Panasonic

MA motion sensor

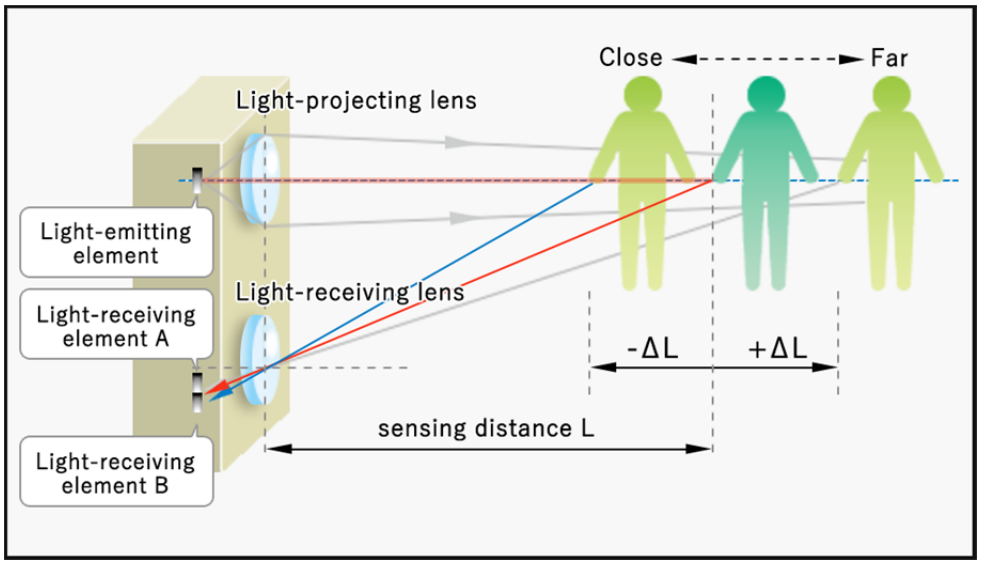
# Impact on detection performance caused by environment

First, there are two types of motion sensors.
One is “Pyroelectric infrared sensor.” It is also called heat ray sensor which is designed to detect objects in a wide area by receiving the change of the heat.
The other one is “MA Motion Sensor.” MA Motion Sensor is designed to emit infrared light to detect reflected light.

## 1. Operation of MA Motion Sensor

The Fig.1 explains how MA Motion Sensor operates.
MA Motion Sensor emits infrared light from its light-emitting element (this light is called pulse emission). Infrared light emitted from the light-emitting element is condensed via a light-projecting lens and reflected after hitting an object (including a person). In the fig.1, it is indicated with the red line.
Light reflected from an object is condensed via a light-receiving lens and focused on two separate light-receiving elements. Comparing receiving light quantities on two separate light-receiving elements, when receiving light quantity on the light-receiving element B becomes larger than light-receiving element A(light-receiving element B> light-receiving element A in the fig.1.), output transistor is turned on to detect objects.

**Fig.1 Operating principle of MA Motion Sensor**

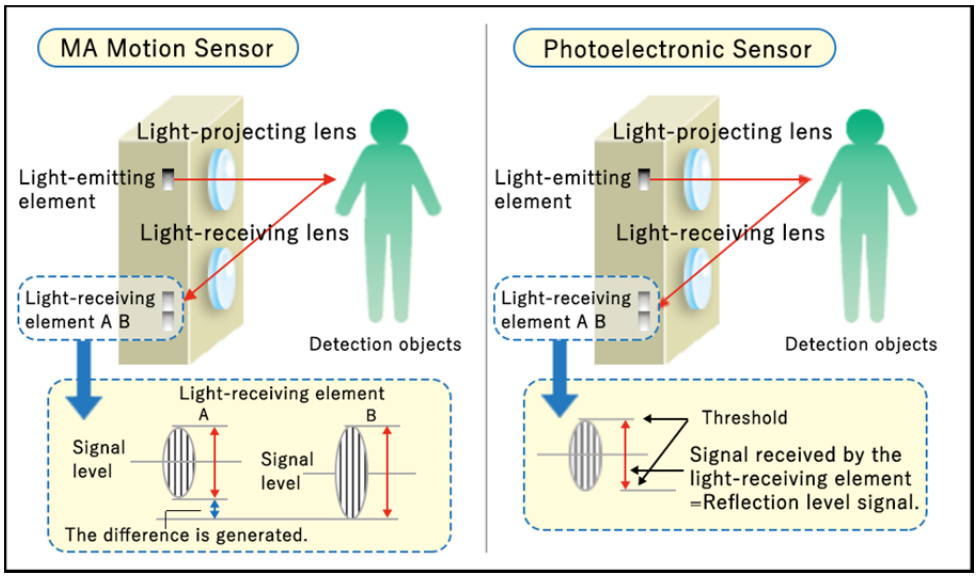



In following sections, impacts on MA Motion Sensor by reflectance of object and disturbed light are described in order.

## 2. Impact on MA Motion Sensor by reflectance of object

MA Motion Sensor is hardly affected by reflectance and performs reliable detection. The Fig.2 shows structural differences from the “light quantity sensor” which has been used frequently.

**Fig.2 Difference between the MA Motion Sensor and the Photoelectronic Sensor**




A light quantity sensor has the disadvantage that it is easily affected by materials and outfits of detection objects as it detects the quantity of reflected light. It means that the object with low reflectance cannot be detected unless it comes in close proximity to the sensor.

On the other hand, MA Motion Sensor which is a distance sensor that measures distance to the object, is less affected by the reflecting object as it detects the variance of signal level between the two elements. This is because the difference in receiving light quantities between two light-receiving elements, A and B is always generated even if overall reflection level is small.

As described above, detection distance of MA Motion Sensor is hardly changed by material difference and color difference of detection objects and can reliably detect detection objects with reflectance from 90 to 18%. But, objects that reflect light only in a certain direction, such as mirror and metallic surface cannot be detected even though it seems that the reflectance is seemingly high, because the light emitted from the sensor does not come back to the sensor.

For MA Motion Sensor detectable and undetectable items, see Table 1.

**Table 1 Inrush current due to the difference of the load**

| | |
|---|---|
| Detectable items | ■Objects with high reflectance :<br>White cloth, white shirt<br>■Mid-tone objects :<br>Colored objects<br>■Objects with low reflectance :<br>Black clothing, fluffy objects such as black fur coat, shiny objects with black glitter, etc |
| Undetectable items | Mirror, objects with metallic painted surface<br>Objects with reflective surface<br>(black car body, metal plate, etc.) |

The next section continues to explain about impact of disturbed light by comparing with a light quantity sensor. As a light quantity sensor detects the quantity of light exceeding the setting threshold (a constant value of detection), there is a possibility that the sensor cannot distinguish between external light and light emitted from the light-emitting element and may detect incorrectly.

MA Motion Sensor performs reliable detection regardless of external lights such as sunlight, etc. by applying a certain difference generated between signal levels two light-receiving elements receive. For using the difference of receiving light quantities, the sensor is designed to avoid being affected by reflecting objects as it is not necessary to distinguish disturbed light. In case of disturbed light only, no difference will be generated between light-receiving elements, therefore the possibility of malfunction will be minimized.

Is the explanation satisfactory?

It can be said that a sensor is an element which plays very important roles in security. Refer to this explanation for selecting sensors when designing.