

Diode Rectified Solenoid Valve Coils For Quiet Operation

Most solenoid valves now in operation are powered by AC current, primarily because AC voltages are more readily available. AC solenoids have faster pull-in (cycle) times, with a ratio as high as 3:1 compared to DC power. However, AC or DC powered valves have a natural tendency to audibly “click” at the beginning of each on-cycle and can sometimes, under adverse conditions, emit a low, but audible hum in operation.

While perfectly acceptable for the majority of applications, valves destined for quiet environments, such as hospitals, often cannot accept the possibility of a hum or, in extreme cases, a buzz. Further, in an AC valve, anything that will prevent proper mating of the plunger pole faces, including dirt and corrosion, can cause noisy operation. In addition, AC solenoids, because of the in-rush current and fast cycling, can evidence higher heat rise than would be experienced under steady-state conditions, another problem in hospital/medical/ laboratory applications. The reactance on AC solenoids increases progressively, reducing the current as the plunger moves into its seated position. If the plunger is restricted, the temperature will increase as the square of the current.

All of these inherent AC valve conditions have led us to provide many AC valves with diode rectified coils, allowing the valve to run on DC power for cooler and quieter operation in application where these are required. Fortunately, semi-conductor diodes are considerably less expensive today than in the past, and their use has not caused a significant cost increase where DC operation is necessary.

Operating on DC, the valve plunger need not be seated on its stop in order to prevent coil burnout, and the typical DC solenoid exhibits a longer life because it is not subjected to the peak voltages produced by the more broadly cycling AC current. The closed gap pull force is greater on DC than AC for the same pole area. Normally the AC pull curve has a sharper bend at each peak or valley, while the DC curve is consistently flatter.

Given the many superior properties of solenoid valves with diode rectified coils converting AC input power to DC operation, and the increase in medical-oriented applications where these DC valve capabilities are desirable, we are able to offer most basic solenoid valves with a diode rectified coil to meet specific user criteria. For applications which require it, a 4-diode full wave bridge also is available.



Location of the rectified fly back diode array in DC rectified solenoid valve coil is shown (cutaway). Most of our valves can be so configured, including the Models 50, 20, and 30 (left to right) above, all specified with diode rectified coils for the inherent low noise/low temperature provided by DC operation. They are used primarily for low noise/low temperature quiet locations such as hospitals and laboratories.

Peter Paul Water-resistant Valves for Submerged Operations

Peter Paul Electronics Co., Inc., offers water-resistant solenoid valves featuring a fully encapsulated coil, for applications where exposure to moisture or even complete submersion is necessary.

The Series 15 or 50 valves are intended for a wide range of outdoor uses including HVACR, irrigation systems, off-road equipment, trucks, buses, trains or other vehicles experiencing significant exposure to wet environments, including boat trailers, controls, engine and bilge areas. The valves feature a liquid epoxy potted coil assembly and a rugged housing covered with a baked-on epoxy/polyester finish rated at 1000+ hours in a 5% salt spray test. The potting provides increased heat transfer capabilities through elimination of trapped air pockets for a cooler running valve.

All internal parts are constructed of stainless steel and brass. Corrosion resistant materials are used for exposed parts. The standard version operates on a 12 VDC, single lead power connection. Dual power lead versions can be used for mounting on non-conductive surfaces such as fiberglass, plastic or wood. Additional power options are also available.



Encapsulated Diode Spade Coil For Series 15 Solenoid Valves



A full wave bridge can now be encapsulated into the coil assembly Series 15 solenoid valves. By embedding the required electronics in the coil, a DC valve can be driven by common AC voltages.

Each valve's encapsulated coil contains a diode circuit that converts common 50/60 Hz voltage to DC. Running the coil on DC eliminates the in-rush current associated with AC valves, thus limiting the excessive heat build-up encountered with frequently cycled valves. The use of DC coil voltage also allows the use of an elastomeric damper within the valve itself. This damper reduces the audible click which occurs on actuation as well as increases the life of the valve, for a wide range of hospital and laboratory applications.

Electrical Connectors

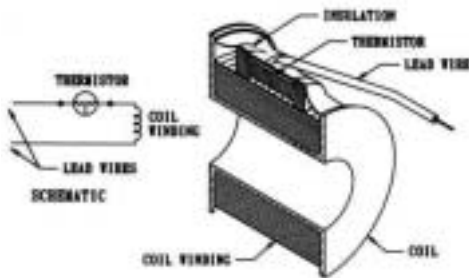


These solenoid valves are factory-equipped with the required pin connectors and as-specified leads and lead lengths to allow the installation of valves by maintenance personnel without the need for on-site electrical engineers.

It is recognized that solenoid valves can be configured with numerous coil options, voltages, orifice sizes, pressure ratings, elastomers, footprints, and more. In addition, there are a wide range of attachments and add-ons such as splice boxes, mounting brackets, manifolds, and more to enhance the utility of the solenoid valve.

To provide even more value-added aspects to our valves, these solenoid valves are offered with many electrical connectors, allowing on-the-floor maintenance staff personnel to disconnect and switch solenoid valve connections without the need for an electrical engineer. These electrical connectors include male or female pins and connectors, custom lead lengths, junction box connectors, and other simple fasteners which can be handled on the plant floor or in the field. Typical electrical connectors include pin styles, receptacles, housings, flag connectors, and two- or three-pin flange connectors. While the add-on costs of these pins and connectors are nominal, their inclusion at the factory make the solenoid valves of which they are a part installation-ready as received by the user.

Time Delay Coils Check Process Before Media Flow



This time delay coil with built-in thermistor (cutaway) is at the heart of the Peter Paul Series 30 solenoid valves employed on many oil burners.

Time delay coils with built-in thermistors have been developed for our Series 30 solenoid valves. The thermistor circuit in the solenoid valve coil delays the pick up of the valve's plunger from 2 to 6 seconds. This allows the solenoid to be certain of the required process parameters before media flow commences.

A common example is the start-up sequence for an oil burner. It is vital that a sensor in the furnace's electrical circuit "sees" that a flame has been generated to continue the flow of fuel oil. If there is no flame, oil flow may flood the burner, often requiring maintenance of an extended period of time before a re-start can be initiated. When the call activates the burner, the solenoid valve's time delay function allows the pump and fan/motor to reach operating speed before starting fuel flow.

Series 30 solenoid valves, UL recognized and CSA listed, are frequently used in these boiler and furnace applications because of their economical pricing and compact size.

Dual Voltage Solenoid Valve Coils



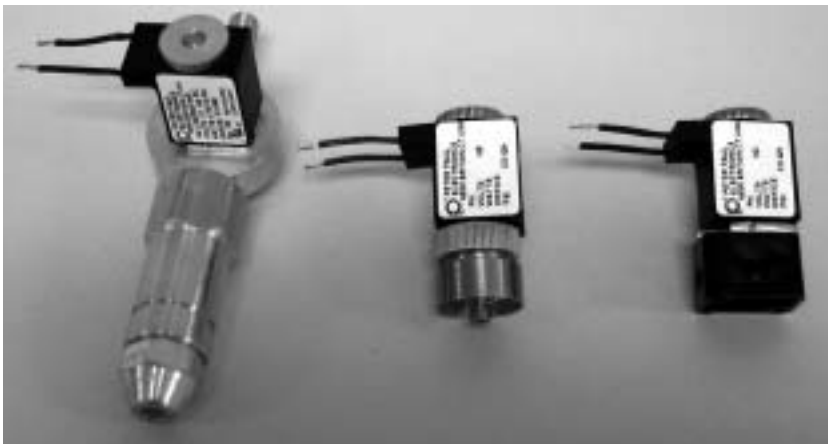
Dual voltage, four-wire coil and completed dual voltage solenoid valve (Series 20, left and Series 50, right) are used when two voltages may be involved in a process, typically 120/240 VAC or 240/480 VAC.

For many small AC motor applications including powered hand tools, it has become quite common for the motors to be configured to operate at one of two voltage levels, typically 120/240 VAC-60 Hz OR 240/480 VAC-60 Hz.

Now for the Series 20, 50, 60 and 80, 2-, 3-, and 4-way solenoid valves, we can provide dual voltage coils to allow the solenoid valves to be wired for either of the applicable voltages, reducing parts inventory and product installation / assembly at the distributor, OEM, and end user locations.

For specific applications in which more than one voltage might be encountered, the dual voltage solenoid valves are identical to their single-voltage versions except for the additional coil windings and leads.

Series 58 Super Sub-Miniature Coils



These coils were specifically designed for small places. The Sub-Miniature coil mounts on our existing Series 58 Bodies, ie Stainless Steel Screw-In or 10-32 Ports and our standard plastic bodies, Manifold Mount or 10-32 Ports. These valves are ideal for micro electronic production equipment and medical or chemical analytical applications where space is limited. Also, can easily be suited for any value added OEM application, as shown with special brass fittings and accessories. Consult factory for size, pressure ratings, orifice sizes and power requirements.