Which sensors are most common in industrial automation?

Sensors are an essential component in any modern factory, with the industrial sensors market worth [$16 billion per year](#). Sensors provide the real-time information that enables control systems to make decisions and operate equipment without human intervention – whether that's as simple as a thermostat-controlled heater, or a complex factory system.

Over recent years, the trends towards the Internet of Things (IoT) and Factory 4.0 have increased the demand for accurate, affordable and low-power sensors that can provide the constant stream of data required. Low-power wireless protocols like Zigbee and Bluetooth enable sensors to be connected without expensive cabling, and computerized applications such as predictive maintenance are adding new levels of sophistication to industrial operations.

Types of sensors

While there are many different types of sensors, we can usefully split the market into six product segments: pressure, temperature, proximity, flow, image and level. There are of course many others that find useful applications. All of these sensors take some kind of real-word quantity, and convert it into an analogue or digital electrical signal.

Of these, pressure sensors are the largest sector, with [21 percent market share in 2017](#). They typically use the piezo electric effect to measure pressure, and are used in many diverse applications, including drilling for oil, and industrial boilers.

Temperature sensors are also widely used, and are essential for many processes include production of pharmaceuticals and food. There are many different types, which range from simple contact sensors such as the bi-metallic strip, to highly integrated semiconductors. The most common is the thermocouple, which sense the temperature difference between two junctions of different metals, and generate a voltage accordingly. Other common types, such as the thermistor, have an electrical resistance that varies with temperature.

Proximity sensors are used to measure the distance to an object, typically by sending out a beam of infrared radiation, or an electromagnetic field, and looking at the returned signal. By measuring how distance varies, these sensors are also useful for vibration monitoring.

Flow sensors can be used with liquids or gases, and there are many different types, including ultrasonic, Coriolis and electromagnetic. Another option is to use the thermal flow measuring principle, which calculates flow based on how much heat is removed from a sensor by a fluid moving past it.

Image sensors can include detectors for visible light, and those in the infrared range. They may just be used to identify simple levels of light, or can be sophisticated, high resolution cameras. Combined with image recognition programs, and artificial intelligence (AI), camera-based systems can provide sophisticated capabilities, such as recognizing any defective products on a production line and taking appropriate action.

To detect the level of liquids, as well as solids that are free-flowing such as powders, there are multiple different types of level sensors. Common types include capacitance sensors, and optical sensors that can detect how much light from an LED has penetrated a liquid. Another option is ultrasonic sensors, that measure the time for a high frequency pulse to be reflected back from a liquid.

Beyond these types, sensors for force, gas, smoke, humidity and many other quantities are finding increasing applications. This is partly driven by continued

innovation by vendors, who are providing smaller, cheaper and lower-power sensors, often combining multiple capabilities into one device -known as 'sensor fusion'.

Requirements for industrial sensors

For industrial applications, the key requirement for sensors is that they are sufficiently rugged to provide the lifetime and reliability needed – many sensors are installed in hard-to-reach locations, where repair or replacement would be costly and difficult. Beyond that, they must meet a customer's demands, including in terms of accuracy, price, power consumption.

For example, Bulgin's slimline [photoelectric sensor range](#) provides a cost-effective and flexible solution, with high levels of mechanical and electrical stability. A simple and secure design enables a watertight and dustproof seal to any standard M5 interface. The sensors are made with a robust stainless steel 316 case, sealed to IP67, making them well-suited to manufacturing automation and industrial automation sensing operations.

For more information, visit https://www.bulgin.com/en/products/range/sensors.html