New output options with LS-Titan limit switches

LSE-AX switch body

Introduction

Historically, limit switches were electromechanical devices providing a simple "open" or "closed" output. With the introduction of LS-Titan™, Eaton introduces new output options for limit switches: analog and solid-state outputs.

Analog output limit switches (LSE-AX)

Traditional limit switches are either "open" or "closed," and as such, the user is provided with only two pieces of information. The LS-Titan limit switch family features a third output option: analog. Available in either 0–10 Vdc or 4–20 mA current loop signals, analog outputs are proportional to the position of the actuator within the limit switch body.

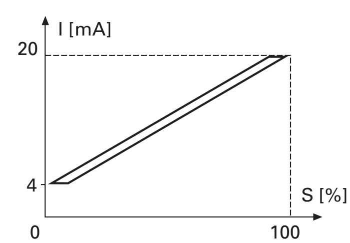

Figure 1. Analog Output

The graph above shows the analog output as it changes proportionally to the position of the switch actuator.

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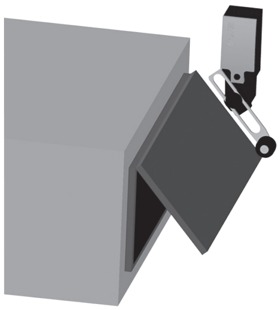
The widespread use of inexpensive programmable logic controllers with analog inputs makes it easy to obtain far more application information than ever before.

Now it is possible to answer a wide range of application questions:

- Just how close is the target, in real-time?
- How quickly is the target moving?
- Is the target in the acceptable position range?
- Should the machine speed up or slow down to compensate?



LS-XRLA

Analog switch application example

In a typical application, an operator may want to monitor the position of ventilation in a damper door. The damper door can either be controlled by a linear motor or a manual override. In automatic mode, the linear motor is equipped with a feedback signal that communicates the door position back to the system, but when in manual mode, the system still needs to know the door location.

The basic analog output switch body is equipped with a small plunger providing just a few millimeters of vertical travel. While it would be possible to use the switch body by itself, it would be even easier to apply the switch with the switch head model LS-XRLA, featuring an adjustable length roller lever. Now, instead of just a few millimeters of motion, the switch lever can be adjusted to over 75 millimeters long and can be rotated to over 60 degrees either clockwise or counterclockwise.

To install, position the switch relative to the door such that as the door moves through its travel, the lever makes the largest change in degrees possible up to the maximum of 60. The analog output of the switch is broken into 100 steps, so it is preferred to use as much of the switch's range as possible to provide the highest resolution. This will result in the smoothest output curve possible.

Solid-state output limit switches (LSE-02 and LSE-11)

The LS-Titan family also offers two switch bodies with solid-state outputs. Typically found in optical or inductive switches, solid-state provides a number of advantages over mechanical contacts—and some disadvantages as well. Understanding the differences between these device types is critical to correctly applying the switch.

Solid-state switches provide four key advantages over typical mechanical devices: adjustable trip points, lack of "contact bounce," the ability to switch very low currents, and better long-term reliability.

Traditional limit switches require the user to determine the trip point through a process of trial and error, or by providing some external mechanical adjustment. The solid-state switches in the LS-Titan family provide a "learn button" that allows the user to set the trip point. This makes installation and setup much quicker than the traditional method.

When mechanical switches are applied to certain applications—like a switch feeding into a high-speed counter—problems can arise due to "contact bounce," defined as an intermittent and usually undesirable opening of mechanical contacts during closure. This phenomenon could result in a single switch actuation being counted multiple times, resulting in inaccurate data to the counter. Solid-state devices do not have the contact bounce characteristic—these switches are either open or closed during a single event.

Solid-state devices are also able to switch very low currents. Mechanical switches can sometimes develop contact resistance that can inhibit the ability to switch low currents over time. Some manufacturers have designed gold-flashed or self-wiping mechanical contacts to reduce the chances of contact resistance building up over time.

Since solid-state switches don't feature a mechanical operation, they are also more reliable over long time periods. Contact wear, caused by arcing during the switching of inductive loads, is not a problem with a solid-state device.

Solid-state switches are not perfect for every application. Most are not rated for switching high currents, and are limited to DC-only operation. But, in the right application, solid-state switches can provide significant advantages over their mechanical counterparts.

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