

Operation Principles of LMI Solenoid Pumps

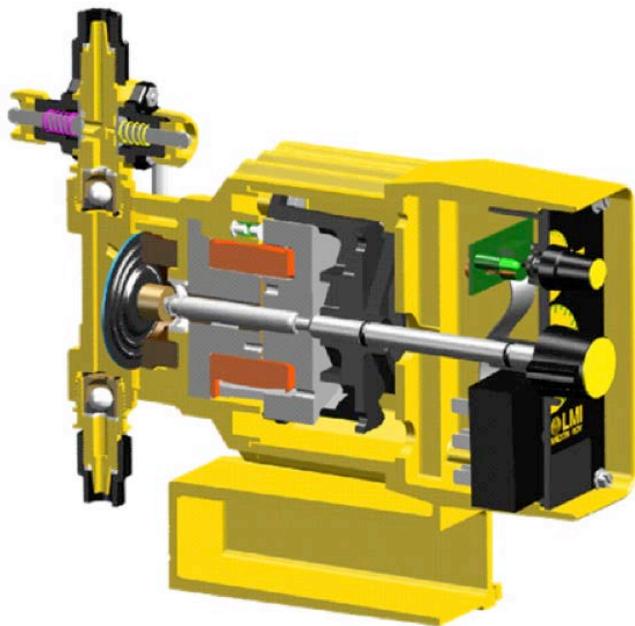


Chemical dosing or metering pumps are used to dispense or inject precise amounts of fluid into a process. These pumps are prevalent in water treatment applications such as cooling towers, boilers, and industrial wastewater treatment; however, they are used in a multitude of different chemical processes around the world.

While there are many types of metering pumps, solenoid driven positive displacement metering pumps are preferred in chemical feed applications due to their low cost, ease of use, reliability, and high degree of accuracy.

The LMI Solenoid Driven product range covers a wide spectrum of pressures and flows. For instance, the LMI PD series can achieve up to 2.0 Gallons Per Hour or up to 450 PSI depending on model selection. Higher capacity solenoid metering pumps, such as the LMI C Series can achieve up to 25 Gallons per Hour at 300 PSI.

There are two main components of a solenoid driven metering pump: the drive and the liquid end. The drive and the liquid end are connected by a connecting rod and fluid diaphragm, or Liquifram®:



The drive of solenoid driven metering pumps uses an electronic pulsing unit (EPU) to energize the solenoid coil. The speed at which the EPU operates ultimately determines the speed, or strokes per minute, of the diaphragm which determines the rate of fluid flow.

Additionally, many pumps have either a fixed or adjustable stroke that enables the user to change the fixed volume, or amount of fluid displacement per cycle. Ultimately, the user needs to determine an optimal stroke length and speed setting to determine the precise fluid flow rate.

Simple and easy to use pumps, such as the LMI PD Series may have a fixed stroke length. This fixed stroke length combined with precise speed adjustment makes it easier for the user to dial in the exact injection amount.

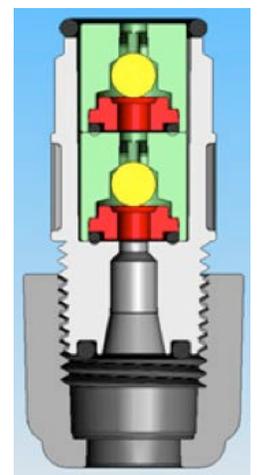


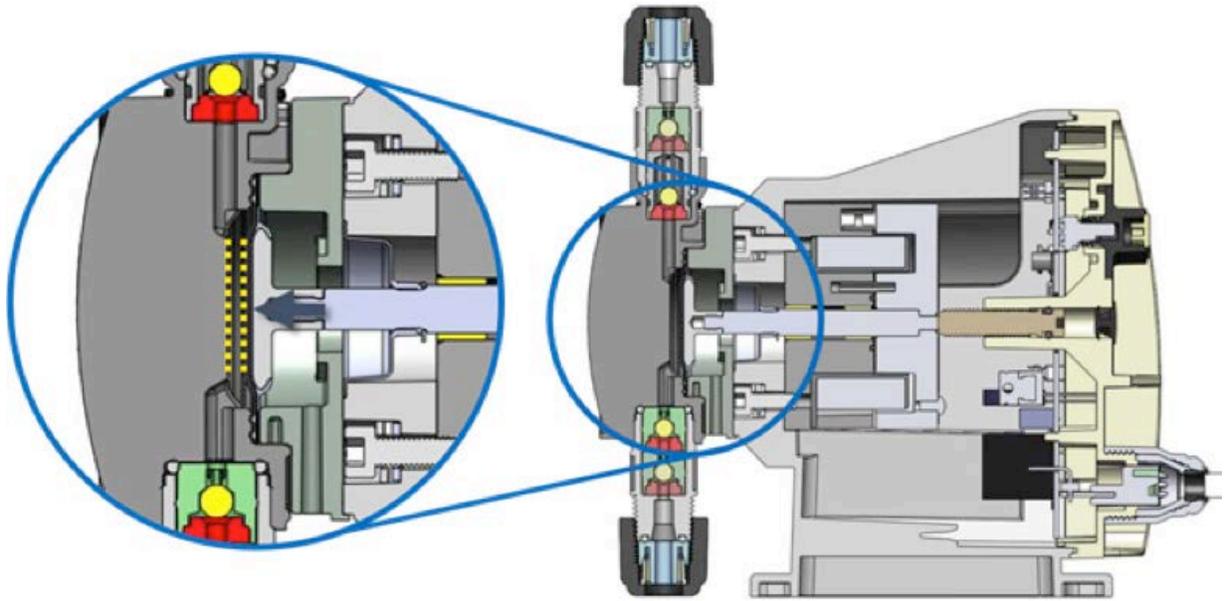
“Turndown ratio” is a measure of how much a pump’s capacity can be reduced from its maximum flow rate. This is a function of both displacement per cycle and speed at which the pump operates. Additionally, solenoid pump drives may have many other useful features that enable seamless integration into a larger chemical process.

The liquid end comprises the fluid head itself, the diaphragm and check valves on the inlet and outlet. Ball checks are used due to their high reliability and functionality.

When the diaphragm is drawn in, the outlet ball check becomes seated such that process fluid does not flow back into the liquid chamber. The inlet ball check opens drawing fluid in from the supply suction.

When the diaphragm is flexed into the liquid chamber, it forces the inlet ball check down and displaces all of the fluid in the liquid chamber out of the outlet ball check.





While this is a relatively simple operation, there are certain features that improve the product's reliability:

1. Dual ball checks on the inlet and outlet ensure that a precise and repeatable amount of fluid is being dispensed and improve reliability.
2. Integrated priming ports enable the user to prime the pump quickly, such as the LMI FASTPRIME port integrated into the PD and AD series product.
3. Availability and selection of liquid end materials which ensures all components are chemically compatible with the process fluid
2. These pumps are frequently placed in a wide variety of environments and operating conditions. Rugged pumps with high NEMA and IP ratings prolong pump longevity. Robust solenoid pumps are less susceptible to issues caused by thermal shift.
3. Speed: pumps that operate above 200 strokes per minute might have trouble with leaks past the ball check as there is not enough time between cycles to fully seat the check valve. This phenomenon negatively impacts accuracy.

There are certain features that should be accounted for when selecting a solenoid driven metering pump that goes beyond price, pressure and flow:

1. As metering pumps are specifically used for dosing precise amounts of chemical, the accuracy and repeatability at which that chemical is dispensed is very important. For example, if too much caustic is dispensed in a neutralizing process, then incremental acid must be dispensed to reach a neutral point which can be wasteful and costly over time. Additionally, it is important that the pump does not see loss of calibration over time or even worse – leaks due to thermal shift.
4. Reliability: it is important to select a pump that you can set and forget. Low quality products are susceptible to leaks, frequent calibration, and chemical spills caused from prematurely failed diaphragms (or failed tubing in peristaltic pumps).

Ultimately, when you select a LMI Solenoid Driven Metering pump for your chemical process, you are selecting a rugged, reliable, and accurate product that helps you focus on the process at hand. *You can rely on LMI.*



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