

# DIGITAL FIBEROPTIC SENSOR TRAINING GUIDE

## FS-neo

Basics: Calibration, Tips, and Troubleshooting



Operation 1

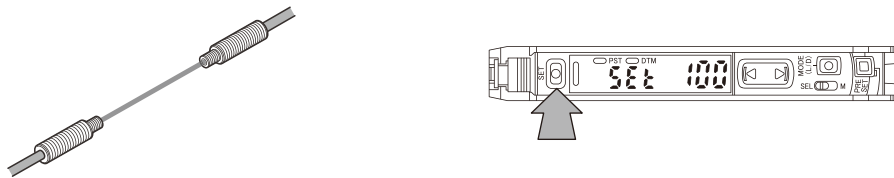
# The Basics of Sensitivity Adjustment

## 1 Two-point Calibration

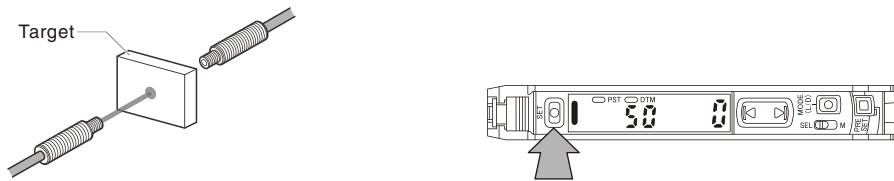
With this method, the FS-NEO Series detects two points (with and without a workpiece present) and sets the intermediate point as the setting value.

**OPERATING PROCEDURE**

- (1) Make sure that the display shows the setting value/current value.
- (2) Press the [SET] button once with no workpiece present.



- (3) Press the [SET] button once with a workpiece present.



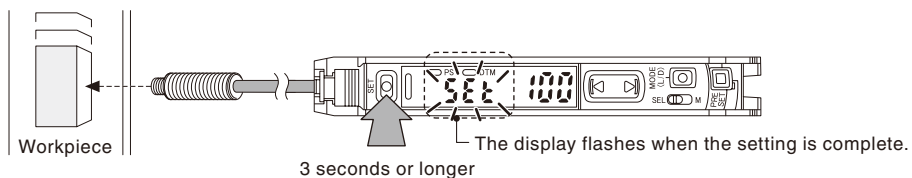
## 2 Fully Automatic Calibration

With this method, the FS-NEO Series sets the intermediate value between the maximum and minimum received light intensity within a certain period of time.

Do you have trouble adjusting the sensitivity for applications where a workpiece that is narrower than the optical axis diameter continuously passes through the light beam? In such a case, fully automatic calibration will enable more stable detection.

**OPERATING PROCEDURE**

- (1) While holding down the [SET] button for 3 seconds or longer, let the workpiece(s) pass through the beam. The sensitivity is set based on the maximum and minimum light intensity received while the [SET] button is pressed down.



After the calibration is complete, the setting value is displayed in green on the digital monitor.



Operation 2

# The Basics of Sensitivity Adjustment

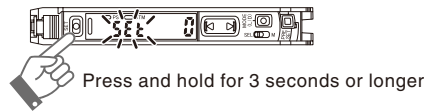
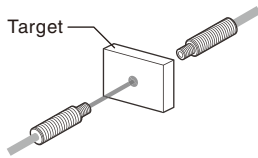
## 3 Maximum Sensitivity Setting

**[For thrubeam models]** When a workpiece is larger than the fiber strand diameter (lens diameter), the light is completely blocked. This method is used to set the sensitivity when the workpiece is large enough to completely interrupt the light.

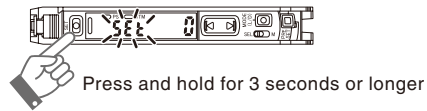
**[For reflective models]** This method is used to set the maximum sensitivity while still ignoring the background.

**OPERATING PROCEDURE**

- (1) Make sure that the display shows the setting value/current value.
- (2) **[For thrubeam models]** Press and hold the [SET] button for 3 seconds or longer with a workpiece present between the transmitter and receiver fiber units.



**[For reflective models]** Press and hold the [SET] button for 3 seconds or longer with no workpiece present.

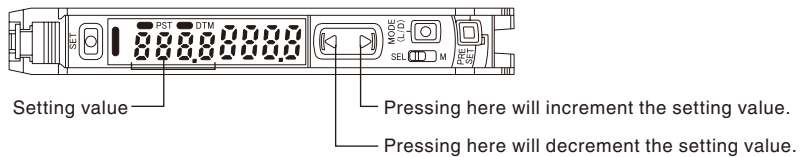


## 4 Fine Adjustment

Set the sensitivity manually.

**OPERATING PROCEDURE**

- (1) Make sure that the display shows the setting value/current value.
- (2) While monitoring the current value display, press the manual buttons to perform fine adjustment of the setting value.



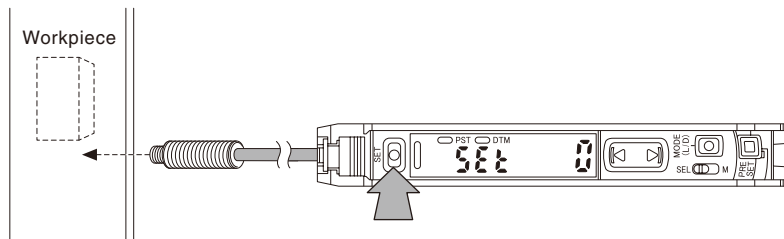
# The Basics of Sensitivity Adjustment

## 5 Positioning Calibration

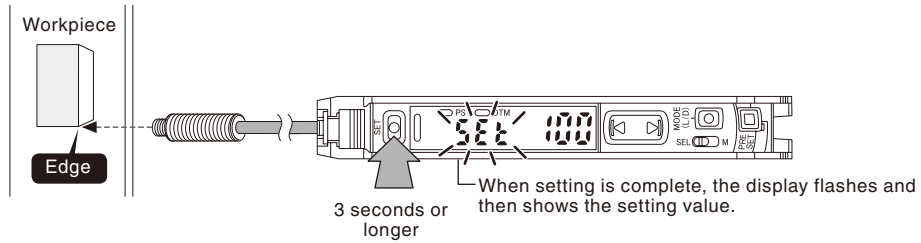
With this method, the FS-NEO Series detects the workpiece exactly when its edge reaches the predetermined position.

### OPERATING PROCEDURE

- (1) Make sure that the display shows the setting value/current value.
- (2) Briefly press the [SET] button with no workpiece present.



- (3) Place the part of the workpiece to be detected (edge). Then, press and hold the [SET] button for 3 seconds or longer.



Operation 4

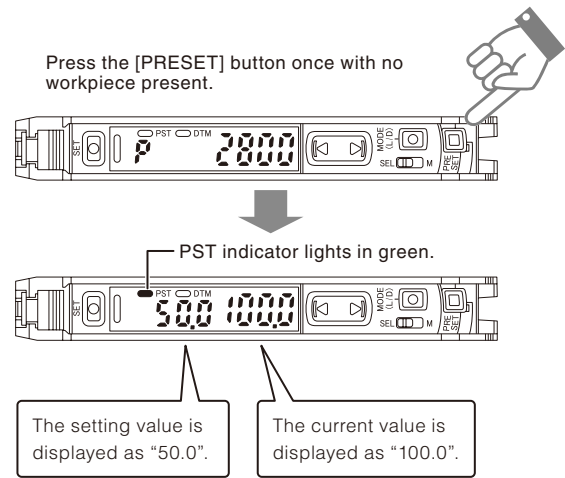
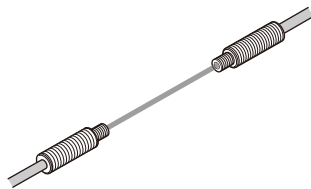
# Simplified Sensitivity Adjustment

## 6 Preset Function

One simple click of the button will make all the displays uniform and set the sensitivity at the same time.

### OPERATING PROCEDURE

After installing the sensor, briefly press the [PRESET] button with no workpiece present when using a thru-beam model (or with a workpiece present when using a reflective model).



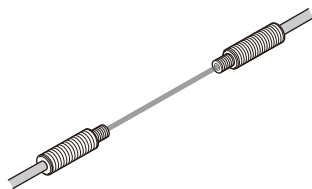
The received light intensity is adjusted to 100.0 and the setting value is adjusted to 50.0. The setting is complete with just one click.

## 7 Saturation Recovery Function

When setting a reflective model, this function automatically adjusts the light intensity from a level that is too intense, which prevents light intensity differences from being detected, to a lower value that allows for proper, reliable detection.

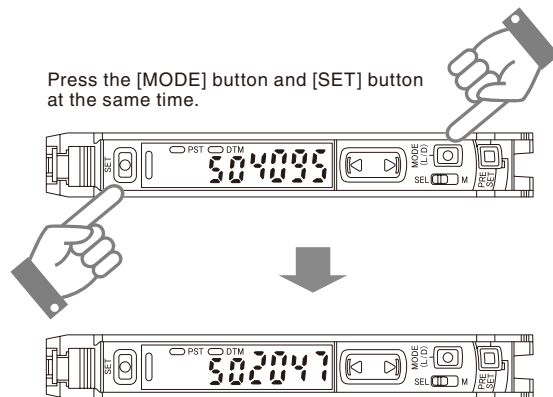
### OPERATING PROCEDURE

After installing the sensor, briefly press the [MODE] button and [SET] button at the same time.



Power mode	Setting range of received light intensity
HSP*, FINE, TURBO	2047 ± 350
SUPER	4095 ± 500
ULTRA, MEGA	5000 ± 600

\* HIGH SPEED



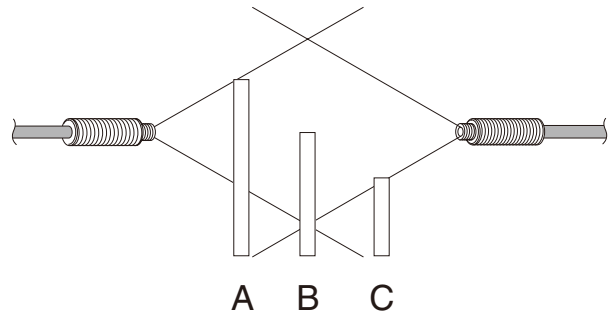
This function automatically adjusts the light intensity to the proper level.

## Tips for Using Thrubeam Models

### 1 Target Size and Detection Range

#### QUESTION

Look at the figure on the right.  
You are going to block the optical axis of the thrubeam sensor with the workpiece. At which position of the workpiece, A, B, or C, will the sensor enter the light-ON mode?

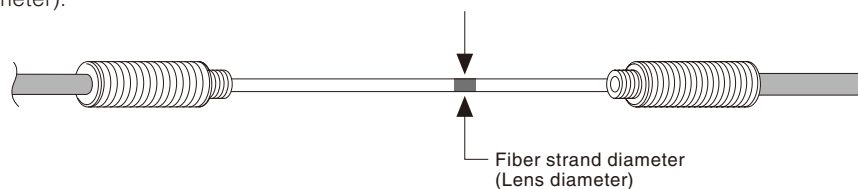


#### THE ANSWER IS...

#### REASON

### 2 Sensitivity adjustment for thrubeam models

When using a thrubeam type sensor, the light is completely blocked if the workpiece is larger than the fiber strand diameter (lens diameter).



Therefore, the optimal sensitivity adjustment will be the maximum sensitivity setting as this is the sensitivity adjustment which is most resistant to dirt or dust.

#### Let's check it out

- (1) Manually perform two-point calibration.
- (2) Block the light using a translucent workpiece and set the maximum sensitivity. (This simulates dirt accumulation on the fiber.)
- (3) Make sure that the light enters the receiver with the translucent workpiece present and that the sensor turns ON and OFF by placing your hand between the sensor head and the workpiece.

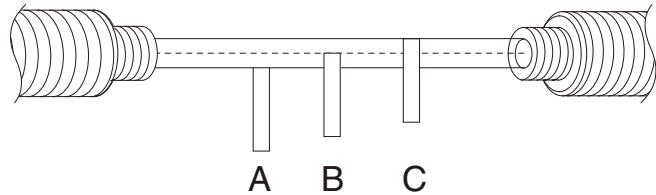
## Tips for Using Thrubeam Models

### 3 Position Detection

#### QUESTION

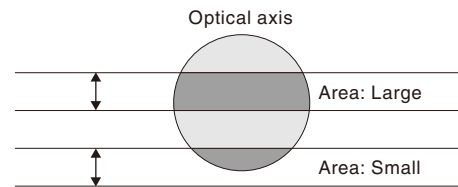
Look at the figure on the right.

You are going to perform positioning using a thrubeam type sensor. At which position, A, B, or C, should the positioning be performed to get the optimal result?



#### THE ANSWER IS...

Align the detection point of the workpiece to the center of the optical axis. Because the light intensity is greatly affected at the center of the optical axis, this installation will give you a higher accuracy.



#### TIPS

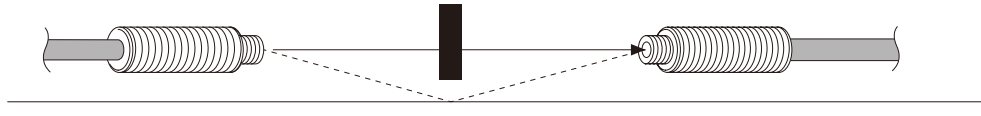
- (1) Accuracy is the highest at the center of the optical axis.
- (2) The thinner the optical axis, the better the result.
- (3) The result will be more accurate with higher received light intensity as long as it is not saturated.

# Troubleshooting

## 1 Stray Light

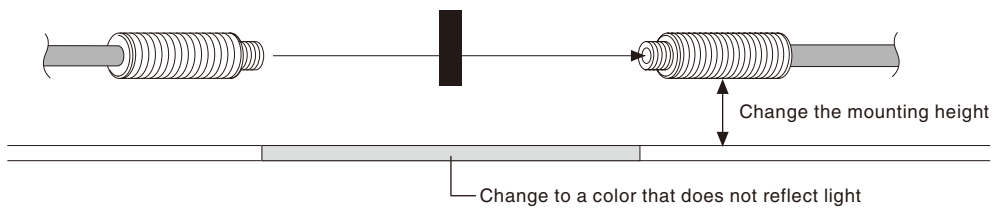
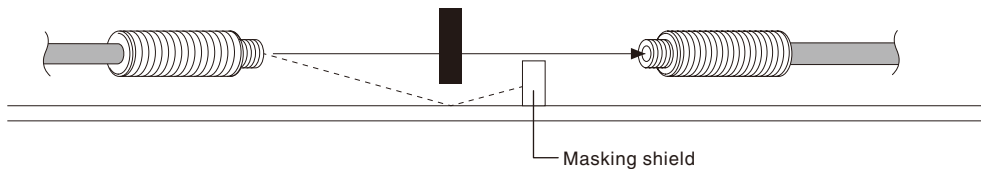
### SYMPTOM

As shown in the figure below, stray light reflected from a nearby surface may make the sensor operate as if it were in the Light ON mode.

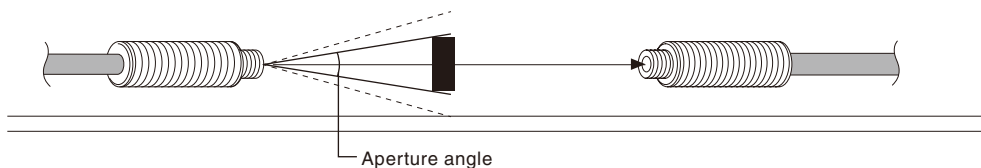


### COUNTERMEASURES

- (1) When there is stray light, adjust the sensitivity with the stray light present.
- (2) In case the problem cannot be solved by (1), make the following changes to the installation.



- (3) Select a sensor with a narrow aperture angle. (The aperture angle can also be narrowed by attaching a lens, when available.)





# Troubleshooting

## 2 Mutual interference

### SYMPTOM

When two sensors are used side by side in close proximity, the operation may become unstable due to the influence of light from the transmitter of the other unit.

### COUNTERMEASURES

(1) Use the interference prevention function.

FS-NEO Series

	Mode	FINE	TURBO/S.TURBO/ULTRA/MEGA
Interference Prevention Function	In normal operation	4 units	8 units
	When the mode is set to "DOUBLE"*	8 units	16 units

\* Up to 16 units can be connected.

(2) Alternate the placement of the transmitters and receivers.



\* In this case, be careful to avoid potential interference caused by the light from the other sensor head entering the receiver when reflected from the target.

### [Other countermeasures]

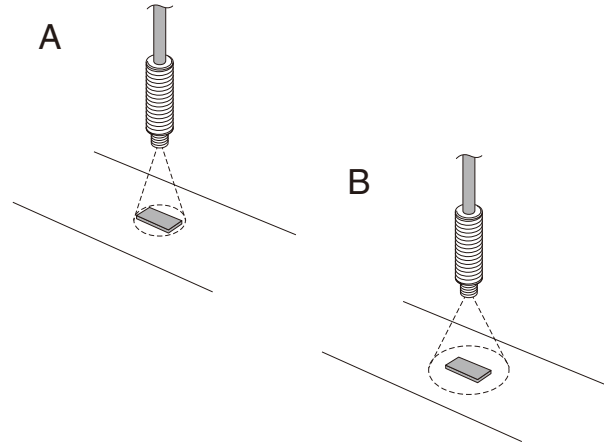
When using a model with a built-in amplifier, a polarizing filter can be used to prevent interference.

# Tips for Using Reflective Models

## 1 Target size and detecting distance

### QUESTION

Look at the figure on the right.  
Which sensor, A or B, do you think will provide more stable performance?

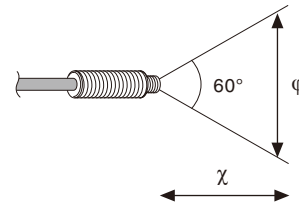


### THE ANSWER IS...

\_\_\_\_\_

When using a photoelectric sensor, the spot size at the detecting distance will be a key factor.

When using a fiber sensor, the aperture angle of the fiber is 60°. Remember this point to calculate the spot diameter at the detecting distance.



$$\phi = 1.15\chi + (\text{Fiber strand diameter})$$

## Tips for Using Reflective Models

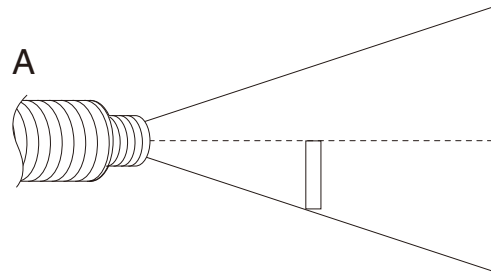
### 2 Position Detection

#### QUESTION

Look at the figures on the right.

You are going to perform positioning using a reflective type sensor.

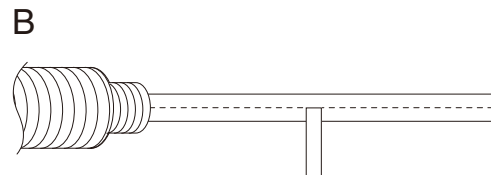
Which one, A or B, do you think will give the optimal result?



#### THE ANSWER IS...

\_\_\_\_\_

When using a reflective type sensor for positioning, select a model with the smallest possible spot diameter.



#### TIPS

- (1) Make the spot as small as possible for positioning.
- (2) Unless the light is saturated, the accuracy will improve as the received light intensity increases.

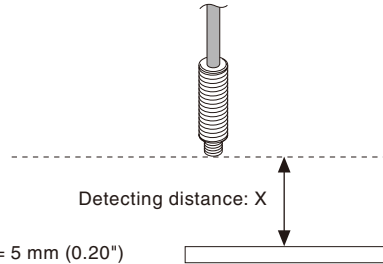
# Tips for Using Reflective Models

## 3 Step Differentiation

### Vertical direction

#### QUESTION

Look at the figure on the right.  
Which position, A, B, or C, will be optimal for performing step differentiation?



#### THE ANSWER IS...

\_\_\_\_\_

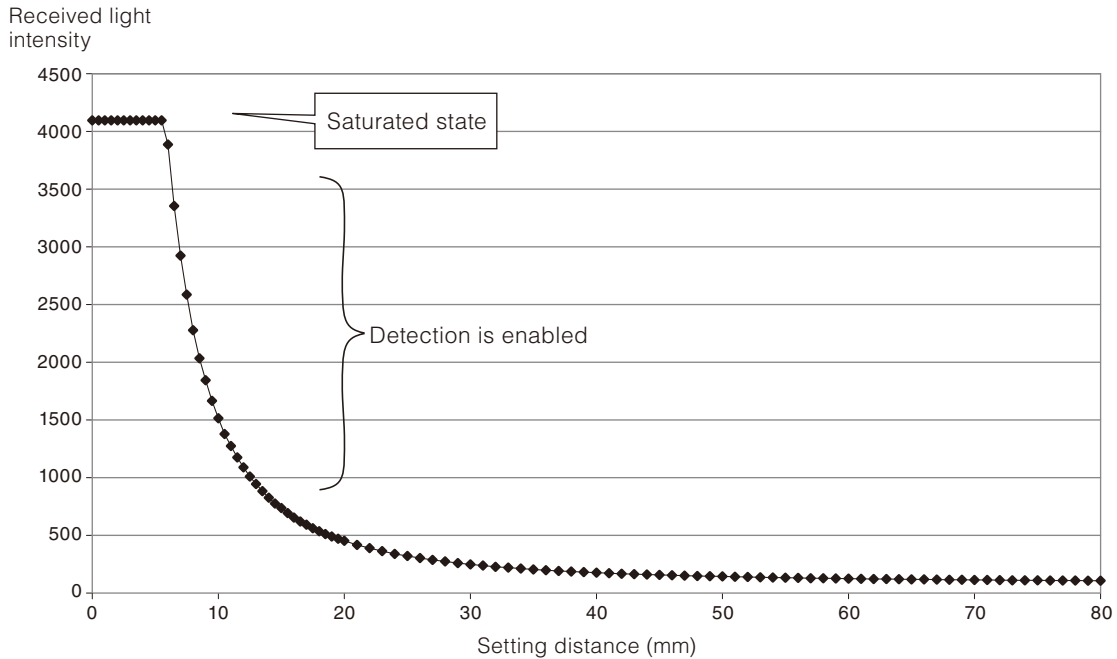
- A X = 5 mm (0.20")
- B X = 10 mm (0.39")
- C X = 15 mm (0.59")

#### TIPS

- (1) When using a reflective type sensor, set a short detecting distance in order to enhance the received light intensity.
- (2) Be careful not to place the sensor head too close to the target, otherwise the received light intensity may become saturated.

### FU-35FZ Characteristics of Detecting distance vs. Received light intensity (Typical)

[Amplifier: FS-N11N (FINE mode, APC-OFF) Target: 300 x 300 mm (11.81" x 11.81") white Kent paper]



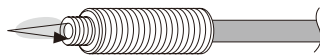
# Troubleshooting

## 1 Influence of dirt and dust

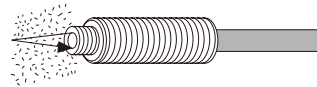
### SYMPTOM

Dirt or dust accumulated on the detecting surface of the sensor may keep the sensor constantly in the light-ON mode.

[Moisture]



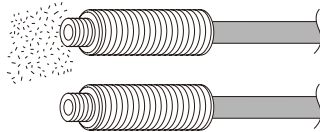
[Dust]



### COUNTERMEASURES

(1) Install a thru-beam type sensor with the transmitter and receiver side by side and use it as a reflective type sensor.

This installation will prevent stray light from reflecting into the receiver, even when moisture or dust accumulates on the sensor head.

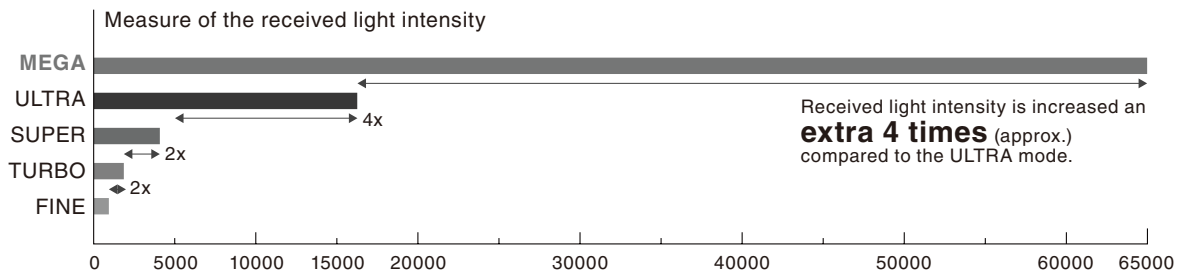


(2) Models with separate transmitter and receiver fiber strands are also available.

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(3) You can increase the received light intensity by switching the Power Mode of the FS-NEO Series.



Received light intensity is increased 64 times when the mode is changed from FINE to MEGA.

# Troubleshooting

## 2 Influence of color variation

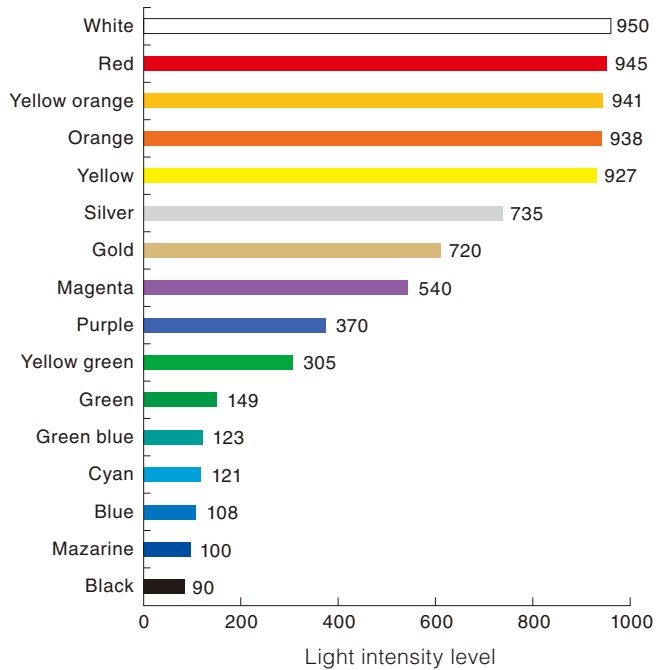
### SYMPTOM

Detection may fail when the color of the workpiece changes.

### CAUSE

Because a red LED is used for the light source, some colors have a higher reflectance than others.

**[Example]** Set the detecting distance to 15 mm (0.59") with FU-6F.

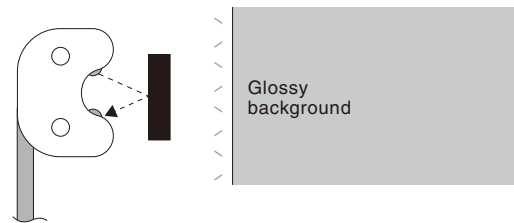


### COUNTERMEASURES

- (1) Set the sensitivity to a level at which the sensor is able to detect the color with the lowest reflectance.
- (2) Use a sensor that employs infrared LED as its light source, which is resistant to the influence of color variation.

- (3) Use a definite reflective type for detecting targets with a brightly-colored background, as seen in the image to the right. Definite reflective sensors have a fixed detection range, allowing them to be mounted with the highly reflective background out of the detecting range.

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**SAFETY INFORMATION**

Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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