

Technical Note

Tips for Effective Use of Checkweigher: The Photocell Error

A motion detection sensor for automatic doors that triggers the opening/closing of doors by detecting the movement of a human. A light sensor for automatic faucets that allows you to start the flow of water by just placing your hand under the spout without touching the faucet. Sensors like these for detecting motions or objects have become an essential part of our daily lives.

Our inspection systems are also equipped with a sensor that detects a product to be inspected when it is conveyed. Anritsu customer support center receives phone calls every day from our customers regarding the error on a sensor. These errors can be prevented by proper cleaning and regular inspection. Even if the error occurs, it can be recovered by a user. This paper explains typical causes of the error and countermeasures by taking examples of the widely-used sensor method regardless of the manufacturer.

1. Mechanism and position of the object detection sensor

The method of object detection sensor

There are various methods used in object detection sensors. For instance, a phototransmitter and a photodetector are placed independently to detect the product when it interrupts light from both a phototransmitter and a photodetector, which is called "transmission method". Another method is called "regression reflection method" in which a photocell irradiates light directly to the product and receives reflect light to detect the product. For Anritsu checkweighers, a photoelectric sensor of "the regression reflection method" is employed. In this method, a photocell integrating with a transmitter and a receiving part irradiates light to a reflection plate. It detects the product when the product interrupts light returning from the reflection plate. The advantages of this method are that it does not take much installation space since a reflection plate is on the one side which only requires wiring space for a photocell; and offers easy optical-axis alignment.

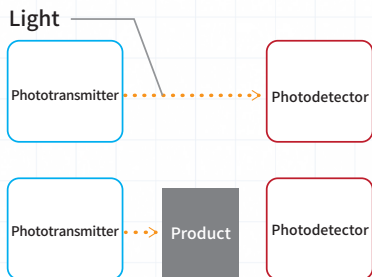


Fig.1: Transmission method

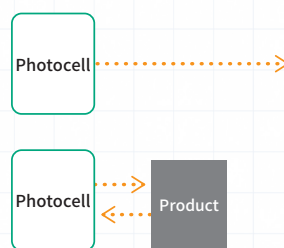


Fig.2: Diffuse reflection method

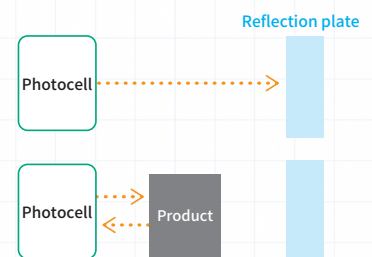


Fig.3: Regression reflection method

Please take a look at the lamp on the photocell. Green and red lights are turned on before the product passes through between the photocell and a reflection plate (Fig.4). But when the product blocks the optical axis between the photocell and the reflection plate, a red light is turned off and only a green light is turned on (Fig.5).

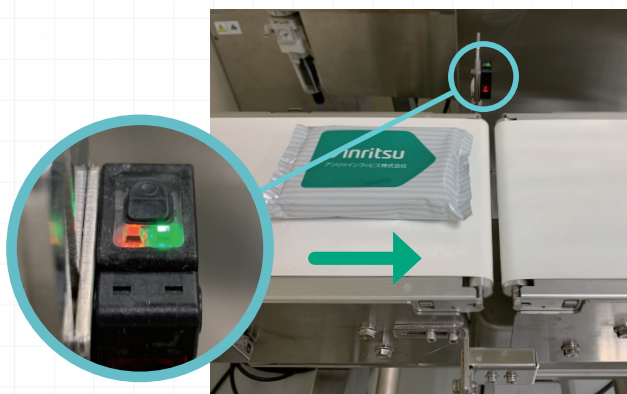


Fig.4: Green and red lights are on

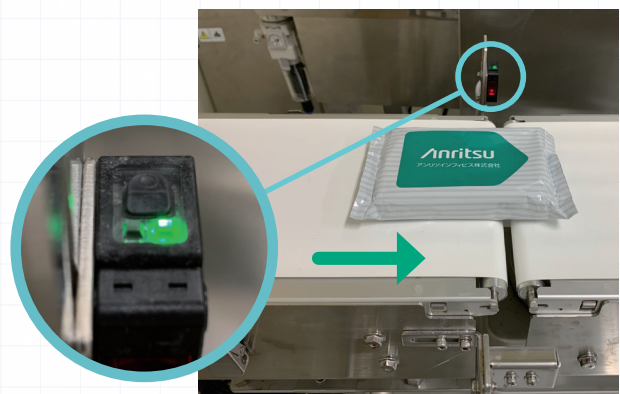


Fig.5: Red light is off and only green light is on

The position of the object detection sensor

Do you know where the photocell and the reflection plate are installed in our checkweigher? As for regular checkweighers, they are located between the infeed conveyor and the weighcell conveyor. For the combination checkweigher and metal detector, they are placed between the infeed conveyor and the weighcell conveyor, and at the entrance of the detector head of a metal detector.



Fig.6: The position of the sensor for single unit model



Fig.7: The position of the sensor for the combination checkweigher and metal detector model

2. The reason for detecting the arrival of the product

When a checkweigher detects the arrival of the product from a photocell and a reflection plate, it performs the following operation after the scheduled time starting from the detection of the product.

1. Start of weight measurement

Load on a weighcell is converted to an electrical signal and then output for measurement.

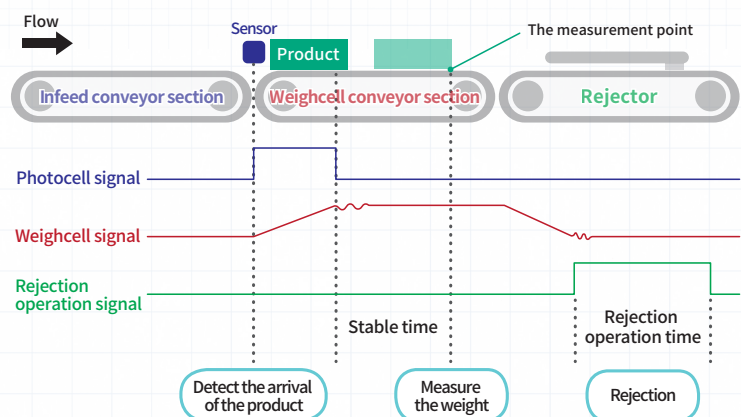


Fig.8: Measurement timing

2. Start of the inspection of the metal detector head

As for the combination checkweigher and metal detector model, two sets of photocell and reflection plate are installed.

When the first optical axis is blocked, the inspection by the metal detector head is started. When the second optical axis is blocked, the operation described in the above section 1 is performed.

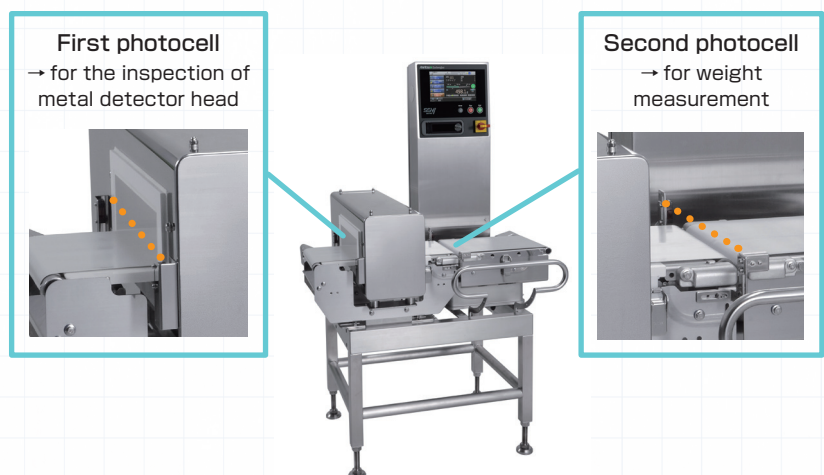


Fig.9: Photocell of metal detector head

3. The causes behind the occurrence of photocell error and countermeasures

Dirt on a sensor part

The error on the photocell can cause by stains or dirt such as food residue, water drops, chlorine content in tap water (it can cause stain), dust, etc. When dirt and stains attach to a photocell or a reflection plate, reflected light can no longer be converted to an electric signal even when the product passes through the photocell, causing the error on the photocell.

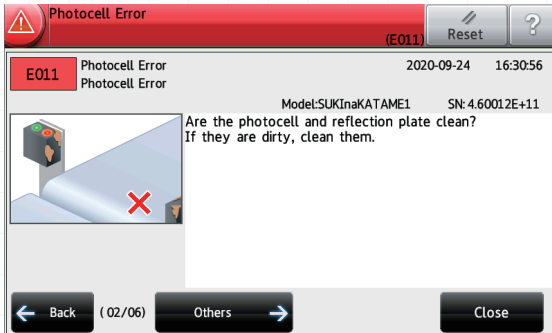


Fig.10: Operation screen showing the photocell error

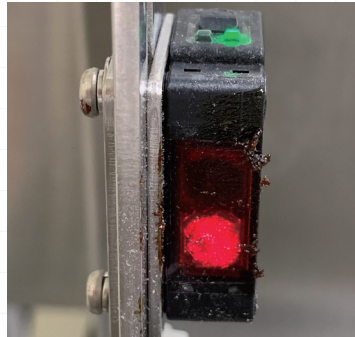


Fig.11: Dirt on the photocell



Fig.12: Dirt on the reflection plate

Solution

With a cloth, gently remove dirt and dust from a photocell. Using a scrubbing brush is not recommended for cleaning as it can damage the photocell which causes a reduction in light quantity of the photocell, and make the detection performance unstable.

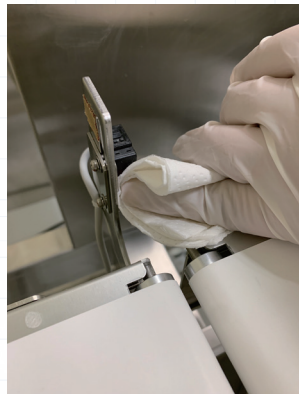


Fig.13: Cleaning the photocell

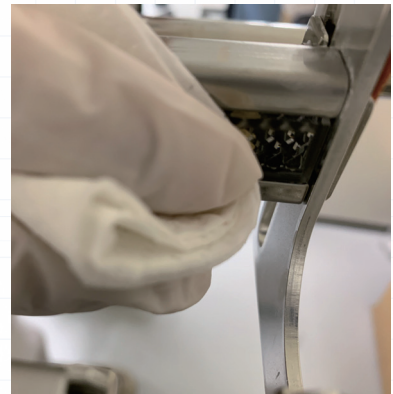


Fig.14: Cleaning the reflection plate

Deviation in the position of a photocell and a reflection plate

The axis of light projection and reception for a photocell and a reflection plate is arranged to be aligned on a straight line at the time of shipping. The position of the photocell and reflection plate can be shifted or inclined upward or downward by any shocks or impacts applied from the outside. When the optical axis deviates the product to be inspected cannot be detected (a photocell is unable to detect reflected light), causing an error on the photocell.



Fig.15: Photocell inclined to upward



Fig.16: Reflection plate inclined to downward

Solution

Put a photocell and a reflection plate in position to align the optical axis, and then make adjustment as follows:

- When the product does not pass through the photocell and reflection plate:
both green and red lights are turned on.
- When the product blocks the photocell and reflection plate:
A red light is turned off and only a green light is turned on.

Press the operation button on the photocell by mistake

By accidentally pressing the operation button on the photocell during cleaning may change the initial settings. In this case, the photocell error can occur.

Solution

Please reset the settings by referring to "Adjusting photocell" in the checkweigher operation manual.

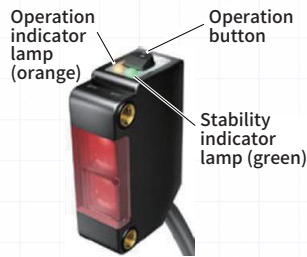


Fig.17: Photocell

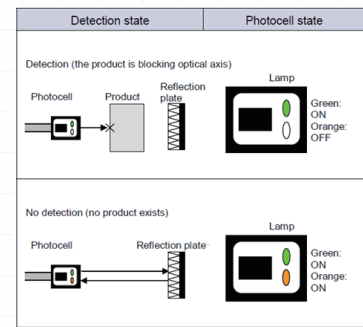


Fig.18: Photocell under the normal setting

A frayed belt can cause an error in product detection

Deterioration of belts on infeed conveyor section, weighcell conveyor section, and rejector can make belts to get frayed. When a frayed belt touches the weighcell conveyor section, a weighcell identifies it as a load and the error on detecting the product can be shown on the operation screen. This error alarm is to prevent any product from being conveyed downstream without proper inspection by a checkweigher.

(Note) When a frayed belt is detected as a product with no load, the error will be shown on the operation screen.

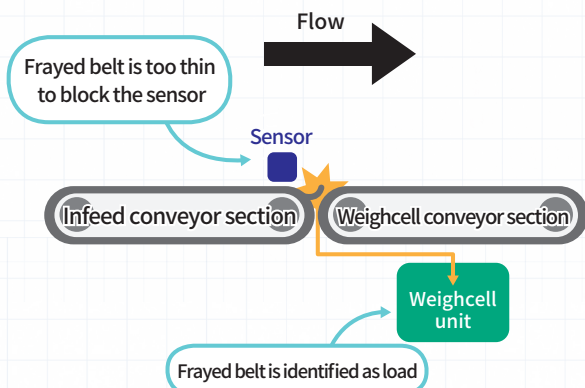


Fig.19: Frayed belt touches weighcell conveyor

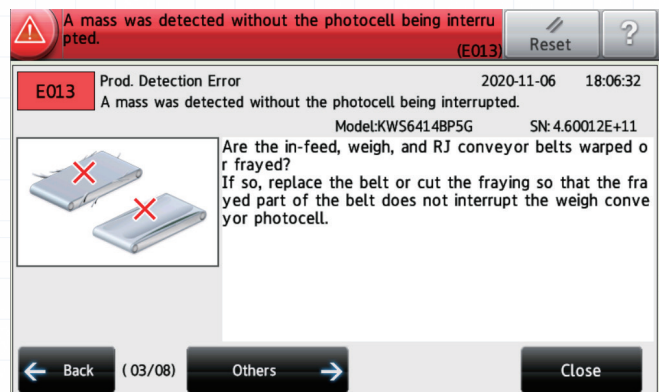


Fig.20: Production detection error screen (Anritsu checkweighers)

Solution

Remove a conveyor belt periodically to check for any fraying or peeling on the edge. If you see any warp or fray on the belt, please change it for a new belt or cut off the fraying part to prevent it from blocking a sensor.

Conclusion

This paper explained typical causes of the error and countermeasures by giving the actual examples.

We hope this paper helps you to recover at the time of error or fault occur.

Please check once more the procedures and standards for inspection and cleaning in the operation manual and use your checkweigher effectively.