

Technical Report

Long-term seal thanks to *proTect+*.

Baumer sensors have an added element of robustness

Sensors should never fail, not even in rough conditions. This is guaranteed by robust sensor designs whose seal integrity is tested according to IP standards. But where particularly high long-term seal integrity is required, Baumer offers even more robust sensors, which are tested by Baumer in accordance with the more stringent *proTect+* test procedure. *proTect+* sensors are made of robust materials and feature an intelligent sealing concept, and undergo an accelerated aging process before the additional testing begins.

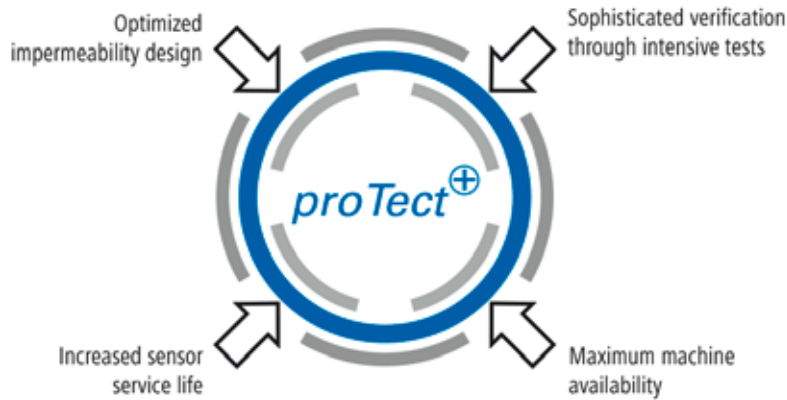


Sealing over the entire life cycle with Baumer sensors tested according to *proTect+*.

IP67, IP68, IP69K – anyone who builds machinery and plants that are exposed to dirt, rain, spray water, high-pressure cleaning, cleaning agents and chemicals is familiar with these abbreviations. They indicate the type of protection and whether electrical equipment is suitable for use in dusty and wet environments. If, for example, a sensor is specified for an IP class, the user can rightfully assume that the sensor has the properties they require. This is indeed true for numerous applications. However, the standards do not provide much information as to whether a sensor is still going to be tight after numerous years. After all, tests are only performed on brand new products. Materials, on the other hand, are exposed to aging and strong cyclical loads. Polymers and seals, especially, expand – when being hosed down with hot steam, for example – and then contract again. Which means that the IP tests do not provide enough information with regard to long-term seal integrity in rough conditions.

Seal integrity throughout the entire life cycle

Since some applications are particularly critical and require verification of long-term seal integrity, Baumer decided to develop a more stringent test procedure and to ensure enhanced long-term seal integrity during the development of the sensors, as well. The result is *proTect+*. The name describes sensors with enhanced robustness that are designed to remain dependably tight even after many years of the toughest use so users do not have to worry that they might fail unexpectedly. To ensure this property, Baumer has developed a test strategy with *proTect+* to pre-age test specimens using predefined criteria before subjecting them to IP testing. Sensors with *proTect+* are available as photoelectric sensors/buttons, inductive proximity sensors, optical distance sensors, radar sensors and expansion sensors – *proTect+* variants for other product groups are at the planning stage.



Baumer sensors were developed to guarantee outstanding impermeability over their entire service life.

Temperature curve resembles a rollercoaster ride

The *proTect+* test procedure is very thorough. Sensors are picked from the production line, subjected to visual inspection, weighed and tested for functional reliability, isolation voltage and tightness. Then, half of the sensors are subjected to temperature cycle testing in air. The temperature alternates for 60 minutes at a time from steady minimum to steady maximum aging temperature (e.g., -40°C and $+85^{\circ}\text{C}$) in 50 cycles. The other half of the sensors are exposed to temperature shock testing in water. The temperature is alternately cooled to $+5^{\circ}\text{C}$ (10 min) and raised to maximum aging temperature, e.g., $+85^{\circ}\text{C}$ (20 min), again in 50 cycles, in which the temperature changes at shock speeds of less than 10 seconds. The sensors from both tests are then subjected to IP 68 and IP 69K testing, respectively. The IP 68 test involves immersing the sensors in water to a depth of one meter for seven days. With IP 69K, the sensors are exposed to a high-pressure water jet of 80 to 100 bar from various directions.

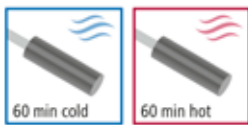
Careful selection of materials

Sensors with *proTect+* were designed from scratch with particular focus on permanent seal integrity. This procedure included the selection of suitable materials – primarily V2A/V4A stainless steel for the housing, together with chemically nickel-plated quenched and tempered steel, and NBR rubber, liquid silicone rubber, polyamide and other materials for the seals. These sensors are frequently used in hygienic applications. Their design ensures that fluids drain easily off chamfered edges, while the smooth surface without indentations prevents the accumulation of dirt and bacteria. Cable outlets or windows for lasers or LED signaling displays are critical points. In response, Baumer engineers have developed the seals to satisfy the most stringent requirements.

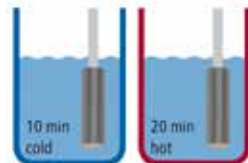
Withstand the toughest conditions

One example is the DST55R *proTect+* variant of an expansion sensor for tough outdoor applications. It is

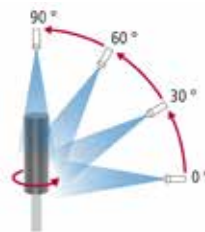
proTect+ test series



Air temperature cycle test
Temperature shock in air over the entire temperature range from -40°C to at least $+85^{\circ}\text{C}$ with 50 temperature cycles.



Water temperature cycle test
Temperature shock test in water from 5°C to at least $+85^{\circ}\text{C}$ with temperature cycles. Temperature change within seconds.



IP 69K test
Water jet-protected and resistant to high pressure cleaning according to the DIN EN 40050 standard.



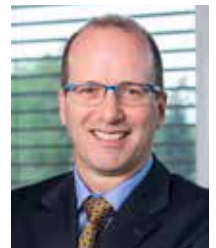
IP 68 immersion test
The sensors are placed under water at a depth of one meter for 168 hours.

In order to guarantee absolute impermeability, the sensors are submitted to extensive stress tests. They first pass through an accelerated aging process before the sensors are subjected to further leakage tests, according to IP guidelines. The test procedures are carried out on several sensors.

found in truck-mounted pumps. The sensor measures the movement of the arm, which is about 65 meters long, and the controller uses the information to implement counter-movements that dampen the vibrations of the arm. Once work is over, a steam jet cleaner is used to remove the dirt and concrete residue, over and over. Another example are *SmartReflect* sensors in the hygienic or washdown versions made of robust stainless steel housing with *proTect+*. Thanks to the barrier principle, the light barriers without reflector offer increased functional reliability even with objects that are difficult to detect, such as transparent ampoules while simultaneously reducing operating costs by dispensing with a reflector. Thanks to these properties, they are ideal for use in the pharmaceutical and food industries with their demanding environmental conditions and aggressive cleaning processes.

proTect+ is just another way that Baumer strives to go Beyond the Standard – to always strive for greater benefits than market standard. Sensors with *proTect+* increase machine availability even under the most demanding conditions thanks to long-term seal tightness and not just in theory, but proven in realistic tests. With *proTect+* sensors, users have one less thing to worry about.

Further information:
www.baumer.com/protect+



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