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McCrometer Propeller Meters Over-Run Capability

McCrometer offers an over-run bearing assembly as an option on many of its propeller meter models. This option increases the high flowrate range of the meter by 50%. The over-run bearing assembly differs from the standard bearing assembly with the addition of a third bearing in the fore chamber of the assembly. This third bearing offers greater support of the propeller and will lengthen the meter life in high flow applications.

McCrometer propeller meters are specified to remain accurate over a range of flowrates. The minimum and maximum flowrates follow the American Water Works Association's (AWWA) *Standard for Cold-Water Meters - Propeller Type for Main Line Applications* (ANSI/AWWA C704-02). This standard covers typical application ranges and standard meters are designed for these ranges.

The need to measure higher flowrates creates pipe conditions that excessively wear a standard bearing assembly. Thus the anticipated life of the meter will be shortened. Several specific conditions contribute to the increased wear. Higher flowrates increase the rotational speed of the propeller. McCrometer's polypropylene propellers are injection molded and not balanced prior to assembly. Any asymmetries that exist in the propeller in relation to the shaft will greatly increase normal forces in the bearings with increased rotational speed. Higher flowrates will also compound turbulent forces acting asymmetrically on the propeller shaft. These forces result from skewed velocity profiles, system vibration, and pipeline swirl created by pumps or elbows. Greater axial forces also exist in the higher flowrate ranges. The linear velocity will push the propeller into the bearing assembly. Axial forces are proportional to the square of the linear velocity. Increasing the flowrate two times will increase the axial force on the propeller/bearing assembly by a factor of four. Pressure and velocity pulses are more likely at increased flow, adding cyclic axial forces.

These forces combined with increased heat and centrifugal forces in the ball bearings create a harsh environment for a standard bearing assembly. This harsh environment will shorten the meter's life significantly. Excessive wear of the ball bearings is the dominant factor. Small particles can work their way into the bearing assemblies in dirty flow. These small particles do not create a problem under standard conditions. In above standard flow, these particles can cause bearings to seize if under too much force.

To counter these forces and provide the additional shaft support, a third bearing is added in the assembly. This third bearing will distribute the forces. Thus each bearing is subject to one-third less stress and wear. With this distribution of forces, the lifetime of the propeller meter is lengthened dramatically.

The accuracy of the meter will not diminish in these higher flowrates. The limiting factor in the maximum flowrates is the strength and life of the bearing assembly. The increased friction on the propeller shaft from the third bearing is minimal. Available energy in the pipeline due to the flowing velocity of the water provides magnitudes more force than the frictional resistance of the bearing assembly. This ensures that the resistance friction is negligible compared to the momentum force of the water. Accuracy will remain ±2.0% from 0 to 150% of the standard flowrates.

Please note that the over-run option is not available for all models.

Nominal size	Minimum flowrate	Maximum flowrate	Over-Run maximum flowrate
3"	35.00	250.00	375.00
4"	50.00	600.00	900.00
6"	90.00	1200.00	1800.00
8"	100.00	1500.00	2250.00
10"	125.00	1800.00	2700.00
12"	150.00	2500.00	3750.00
14"	250.00	3000.00	4500.00

For larger line size, simply add 50% to the maximum standard flowrate.

