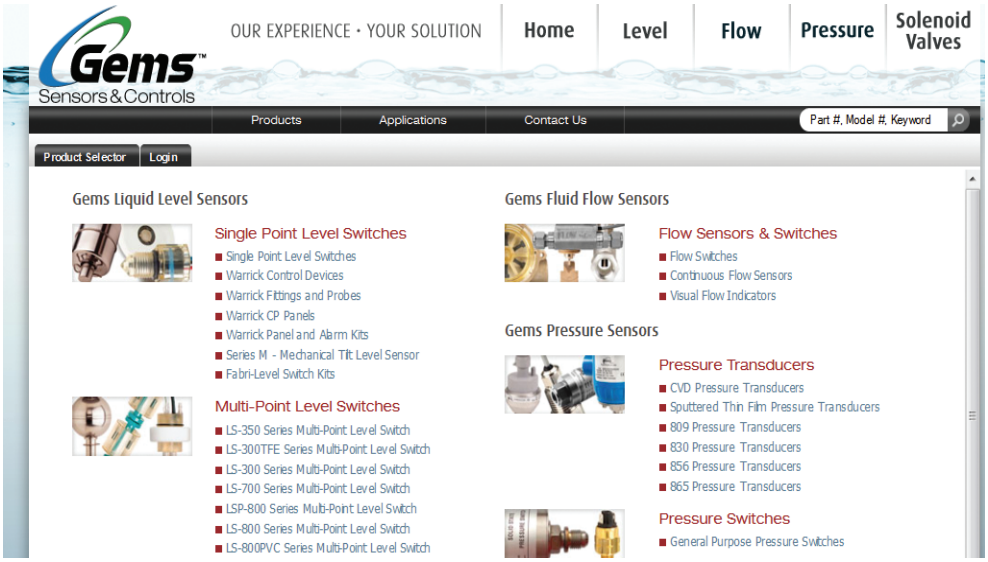
Standard Catalog Product as a Starting Point

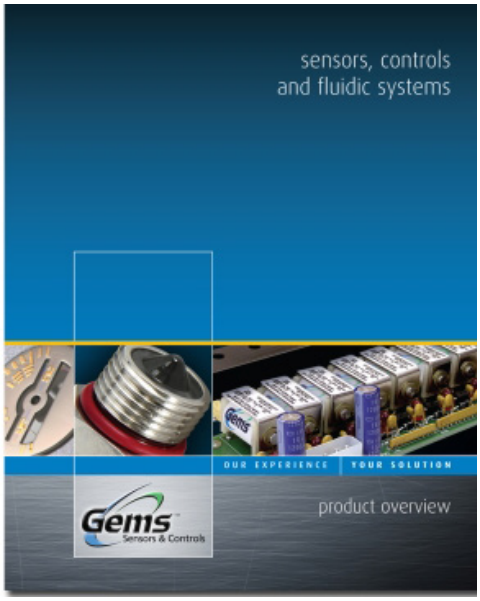
Since 1955, Gems Sensors & Controls has built a solid reputation as a global industry innovator. They design and manufacture a wide range of sensors for the detection and measurement of liquid level, pressure, and flow, as well as solenoid valves for fluid control. While Gems is always willing to engineer a custom solution for qualified OEM customers, their standard product catalog is a universal starting point.

The online fully digital catalog contains hundreds of standard models, reference specifications and unit pricing. Content is ever-evolving in response to the ongoing codification and addition of new products. This type of rapid growth is directly attributable to a company passion for engineering innovation. Never complacent, Gems treats each new inquiry as a viable opportunity to push standard product performance limits.



Ensuring a “best-fit”

Gems appreciates that customers might already have a preferred solution in mind. As such, an initial Gems consultation focuses on performance requirements and overall application goals. Collected data might include dimensions, weight, output type, target price, projected volumes, and necessary certifications. The data allow Gems engineers to generate their own preliminary recommendations, taking customer preferences heavily into account. The company then goes one step further, introducing suitable technology options and any associated design and cost tradeoffs. If a Gems standard sensor is selected, it can quickly proceed to manufacturing and shipment of test samples at OEM volumes. If an off-the-shelf product does not exist, Gems can discuss available customization options.



Applying innovation “off-the-shelf”

Most standard catalog products can be effectively modified “off the shelf” to meet a variety of stringent parameters. They can also be easily fitted with alternate connectors, ports, and housings. For integrated fluidic control systems, Gems can design and manufacture custom manifolds at OEM volumes. The company also supports customer requests for sensor redesigns that address industry-specific regulatory compliance standards.

Solving universal measurement challenges

Many popular Gems standard catalog products began as custom sensing solutions, developed to address a universal measurement challenge. Consider the example of the Gems LS-7. It was originally a custom fluid level switch, developed at the request of a major off-highway vehicle OEM. Requirements called for a low-profile, rugged device that could reliably measure hydraulic fluids within construction equipment tank reservoirs. The switch

needed to offer effective early warning of possible tank leakages and fluid level drops. An ideal sensor needed to be side mounted and fluid media compatible. It required high shock and vibration resistance. It would also need to withstand harsh outdoor environments and installation conditions. Customer goals were improved equipment uptime, reduced maintenance costs, and improved vehicle safety. In response, Gems produced a low-cost, single-point fluid level reed switch with a die-cast zinc body, with choice of either nylon or polypropylene float, now known as the LS-7.

The Gems LS-7 has since evolved into 22 unique standard versions with various mounting configurations, housings, and float materials. Specific models also exist to address temperature extremes, high shock and vibration exposures, and corrosive media compatibility. Certain versions of the LS-7 also meet National Science Foundation (NSF) approvals for potable water compatibility. The offering of specialty fluid level switches as standard catalog product allows Gems to provide budget-conscious OEMs, end users and smaller shops with a custom engineered solution at a lower price point. The Gems LS-7 serves as a truly great example of how a now-widely used standard catalog product, originating from a custom sensor design, may be successfully introduced to solve universal measurement challenges.

Solving universal measurement challenges

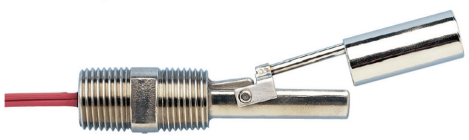
In another example, a commercial bus manufacturer was using capacitive sensors to monitor hydraulic oil levels. They were not achieving desired measurement accuracy. The manufacturer contacted Gems for a comparably priced alternative. Application goals were to maintain reliable vehicle operation and avoid costly, unplanned repairs.

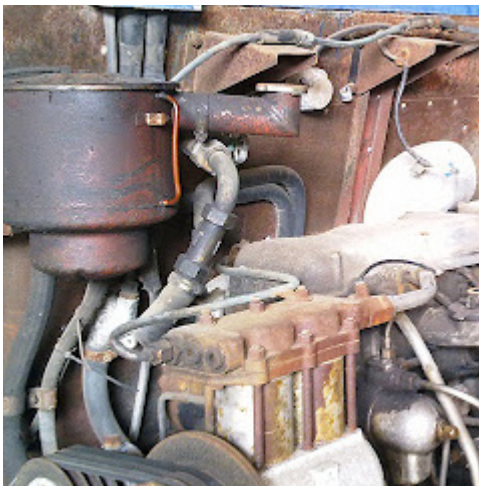
Central to the design of a typical capacitive fluid level sensor is a specialty probe. The probe is used to sense the dielectric differences between the media and air. The sensor housing and probe form the two plates of the capacitor. As liquid capacitance properties change over time, so does their dielectric constant. Capacitive sensors also incorporate internal electronics that can tune a probe to a very specific frequency. If the measured fluid media dielectric constant changes, sensor performance can fall below its specified accuracy range.

This change in dielectric constant can occur from something as simple as switching to a new brand of coolant. The accumulation of fluid coating on the probe itself is a separate complication. This accumulation can also block the sensor signal. Because of these factors, Gems recommends capacitive level sensing only within applications where the media has a sufficiently and consistently high dielectric constant.

Electro-optic level switches for non-coating fluids

Gems determined that, due to the very low dielectric constant of hydraulic oil, the use of capacitive-based sensors was simply not feasible. Instead, the company recommended the installation of an electro-optic level switch through the tank walls. Gems electro-optic switches provide accurate single-point level and leak detection with non-coating fluid media. Their unique design consists of a glass prism, IR emitter, receiver and onboard electronics. These features allow them to reliably detect the differences between the refractive air index and refractive fluid index. Gems electro-optic switches also tend to be more compact and lower cost.



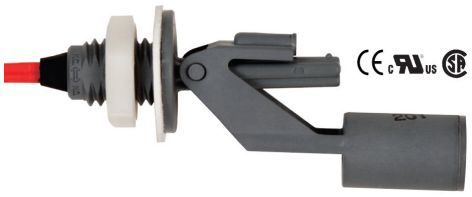


So long as the fluid media does not leave a persistent coating over the prism, electro-optic switch accuracy is unaffected. It is also unaffected by media dielectric constant changes. This allows it to be specified for a wider variety of liquid level sensing applications, regardless of whether the media might be opaque or clear, or whether dielectric or other properties might change over time.

Gems determined that a standard electro-optic switch was a good fit for all customer requirements, with the exception of its larger footprint. This meant that it could not be used as a drop-in replacement for the legacy capacitive unit. Remaining confident in its recommendation, Gems produced a number of smaller-footprint standard electro-optic switches. This solution proved so effective, the customer ordered the new switches at OEM volumes within 30 days. By simply reducing a standard product footprint, Gems was able to offer the customer a better-performing switch at a similar price.

Improving transmission fluid transfer

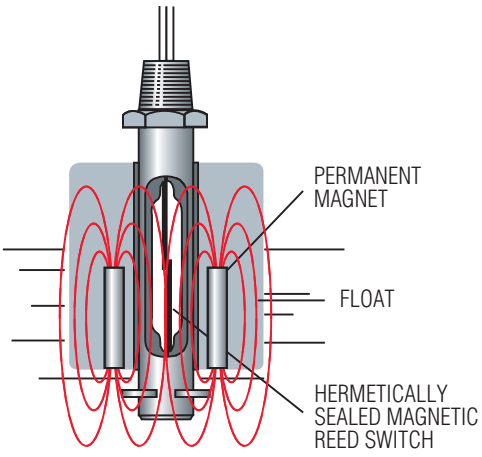
At times, Gems may be asked to revisit a “best fit” solution as customer applications evolve. In one example, a major automotive service center franchise was using Gems inline unidirectional flow sensors. As part of its automotive service, shop mechanics were using two separate-yet-identical hydraulic lines to flush out old transmission fluid. The mechanics would flush out the old fluid, then replace it with fresh new fluid. The zero reading of the flow sensor would confirm to the mechanic that legacy fluid was fully flushed. The second hydraulic line would introduce the new fluids via the same process.



The two hydraulic lines incorporating the Gems flow sensors were performing well. Over time, however, shop mechanics came to realize that not all automobiles had the same inlet and outlet transmission port orientations. Because of this, mechanics would hook-up the system in the same manner each time, only realizing error when there was no flow. They would then need to shutdown the machine, switch hoses, and restart, losing valuable time. Gems re-engineered this process to incorporate a bidirectional flow sensor that was identical in footprint to the unidirectional model, along with a few solenoid valves. As a result, the machine now allows mechanics to perform their tasks in a consistent manner, regardless of inlet and outlet port orientation. And, without the prior risks of human error.

Troubleshooting an FDA approved design

In another example, a medical systems OEM integrated two standard Gems RotorFlow sensors into a new prototype design. Central to system performance cross-checks was the incorporation of redundant, identical flow sensors. Flow rates through both sensors were verified pre-installation. The customer mounted these two sensors in a linear fashion, placing one behind the other. After installing, the customer found that the second sensor was now reading at a higher flow rate. The new system prototype had already been through a lengthy and costly FDA approval process. As such, its design could not drastically change. Customer goals were to ensure that the two flow sensors could provide accurate and identical outputs, within a certain percentage, over a given flow rate of 0.5 to 2.5 GPM. They also needed to ensure that the design still maintained FDA compliance.



Reducing turbulent flow effects via PC board output mapping

Gems engineers recognized turbulent flow effects as the root cause of these sensor readout discrepancies. To resolve, the company integrated a custom PC board into the already specified sensors. A unique flow sensor body was also added. This combination allowed the customer to correctly map the second sensor output to the first for necessary system cross-checks. Gems also calibrated both of the sensors simultaneously, resulting in a reliable subassembly that met interchangeability requirements over the required flow rate. PC board output mapping is now a technical capability available to all Gems customers.

Understanding the rewards

Gems understands that, by pushing the performance limits of its standard product catalog, there are many tangible rewards. Some come in the form of thousands of tangible, field-proven customer successes. Others, in the form of a growing and evolving standard portfolio, all derived from true problem-solving innovation. Most notably, Gems is rewarded with a rare capability to translate some of the world's toughest sensing challenges into tomorrow's most reliable standard products. Central to all of these accomplishments, however, remains the Gems online digital standard product catalog. More than just a starting point, it serves as a comprehensive reference library of product design improvements, a clear illustration of engineering ingenuity, and a better understanding of the possibilities.

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