



DISCOVER INDUSTRIES, INC.

DISCOVER VALVE

DISCOVERVALVE.COM

719-434-1727

What Are “Direct-Acting” Solenoid Valves?

Direct-acting solenoid valves are a type of electromechanical valve that use an electrical current to control the flow of fluids (liquids or gases) through a system. These valves work on the principle of electromagnetic force generated by the solenoid coil to actuate the valve mechanism directly, without the need for an external pressure source or pilot valve.

The main components of a direct-acting solenoid valve include:

Solenoid Coil: It is an electromagnet consisting of a coil of wire wound around a magnetic core. When an electric current passes through the coil, it creates a magnetic field.

Plunger or Armature: The plunger is a movable component that is attracted to the magnetic field when the solenoid coil is energized.

Valve Seat and Orifice: The valve seat is the sealing surface where the plunger comes in contact to close the valve. The orifice is the opening through which the fluid flows when the valve is open.

Working principle of [Normally Closed direct-acting solenoid valves](#):

When the solenoid coil is not energized (de-energized), the plunger rests against the valve seat, sealing off the orifice, and preventing fluid flow through the valve.

When an electric current is applied to the solenoid coil (energized), the coil creates a magnetic field that attracts the plunger towards it. This action lifts the plunger away from the valve seat, opening the orifice and allowing fluid to flow through the valve.

When the electric current to the solenoid coil is removed, the magnetic field collapses, and the plunger returns to its original position under the influence of a spring or other restoring force. The valve seat is once again sealed, stopping the fluid flow.

Direct-acting solenoid valves are typically fast-acting and energy-efficient since they do not require a separate source of air or other fluids for actuation. They find applications in a wide range of industries, including:

Water and wastewater treatment systems

Refrigeration and air conditioning systems

Process control and automation in industrial applications

Medical and laboratory equipment

Agricultural irrigation and hydroponics

Livestock and poultry watering



DISCOVER INDUSTRIES, INC.

DISCOVER VALVE

DISCOVERVALVE.COM

719-434-1727

It's worth noting that direct-acting solenoid valves are suitable for low to medium pressure and flow applications. For high-pressure or large flow systems, pilot-operated solenoid valves or other valve types may be more appropriate.

Pros to using Direct-Acting Solenoid Valves compared to "pilot-operated":

Usually, no flow required to activate

Fast acting

Less likely to clog or fail

Simple design is easy to maintain

Cons to using Direct-Acting Solenoid Valve:

More expensive than pilot-operated valves

Heavier

Requires more electrical current to operate

What Are "Pilot-Operated" Solenoid Valves?

A pilot-operated solenoid valve, also known as a pilot-controlled solenoid valve, is a type of solenoid valve that uses a smaller control valve, called a pilot valve, to regulate the flow of the main fluid valve. These valves are commonly used in applications where higher pressures, larger flow rates, or more precise control are required.

The main components of a pilot-operated solenoid valve are similar to those of a direct-acting solenoid valve, including the solenoid coil, plunger or armature, and the main valve seat and orifice. However, in a pilot-operated solenoid valve, there is an additional pilot valve that controls the actuation of the main valve.

Working principle of pilot-operated solenoid valves:

Pilot Valve: The pilot valve is a smaller valve, often operated directly by the solenoid coil. When the solenoid coil is energized, it opens the pilot valve, allowing a small amount of fluid (usually air or a liquid) to flow through the pilot valve and into the actuator chamber of the main valve.

Actuator Chamber: The actuator chamber is a part of the main valve that, when pressurized by the fluid from the pilot valve, causes the main valve's plunger or diaphragm to move and open the main valve. This allows the main fluid (e.g., water, gas, or oil) to flow through the orifice of the main valve.



DISCOVER INDUSTRIES, INC.

DISCOVER VALVE

DISCOVERVALVE.COM

719-434-1727

Pilot Pressure: The pilot pressure from the pilot valve is required to overcome the forces that keep the main valve closed, such as spring tension or fluid pressure.

De-energized Position: When the solenoid coil is de-energized, the pilot valve closes, cutting off the pilot pressure to the actuator chamber. The main valve's plunger or diaphragm returns to its original position, closing the main valve and stopping the fluid flow.

Pilot-operated solenoid valves are often used in applications where the pressure differential across the main valve is significant or when precise control is needed. They are commonly found in industrial processes, fluid power systems, and large-scale applications where direct-acting solenoid valves may not be sufficient due to their limitations in pressure and flow capacity.

It's essential to choose the appropriate type of solenoid valve based on the specific requirements of the application, considering factors such as pressure, flow rate, temperature, and the type of fluid being controlled.

Pros to using Pilot-Activated Solenoid Valve compared to direct-acting:

Lower cost for similar function. There is less copper, a valuable commodity

Light weight

Requires less current to operate

Cons to using Pilot-Activated Solenoid Valves:

More prone to clogging and failure due to smaller pilot valve

Requires a minimum flow to actuate

Slower to open and close

More internal components may be more difficult to maintain

Discover Industries offers a variety of solenoid valves including direct-acting and pilot-operated. We carry stainless steel and [CPVC](#) options. Discover Industries brand Discover Valve solenoid valves are made custom for your order. Select the body material and size, current available inventory will appear once you choose the coil voltage. Solenoid valves typically ship within 24hrs and a FAQ card is included with every order to help you get started. Still have questions, never hesitate to contact us, we are here to help. www.discovervalve.com or 719-434-1727.