

Finding the Right Pressure Switch

By: Michael F. Horn V.P. Whitman Controls Corp. As Published in Sensors Magazine in 2008

Selecting a pressure switch that is well suited for a particular application is a multi-faceted process. The trick is to know what questions to ask to optimize your application.

Pressure and vacuum switches have been around for at least 100 years and are considered well-established, end-sensor technology. It is, therefore, surprising how many potential users don't know the fundamental considerations of specifying one of these devices.

There are six major categories you need to explore to specify a pressure or vacuum switch. They are in relative order of importance:

- System pressure
- Set points
- Environmental conditions
- Electrical operating parameters
- Media port interface characteristics
- Special requirements

System Pressure

Maximum system pressure is probably the most important parameter you have to consider when choosing a pressure or vacuum switch. So the first step is to determine the application's maximum and normal system pressures. This is necessary even if you plan to use a vacuum switch.

Be aware of the big picture. Certain situations obscure the fact that you have high system pressures. Some applications normally run in vacuum, but still experience major positive pressures, such as a vacuum chamber that can have major pressure inrush spikes. Other applications have low gauge set points and major positive pressures. For example, you may have a switch downstream of a solenoid valve. In this situation, you have short-duration pressure spikes that may not show up on a pressure gauge. Still others have high set point requirements and high system pressures, such as a hydraulic system. In each of these examples, a different switch is called for. Choose a pressure switch that will survive and thrive in the maximum system pressure.

Set Points

You usually have a reasonable idea of your application's desired set point, but there are several important questions that accompany it. For example, is the set point on increasing pressure (or vacuum) or decreasing pressure (or vacuum)? Do you want the switch to open or close when it reaches its set point, or do you need a single-pole double-throw switch?

Other questions arise concerning set point adjustability (**Figure 1**). For example, do you require field adjustability? Usually this is desirable when you do not know the set point or wish to experiment. Field adjustability with a factory preset switch is suitable when you know your set point but want field adjustability. And a factory preset switch with a fixed set point is usually found in OEM applications where it is not appropriate for the end user to readjust the set point.



Figure 1. A group of calibration stands, which allow operators to install the set points into the pressure or vacuum switches

You should also take into account:

- Do you need a switch with a fixed differential between "on" and "off" or a calibrated switch? Using one switch to do both the "on" and "off" functions at two different set points can save money and circuitry.
- What is the anticipated frequency of operation? All devices have a maximum frequency of operation. Make sure the pressure or vacuum switch can meet or exceed this.

Environment Conditions



Figure 2. Whitman Controls' P119 pressure switch, with zinc die cast

The pressure or vacuum switch's environment consists of the media that it senses and the external environment in which the device functions. Pay attention to the media—the normal operating temperature, expected temperature extremes, and contaminants present. This information will aid in selecting the wetted material for the switch (**Figure 2**). Wetted materials are the materials of construction that your process media will actually be in contact with (e.g., air, water, acid, or hydraulic fluid).

body, which limits its compatibility with process media (e.g., compatible with air and oil; incompatible with acid)

Regarding the external environment, determine if it is an indoor or outdoor application. Will the switch be in a control panel box or exposed to the elements? Is a NEMA-class enclosure required? What are the expected environmental temperature extremes and the normal temperatures? Also, decide if shock and vibration will be factors in the application. Weighing all these factors will allow you to make a more enlightened choice.

Electrical Operating Parameters

The electricity you run through the pressure or vacuum switch varies with the application. Determine the amount of voltage supplied to the device. Is the voltage AC or DC? Is it inductive, resistive, or capacitive? Find out where the electricity passing through the switch's electrical interface is going and what it is doing. For example, if it is running a relay, the electricity will be inductive and have electrical inrush spikes that have to be taken into account when specifying the electrical rating. Also, it's important to quantify the amperage. Amperage is especially important because you typically choose gold contacts for light current and silver contacts for heavy current.

Additional questions to ask: What kind of electrical interface you want to use? Do you want wires, terminal blades, screw terminals, DIN connectors, military-style connectors, or another type?

Media Port Interface Characteristics

What size (e.g., 1/8 in.) and type (e.g., NPT or VCR) fittings do you prefer? Remember 1/8 in. and 1/4 in. NPT are industrywide default pipe threads. Some applications, however, require special media connections, such as 1/4 in. VCR for high-purity applications, or other specialty connections that almost always cost more money. Specials are usually worth considering.

Special Requirements

You may also have special option requirements. Value-added choices are good for both the buyer and the seller. Special requirements can range from your favorite brand of connector and Teflon tape on fittings to extra long wire. There are lots of options. Be sure to ask your provider if you want something special. If you don't ask, your vendor can't support you.

Finally, pressure and vacuum switches, like everything else in this life, cost money. Place a premium on competence and value.

Michael Horn is Vice President of Whitman Controls Corp and a two time past president of the CT Valley chapter of the ISA (International Society for Automation)