid flow, many times referred to as a rotameters. This type of meter incorporates a float inside of a tapered tube that is vertically mounted. Up or down float movement corresponds to the fluid flow rate in the tapered tube. This type of a meter is available with or without the incorporation of a metering valve. Viscosity and density of fluids to be monitored does impact meter model selection.

VISCOSITY

Describes the relationship between flow rate (shear rate) and the pressure (shear stress) that causes movement. Viscosity is a measure of resistance to flow of a fluid. There are two commonly used measures of viscosity, *"absolute"* and *"kinematic or relative"*. Absolute viscosity is pressure (shear stress) divided by flow rate (shear rate). Absolute viscosity is commonly measured in poise or centipoise. Kinematic or relative viscosity is the ratio of absolute divided by density. Kinematic or relative viscosity is commonly measured in stokes. Absolute viscosity is measured in our Flowfinder™ Flow Prediction Software. Viscosity is affected by temperature.

Futurestar Corporation ● 1470 Lake Drive West ● Chanhassen MN 55317 ● 952 942 8388 ● 952 942 8661 fax ● futurestarcorp.com