

# PERMANENT MAGNET (Self Holding) SOLENOIDS

## 1. Design and Features

The permanent magnet solenoids (also known as magnetic latching or self holding solenoids) is a product line of linear open frame solenoids that utilize the advantages of a high performance permanent magnet. The principle of operation is similar to all linear solenoids. When the coil is energized, the plunger moves toward the pole piece. The advantage of the PM solenoid is that once energized and plunger movement has occurred, the plunger will remain in the energized position without any further electrical power input.

This “holding” feature is accomplished because the permanent magnet creates a magnetic latching field that maintains the plunger in the closed or energized position. There are two types of PM solenoid configurations: one is a single direction holding design and the other is a two direction holding design. The one direction design uses a PM to hold the solenoid in the energized position, Fig 1. The two direction design uses a PM that can hold the enclosed plunger in two different positions at both ends of the stroke. This is effected by the use of two separate coils and pole pieces, Fig 2.

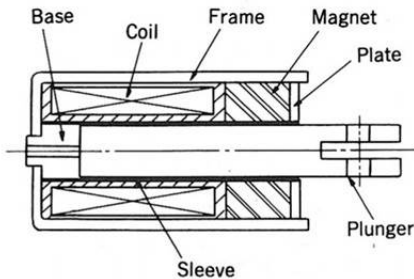


Fig. 1 One Direction

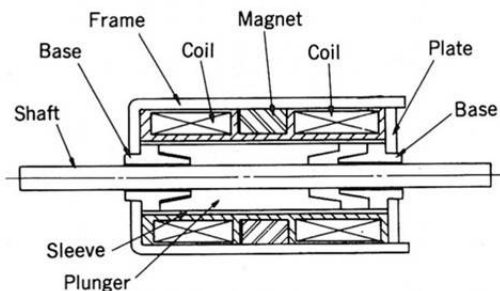


Fig. 2 Two Direction

## 2. Stroke, Force and Holding Force

The PM type solenoids can be used in both short and long stroke applications. As such, the pole piece designs are both conical and flat depending upon the performance requirements. To improve efficiency, the solenoid stroke should be minimized in the application.

## 3. Operational Considerations

### A) Temperature

The coil data for the permanent magnet solenoid shows the values at ambient temperature 20°C and a duty cycle of 25% (SH2LC0524 is duty cycle 10%). The solenoid coil can operate at temperatures up to 105°C. Most applications using PM solenoids are intermittent applications (as the permanent magnet is used for holding). Please note the maximum on time to prevent potential thermal damage.

### B) Operation

The PM solenoid is different than traditional solenoids, in that electrical polarity is important to obtain proper operation. The lead wires from the coil are color coded and must be wired to the appropriate electrical connections (plus and minus terminals). With current flowing in one direction (when energizing the solenoid) the coils magnetic field and the permanent magnet field are additive. To release the solenoid from the “hold” position, the coil field has to cancel the permanent magnet field, thus current has to flow in the opposite direction to the pull in current flow.

### C) Return Spring

In a one direction design it is advantageous to use a return spring to prevent inadvertent plunger “pull in” that could be caused by the magnetic field from the permanent magnet.

### D) Plunger and Shaft Modifications

It is not recommended that the customer modify the plunger or shaft, as the shafts are manufactured and plated at the factory. Any special configurations can be supplied. Please consult the factory for details.

### E) Handling

The permanent magnet solenoid utilizes a permanent magnet that will attract metal particles and care must be taken to prevent these particles from becoming “attached” to the solenoid.

