

Glossary of Terms

Accuracy:

The accuracy of a meter is often called the percent registration. Divide the liquid volume indicated on the meter counter by the liquid volume measured in a calibrated prover at any given flow rate, and express as a percentage.

Accuracy curve:

Plot, sometimes called a performance curve, showing a meter's accuracy over the entire operating range.

Accuracy range:

Flow range over which a meter can operate and maintain its accuracy within a permissible tolerance.

Batching Meter:

The traditional mechanical batching meter is an assembly consisting of a flow meter, a mechanical register where the desired flow volume is keyed in with buttons and a integrally mounted valve which controls the flow. An electronic batcher is a system consisting of a flow meter with a pulser: the electronic batcher mounted in a control panel or box and a separate valve which is either air or electrically actuated. The electronic batching system is less expensive and more versatile. Mechanical batching systems are sold primarily for hazardous areas and to companies who prefer the greater simplicity of a manually set and operated system.

CV Factor:

The quantity of water at 60°F, expressed in Gallons/Minute, which will flow through a valve with a 1 PSI pressure drop.

Direct-Acting Valve:

A solenoid valve where all the flow passes through the orifice which is opened directly by the solenoid actuated plunger.

Explosion Proof Housings:

All housings are not made equal. A housing sold as explosion proof may be suitable for a Class I, Division 1, Groups C or D and not be rated for Group B. In more familiar terms, a housing that is suitable for propane, toluene, methanol or gasoline, is not suitable for use on hydrogen or formaldehyde.

Flow Indicator:

This does not indicate a rate of flow, only the presence of fluid movement in the line. Some totalizing meters have a little pointer which will turn with flow, however, the term is normally applied to a device which has a spinning rotor, bouncing balls or disk which will move when flow occurs.

Flow Rate Indicator:

This device tells you how fast the fluid is flowing through the pipe. Almost any electronic meter will give you the rate of flow, but this term is generally reserved for devices which install in the line and have a scale with a pointer, or a "float" which rises and falls in a vertical tube and whose position is read on a scale as Gal/Min, Liters/Hour, etc.

General Purpose Valve:

A valve intended to control the flow of a fluid, but not be depended upon to act as a safety valve.

Measurement Accuracy:

A meter accuracy is expressed as percent of full scale (F.S.), and percent of rate.

To determine the F.S. you take the full range calibrated value of the meter and multiply it by the stated accuracy. If a meter has a $\pm 1\%$ F.S. statement and has a maximum flow rate of 100 GPM, at exactly 100 GPM, the register may vary from 99 to 101 GPM. This same meter at 10 GPM can have a register variation from 9 to 11 GPM (a 10% of actual flow rate error).

The percent of rate of the stated accuracy is the stated accuracy applied over the entire range of the flow meter. For example, if the above meter had a $\pm 1\%$ of rate statement, it is allowed to have an error at 100 GPM of 99 to 101 GPM. However, at 10 GPM, the allowable register error is only 9.9 to 10.1 GPM.

Positive displacement meters, ultrasonic meters and rotameters are generally defined with % F.S. accuracy statement.

Turbines, magnetic flow and oval gear meters are generally defined with a percent of rate accuracy statement.

NEMA enclosures [from NEMA 250-2003]

In **Non-Hazardous Locations**, the specific enclosure Types, their applications, and the environmental conditions they are designed to protect against, **when completely and properly installed**, are as follows:

NEMA TYPE 3:

Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow); and that will be undamaged by the external formation of ice on the enclosure.

NEMA TYPE 4:

Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.

NEMA TYPE 4X:

Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); that provides an additional level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

NEMA TYPE 7:

For use in hazardous locations, these enclosures are rated NEMA 7 and 9 and meet UL Class I, Divisions 1 and 2, Groups B, C, and D; Class II, Divisions 1 and 2, Groups E, F, and G; and Class III, Divisions 1 and 2. They are also rated NEMA 4 for protection from dirt and washdowns.

NEMA TYPE 9:

Certified and labelled for use in areas with specific hazardous conditions: for indoor and outdoor use in locations classified as Class II, Groups E (atmospheres containing metal dust), Group F (atmospheres containing carbon black, coal or coke dust), or Group G (atmospheres containing flour, starch or grain dust) as defined in NFPA standards such as the NEC.

Output Signals:

Almost every meter is available with some sort of option which will provide a output signal. These are normally volumetric and rate related types. A volumetric signal can be as simple as a switch which gives a contact closure every gallon, or a solid state pulser providing a several hundred pulses/gallon. Rate related signals are typically analog 4-2 mA DC. As the flow rate varies, the milliamp signal varies. If this signal was sent to a chart recorder, the recorder would graphically depict the actual flow rate over time.

The flow meters sold by Controls Warehouse have linear outputs, with the exceptions of the Hersey target meter and the RCM flow rate indicator. These meters are available with either a square law or linear outputs. Square law signals of over 50% of span provide a very large change in signal value for a small change in flow rate. Linear signals have a wider flow range and are preferred where totalization is required. Other type of signals are the 3/2 and 5/2 power relationships seen in open channel flow measurement with weirs, v-notches and flumes. Log based signals are available from certain flow meters, but seldom used.

For an example of a square law signal, look at any of the scales in the RCM specification sheet. The scale is constricted at the low end and spread out at the high end. This means that you want to operate this type of meter in the upper 50% of its range whenever possible.

In newer technology flow meters, it is common to see Modbus and HART protocols, as well as RS232/422/423 serial communication links to a computer. These signals are also available from associated electronic displays.

Pilot-Operated Valve:

A solenoid valve that uses a small plunger to open and close a control orifice, which adjusts the pressure differential across a large diaphragm, allowing it to open and close.

Rangeability:

Ratio of maximum operating capacity to minimum operating capacity within a meter's specified tolerance

Repeatability:

The ability of a meter to deliver a constant reading or output at any given flow rate within close tolerances. Repeatability is often confused with meter accuracy, but the two terms do not have the same meaning

Totalization:

The water meter in your front yard is a totalizing meter. It gives a running total of the volume of water you used. This can also be referred to as a integrating meter. This type of meter is available with both a resettable register



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as well as a non-reset register. Your front yard water meter is an example of a non-reset meter. Totalizers read in units like Gallons, Liters, Cubic Feet, Acre Feet, etc.