



## Overview

### What Are Proximity Sensors?

"Proximity Sensor" includes all sensors that perform non-contact detection in comparison to sensors, such as limit switches, that detect objects by physically contacting them. Proximity Sensors convert information on the movement or presence of an object into an electrical signal. There are three types of detection systems that do this conversion: systems that use the eddy currents that are generated in metallic sensing objects by electromagnetic induction, systems that detect changes in electrical capacity when approaching the sensing object, and systems that use magnets and reed switches.

The Japanese Industrial Standards (JIS) define proximity sensors in JIS C 8201-5-2 (Low-voltage switch gear and control gear, Part 5: Control circuit devices and switching elements, Section 2: Proximity sensors), which conforms to the IEC 60947-5-2 definition of non-contact position detection switches.

JIS gives the generic name "proximity sensor" to all sensors that provide non-contact detection of target objects that are close by or within the general vicinity of the sensor, and classifies them as inductive, capacitive, ultrasonic, photoelectric, magnetic, etc.

This Technical Guide defines all inductive sensors that are used for detecting metallic objects, capacitive sensors that are used for detecting metallic or non-metallic objects, and sensors that utilize magnetic DC fields as Proximity Sensors.

## Features

**(1) Proximity Sensors detect an object without touching it, and they therefore do not cause abrasion or damage to the object.**

Devices such as limit switches detect an object by contacting it, but Proximity Sensors are able to detect the presence of the object electrically, without having to touch it.

**(2) No contacts are used for output, so the Sensor has a longer service life (excluding sensors that use magnets).**

Proximity Sensors use semiconductor outputs, so there are no contacts to affect the service life.

**(3) Unlike optical detection methods, Proximity Sensors are suitable for use in locations where water or oil is used.**

Detection takes place with almost no effect from dirt, oil, or water on the object being detected. Models with fluororesin cases are also available for excellent chemical resistance.

**(4) Proximity Sensors provide high-speed response, compared with switches that require physical contact.**

For information on high-speed response, refer to *Explanation of Terms* on page 3.

**(5) Proximity Sensors can be used in a wide temperature range.**

Proximity Sensors can be used in temperatures ranging from -40 to 200°C.

**(6) Proximity Sensors are not affected by colors.**

Proximity Sensors detect the physical changes of an object, so they are almost completely unaffected by the object's surface color.

**(7) Unlike switches, which rely on physical contact, Proximity Sensors are affected by ambient temperatures, surrounding objects, and other Sensors.**

Both Inductive and Capacitive Proximity Sensors are affected by interaction with other Sensors. Because of this, care must be taken when installing them to prevent *mutual interference* (refer to page 8). Care must also be taken to prevent the effects of surrounding metallic objects on Inductive Proximity Sensors, and to prevent the effects of all surrounding objects on Capacitive Proximity Sensors.

**(8) There are Two-wire Sensors.**

The power line and signal line are combined. This reduces wiring work to 2/3 of that require for Three-wire Sensors. If only the power line is wired, internal elements may be damaged. Always insert a load (refer to page n1p 6).