

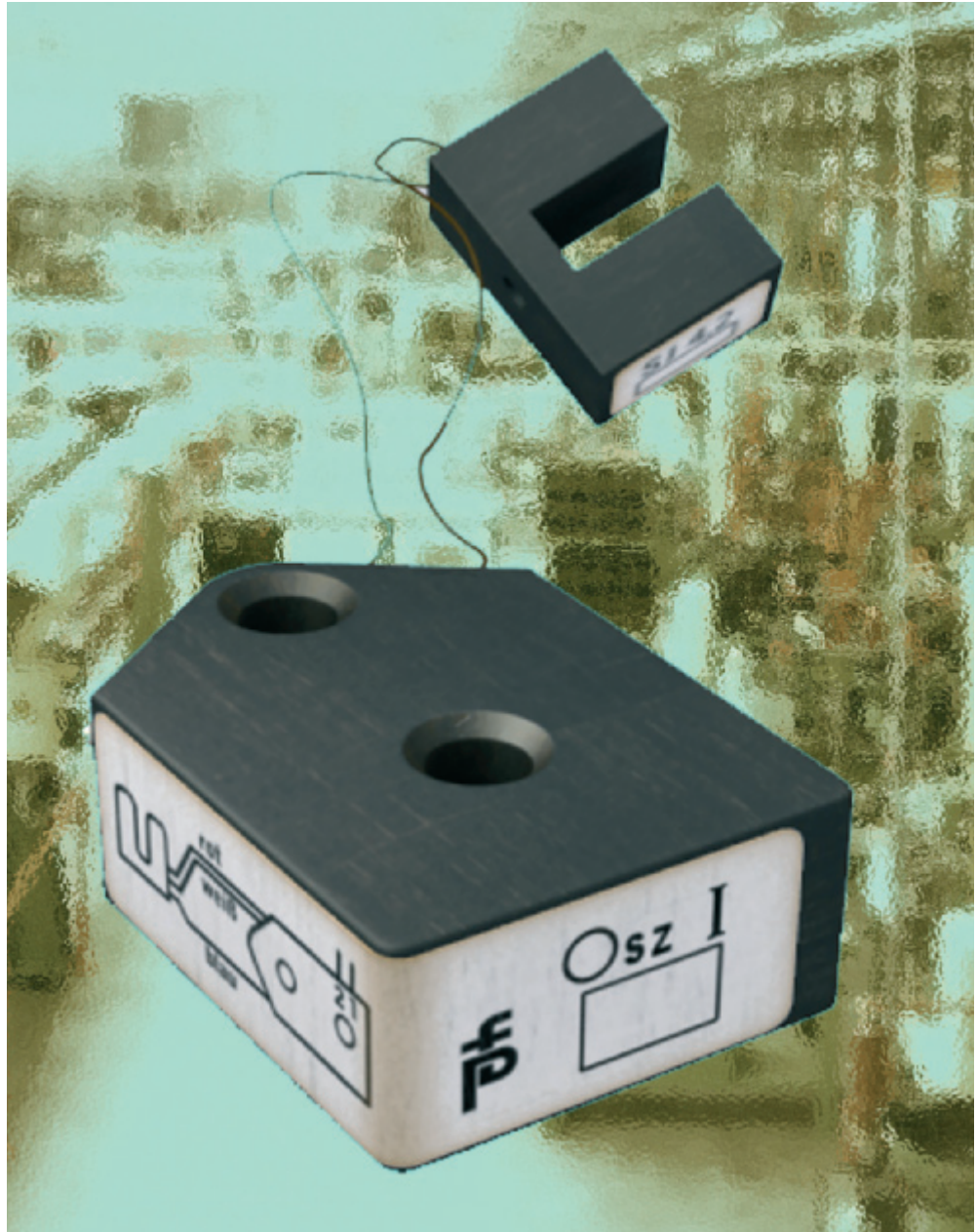
50 Years And Still Going Strong

The inductive proximity switch - an indispensable component in modern automation



In 1958 - exactly 50 years ago - the proximity switch was invented in a Mannheim laboratory owned by Pepperl+Fuchs. What was originally conceived as a customer-specific solution for an intrinsically safe current circuit in the chemical industry, has since become the universally recognized industry standard for non-contact switching. Thus the proximity switch is one of the oldest and most successful electronic components in automation, due to the fact that it has been continuously reinvented over the years to keep pace with ever-changing requirements.

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Fifty years ago, when Walter Pepperl and his colleague, Wilfried Gehl from BASF, were commissioned with the task of finding an alternative to mechanical contact, they had no idea that they would set a milestone in the development of automation technology. The challenge was to develop a ro-

bust component that would operate reliably after many thousands of switching cycles at very low switching currents, in the corrosive atmosphere of a chemical plant. As a trained radio engineer, you knew what happens when a metallic object approaches a coil system. With the bi-polar transistor, which William B. Shockley >



had invented 10 years earlier, the two engineers had at their disposal a new compact component with which the damping of an oscillating circuit could be easily evaluated and converted into a switching signal. The invention of the proximity switch is an early example of know-how from communications engineering advances automation technology.

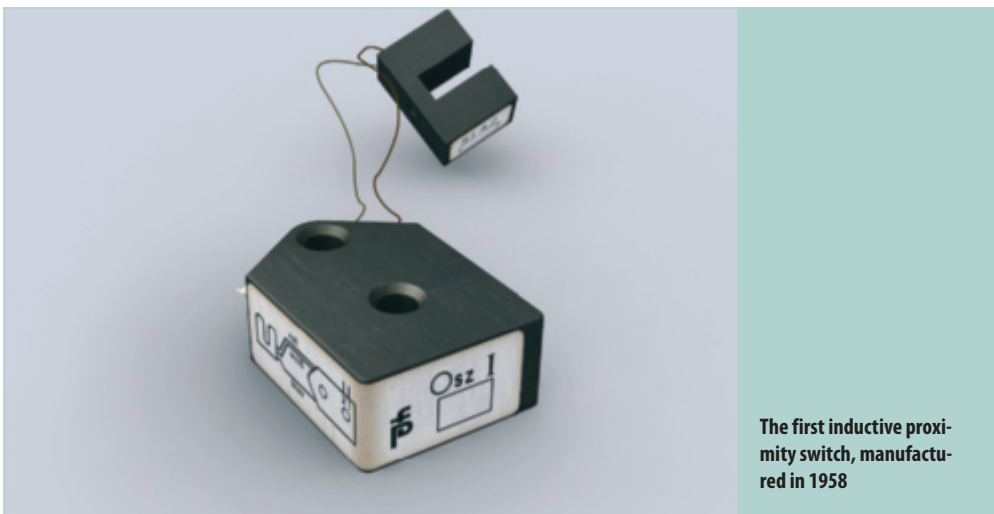
In the early years, the application of the inductive proximity switch remained confined to the chemicals industry. This is where problems with mechanical contact wear due to low currents, without the cleansing effect of contact erosion, were the most severe. However, in the early sixties, people also began to appreciate the practically unlimited service life of these switches in other automation applications. So it was no surprise when Pepperl+Fuchs introduced an inductive version of the roller lever limit switch (DIN 43 694 compliant) to the market in 1968. This device shared mounting compatibility with its mechanical counterpart and had the option of five different positions for the active sensor surface, so that any possible travel direction of the mechanical switch could be detected. Furthermore, in those days it was not yet possible to reproduce all the different voltage ranges elec-

tronically. Nevertheless, the 60 different versions of proximity switch required for this could not prevent its success on the market. The absence of wear was a major advantage for the reliability of automation systems.

Ten years later, the next-generation device was presented which simplified applications. The user could now change the active sensor surface himself and the amplifiers with different voltage ranges could be easily replaced by insertion. This proximity switch design continues to be one of the highest selling, but the development of this technology has resulted in much greater variety.

Versatility of the proximity switch

The most familiar proximity switch design is the cylindrical threaded bushing. Its design resembles a threaded stud and, consequently, can be easily mounted on any machine. The sturdy brass or stainless steel housing protects the electronics against all types of environmental influence and, of course, mechanical destruction. Moreover, there are hundreds of other designs available on the market today, taking account >





Analog position measurement: basic principle of the proximity switch and different designs

of the various installation requirements in machine manufacturing. This sensor is one of the few electronic components whose housing design must be adapted to the application rather than to the packaged electronics.

In the 1990s, the proximity switch electronics were also fundamentally further developed. Integrated circuitry was introduced, which extended functionality and improved EMC interference immunity. New oscillator concepts enabled switches with a reduction factor of 1 to have the same switching distances for different

metals. For applications with especially high durability requirements, proximity switches are available with active sensor surfaces made of stainless steel. Extremely sensitive evaluation is required for such applications, as the pre-damping of the oscillator through the end surface of the housing is quite significant.

Micro-controllers have now also become established in proximity switches. These enable even higher switching distances to be achieved together and provide for simplified adjustment of components in production, in addition to improved functionality. As this sensor is required in very large quantities, it is subject to constant price pressure.

These facts show that the development of the proximity switch has never stopped over the last fifty years. Driven on by new requests and requirements from machine manufacturing and plant engineering, the proximity switch has been continuously reinvented and this trend is set to continue into the future.

Future of the proximity switch

There are several reasons for the market success of the proximity switch. On the one hand, the coil as sensor element is cost-effective to produce and evaluate. On the other hand, these switches are extremely sturdy, easy to use in applications and reliable. Soiling or other environmental influences hardly effect its function. These properties distinguish the proximity switch from other types of sensor. The quantities sold have increased dramatically in recent years, with no sign of a downturn currently in sight.

And today, there are interesting applications in automation technology that exploit the basic principle of the proximity switch and provide the same benefits to the user. Analog position measurement is a good example of such an application.

For this purpose, multiple coils are assembled in a row to precisely measure the horizontal displacement of a metal target within a range of a tenth of a millimeter. A micro-controller evaluates the damping of the different coils by the target and thereby calculates the exact position. The measurement result is independent of the precision of the vertical guidance of the target. This example nicely demonstrates how a fifty-year-old principle can be transformed into a reliable and easy-to-use displacement measurement system with the aid of modern electronic technology.

Outlook

Sensors as the “sensory organs of machines” are indispensable in the field of automation. In principle, it is merely a matter of transforming physical events into electrical ones. The coil as a sensor element for the proximity switch has established itself as an almost perfect device for position recognition. As long as machines are constructed primarily from metallic materials, the further success of the proximity switch is assured. ■

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