

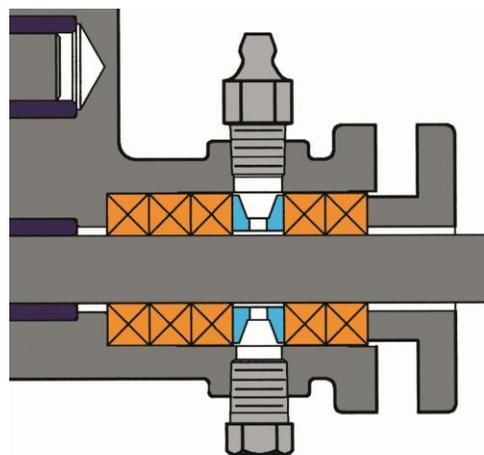
There are many cases where it is readily apparent what type of sealing method is appropriate to use for a pump application, but there are also those where it is not. This note is meant as a general guide or starting point to help decide what to use.

As a preliminary step, the following outlines the approximate leak rates of various types of sealing methods (does not take into account differing viscosities and pressures):

- Packed box (properly adjusted): 10 drops per minute
- Mechanical seal: 10 drops per day
- Mag-drive: no leakage

One would obviously not want to use one of the above in the case where the rate of leakage is more than could be tolerated for a given product. This might be for various reasons ranging from toxicity, hazardousness, etc., to simply not wanting a mess.

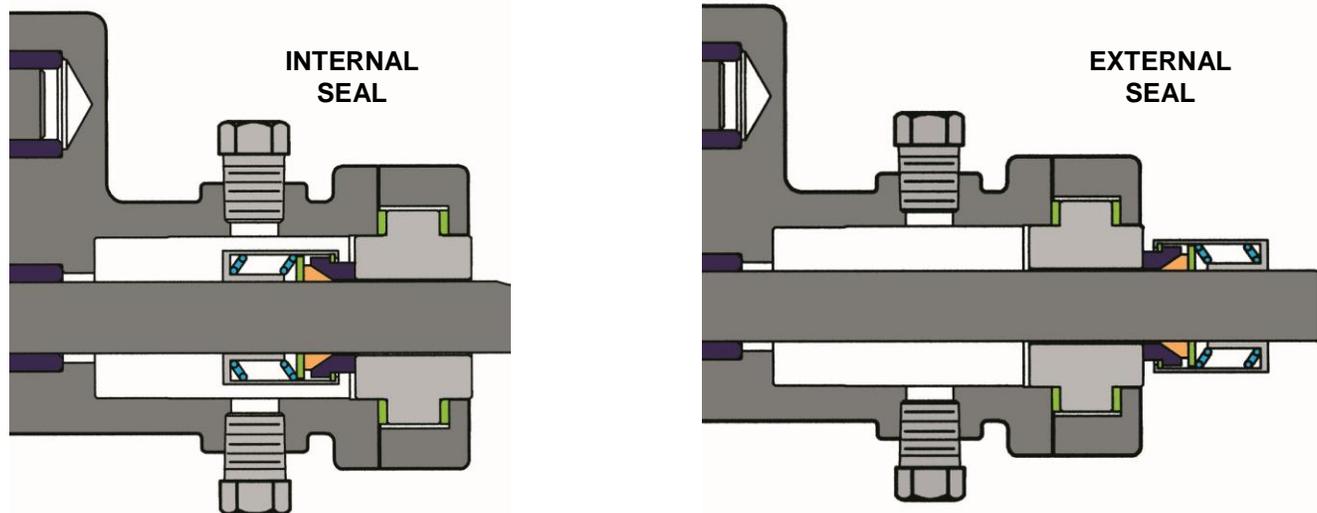
Packing:



Many plants do not use packing at all anymore unless there is some reason it cannot be avoided. There are cases where packing is a very good choice, however. In the case of a fluid with a very high viscosity, your choices may be limited. The small annular gap between the inner magnet and containment can of a mag-drive pump contribute significantly to torque, due to viscous drag. This may mean that it is either not practical or not possible to use this method. Likewise, it may not be possible to use a single seal, as many are only rated to around 5,000 cP. What is left is either a double mechanical seal or packing. A double seal is a good choice, but must be properly supported and is more expensive. Packing may, in this case, be a good option (if the fluid is non-toxic and non-hazardous), as realistically, the process fluid may either penetrate the stuffing box very slowly or not at all. In this case, the packing should be lubricated with something compatible with the process fluid (a grease fitting is provided for this purpose), to be sure it is lubricated properly.

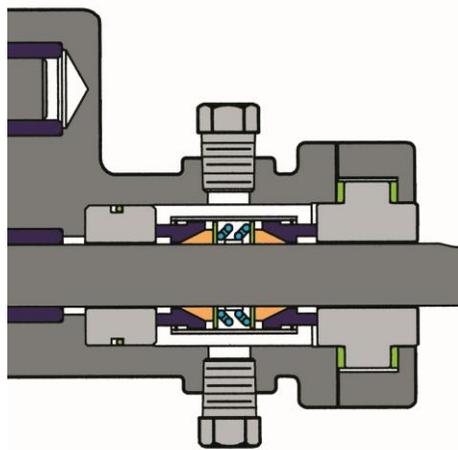
Liquiflo Application Note to the Field: Sealing Liquiflo Gear Pumps

Single Mechanical Seals:



Single internal mechanical seals are very popular for many chemicals. They are simple and easy to install and maintain, and relatively inexpensive. This type of seal is generally used where the fluid being pumped is clean, less than 5,000 cP, non-hazardous and non-toxic in the amounts crossing the seal faces, below about 500°F (260°C) and not so close to the vapor pressure as to flash as it crosses to atmosphere. (Note: material changes may be necessary depending on the conditions.) You typically want the compression springs to be working in the same direction as the forces due to pressure, as this provides for better sealing. When the higher pressure is on the outside of the stuffing box (as in vacuum service with relatively low differential pressure), an externally mounted seal can be used. The external seal has the advantage of being isolated from the pumpage and can sometimes be replaced without disassembling the pump.

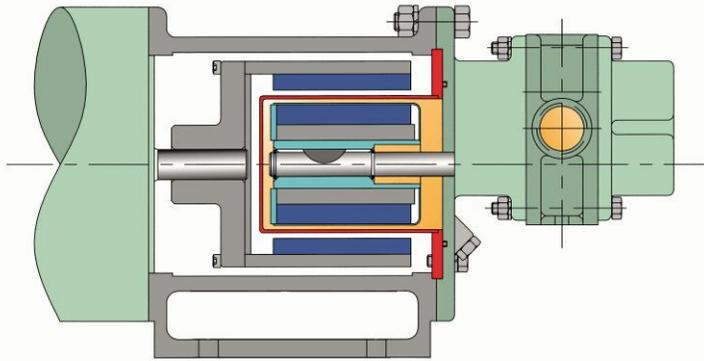
Double Mechanical Seals:



Liquiflo's double mechanical seals are basically two back-to-back single seals with a common carrier. They are supported by a flush in between them via the supplied 1/8" NPT ports in the stuffing box. Since the flush is between the seals and must be at a higher pressure than the stuffing box, the process fluid is prevented from exiting the pump. Instead, the flushing fluid will cross the faces of the inboard seal into the process and also cross the faces of the outboard seal into the environment. For this reason, a flushing fluid needs to be chosen that is both compatible with the fluid and is non-hazardous. Double mechanical seals are usually used in the cases where leakage of the process fluid to the outside of the pump cannot be tolerated, where the viscosity is higher than 5,000 cP, where a packed box is not appropriate and where a mag-drive is either not desired or it would contribute to too much torque. For a plant that has flushing fluid readily available, this may be very convenient.

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Mag-Drives:



In many places, mag-drives are being used almost exclusively. This is because they are inherently sealed (i.e. there is no shaft going from the inside of the pump to the outside). This alone makes them very attractive. As well, there is no mechanical seal or packing to maintain or adjust and repair kits are less expensive (no seal or seat to replace). In the case that they can be used (which depends mostly on the fluid viscosity), they are very often the best and simplest choice. Liquiflo's H-Series, 3-Series (Models 31-

39F), 2-Series, 4-Series and Max-Series mag-drive gear pumps certainly are simple, with no mechanical coupling, guard, etc., required for close-coupled arrangements. A base plate is not even strictly necessary, as the pump/motor assembly can be bolted directly to a piece of machinery. The mag-drive pump can also be used for vacuum service (as an alternative to the external mechanical seal).

The various sealing methods discussed are summarized below:

Summary of Liquiflo Gear Pump Sealing Methods

SEALING METHOD	ADVANTAGES	DISADVANTAGES
Packing	Good for safe, clean and innocuous liquids; can handle extremely viscous fluids (using lubricant); high pressure and temperature capability	High leakage rate for low-viscosity liquids; requires gland plate adjustment for proper compression of packing during operation
Single Mechanical Seal – Internal	Suitable for majority of clean chemicals; virtually no leakage; high pressure and temperature capability	Low tolerance to solids, crystals, abrasives or highly viscous fluids (5,000 cP max)
Single Mechanical Seal – External	Ideal for vacuum conditions (< 0 PSIG) at low ΔP ; virtually no leakage; seal body is isolated from pumpage; can be replaced without pump disassembly; high temperature capability	Same fluid limitations as single internal seal; not as effective as single internal seal at pressures above atmospheric (> 0 PSIG)
Double Mechanical Seal	Good for noxious, toxic, hazardous, crystallizing, mildly abrasive and highly viscous fluids; no leakage of process fluid; dry-running capability; high pressure and temperature capability	Requires pressurized, non-hazardous fluid flush system for support; flush fluid must be compatible with process fluid
Mag-Drive	Ideal for noxious, toxic, hazardous and crystallizing liquids; complete containment of process fluid (no leakage); high pressure and temperature capability; suitable for vacuum service	Requires higher torque and power for viscous fluids; max viscosity limited by magnetic coupling; cannot tolerate magnetic particles