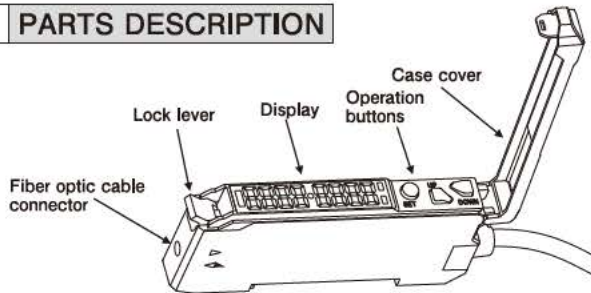


- This is a sensor to identify the color and the brightness of light sources (such as LEDs).
- The sensor identifies the ratios of the color components such as red, green, and blue and the brightness ratio, based on the reference light.
- The reference lights can be learned by teaching, and the tolerance values of the color component ratios as well as brightness can be set separately.
- Two large displays are incorporated, for easy display of the difference between the two tolerance values. Two outputs of color component ratios and brightness are available. NPN/PNP output can be switched by button operation.

### 1 PARTS DESCRIPTION



### 2 SAFETY PRECAUTIONS

- To ensure safety, be sure to follow the precautions below.
1. Do not use this product for safety critical applications.
  2. Do not use this product when its housing or cable is damaged.
  3. Do not attempt to disassemble, repair, or modify this product.
  4. Do not use this product in an environment containing flammable, explosive, or corrosive gas.
  5. Do not use this product in an environment exposed to chemicals or oil.
  6. Do not use this product in an environment exposed to water including outdoors or underwater.
  7. Use this product within its rated specification.
  8. Do not expose this product to direct sunlight.
  9. Do not use this product in a place exposed to vibration or shock.
  10. Do not use organic solvents such as alcohol or thinner to clean the product.
  11. Perform a daily operation check, weekly periodical check, and maintenance to ensure correct operation.
  12. This product should be disposed of as industrial waste.

### 3 PRECAUTIONS FOR OPERATION

1. Be sure to route the sensor cables separate from any power transmission or high voltage line, or else use shielded cables. Using the same conduit or duct as high voltage or power lines will cause malfunctions or damage because of electromagnetic induction.
2. Do not apply excessive force to the cable.
3. When using a switching regulator, be sure to ground the frame ground (FG) terminal.
4. The sensor starts operation 1000 ms after power is applied. Always power on the sensor prior to loads.
5. Turn off the power of the load first as this product may generate an output pulse when the power is turned off.
6. Avoid turning the power on and off consecutively.
7. When extending the cables, use conductors of 0.3 mm<sup>2</sup> cross-sectional area or more.
8. Limit the current from the power supply to 2A.
9. Some optic fiber cable requires strong force for insertion, but this does not mean malfunction.
10. Do not use in an environment where strong ambient light such as sunlight, inverter light, or LED illuminating light affect the detection.
11. The sensor can be influenced by surrounding lights. Do not use in an environment of variable illuminance, such as next to a window.
12. When the illuminance of the surrounding light is stronger than that of the workpiece light source, detection may be fluctuated. Use the workpiece light source as bright as possible, and install the optic fiber cable as close as possible to the workpiece light source.
  - Use an optic fiber cable having a large core diameter. Recommended optic fiber cable: FT105BC-CS (core diameter:  $\phi 1.5$ )
  - When the optic fiber cable cannot be installed near the workpiece light source, adjust the field of vision by combining the lens unit such as FA515 with the fiber cable.
  - When the workpiece light source has high brightness and the sensor receives excessive light, adjust the field of vision by combining the lens unit such as FA515 with the fiber cable.
13. Some installation environment or setting may cause unstable operation, resulting in chattering. Activating ON delay timer or OFF delay timer is effective for reduced chattering.
14. Hysteresis is coordinated with the tolerance value. Larger tolerance value increases the width of hysteresis, reducing the chattering.

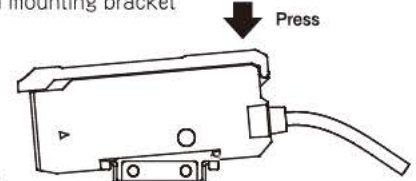
### 4 INSTALLATION

#### 4-1 Installation of Amplifier Unit

- Using DIN rail, dedicated mounting bracket (separately sold)

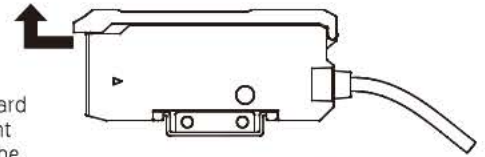
##### 1) DIN rail mount

Hook the front tab on the rail (or mounting bracket), and then press down the rear section.



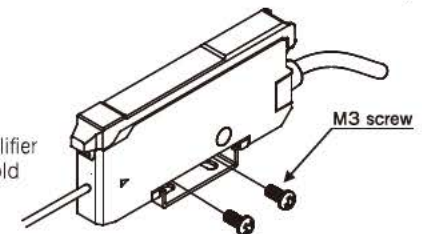
##### 2) Removal

Press the unit forward and pull up the front section to remove the front hook.



##### 3) Side face mount

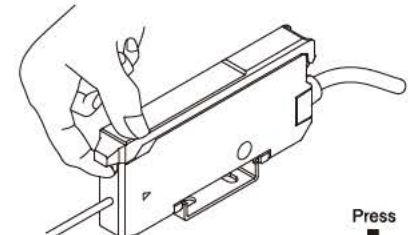
Install the side of the amplifier unit using a separately-sold mounting bracket. Tightening torque should be 0.8 N·m or less.



- Amplifier case cover

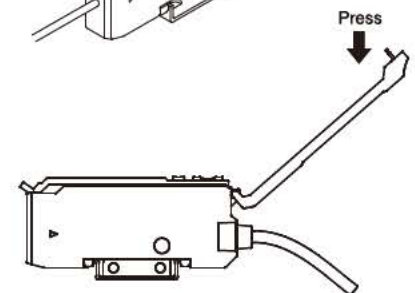
##### 1) To open the case cover

Lift the cover by pulling up the tab.



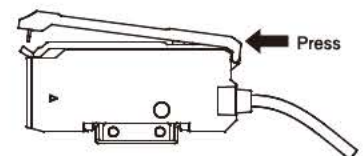
##### 2) To remove the case cover

Fully open the cover, and press the edge.



##### 3) To attach the case cover

Place the removed cover on the amplifier unit, and press the hinge part.

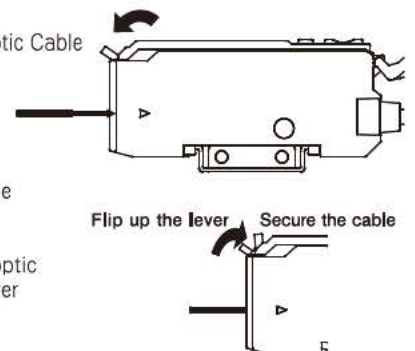


#### 4-2 Installation of Fiber Optic Cable

- To attach the fiber optic cable to the amplifier unit

- Flip down the lock lever.
- Insert the fiber optic cable until it stops.

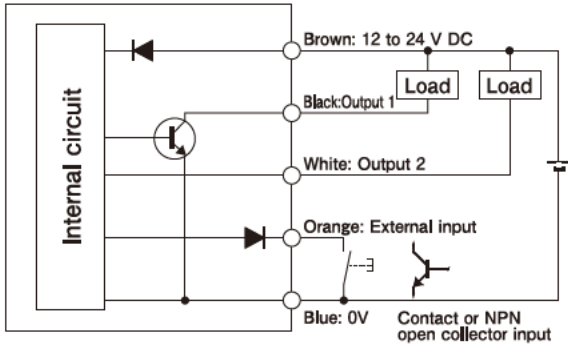
- After inserting the fiber optic cable, flip up the lock lever until it clicks into place.



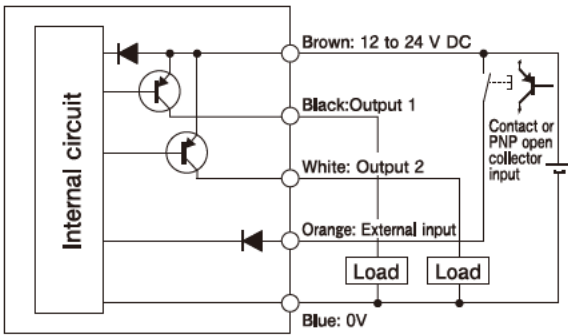
## 5 CONNECTION (including input/output circuits)

- There are two outputs: A color component ratio identification output (Output 1) and a brightness identification output (Output 2), and an external input for teaching.
- The button operation (output setting) can switch between NPN output/PNP output.
- Insulate the stability input / output cables when unused.

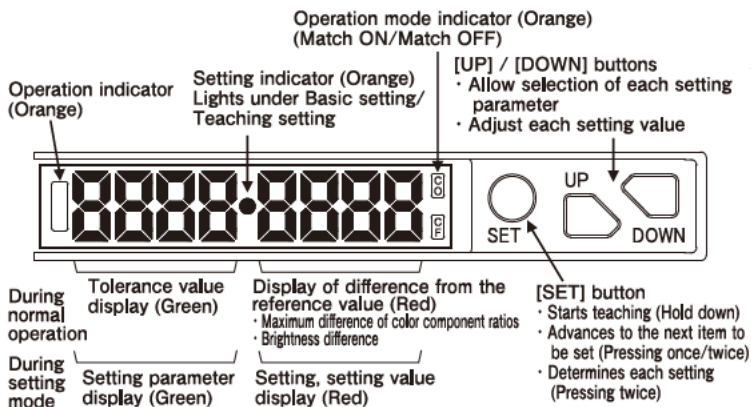
### ● NPN Output



### ● PNP Output

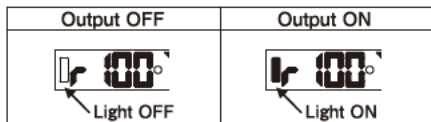


## 6 INDICATOR AND OPERATION



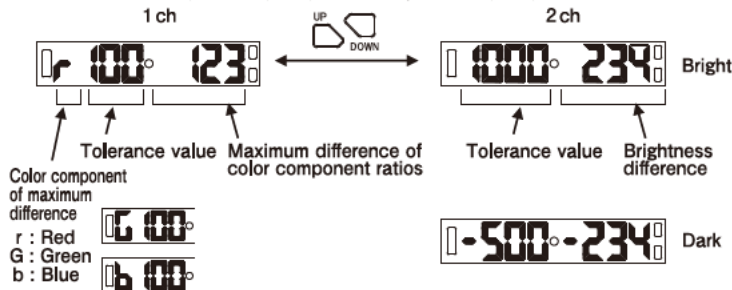
### 6-1 Operation Indicator

Lights when any output is ON.



### 6-2 Display Switching (during Normal Operation)

The [UP] / [DOWN] buttons switch the display channels. Color component (Ch1) ↔ Brightness (Ch2)



### 6-3 Digital Display (Green)

#### 6-3-1 Normal Operation: Tolerance Value Displayed

- When Ch1 (color component) is selected: Displays the tolerance value of the color component which has the largest difference in color component ratios between the workpiece and the reference color.
- When 2ch (brightness) is selected: The upper and lower limits of the tolerance values of brightness are displayed.
- For both channels, when the sensor receives no light, "Lo" is displayed.

#### 6-3-2 Mode Setting: Setting Parameters Displayed

While the green indicator of the setting parameter is flashing, press the [SET] button once. The cursor moves to the next setting parameter. Pressing the [SET] button twice in quick succession returns the cursor to the previous setting parameter.

### 6-4 Digital Display (Red)

#### 6-4-1 During Normal Operation

- Displays the difference between the reference color and the workpiece color.
- When Ch1 (color component) is selected: Displays the difference in the color component ratios for the color component which has the largest difference in color component ratios between the workpiece and the reference color. The value is displayed in the range of 0 to 999 (0 to 9.99%). The value becomes smaller as it approaches the reference value.



#### • When Ch2 (brightness) is selected:

Displays the difference in the brightness between the workpiece and the reference color in the range of -999 to +9999 (-99.9 to 999%). The value becomes smaller as it approaches the reference value.

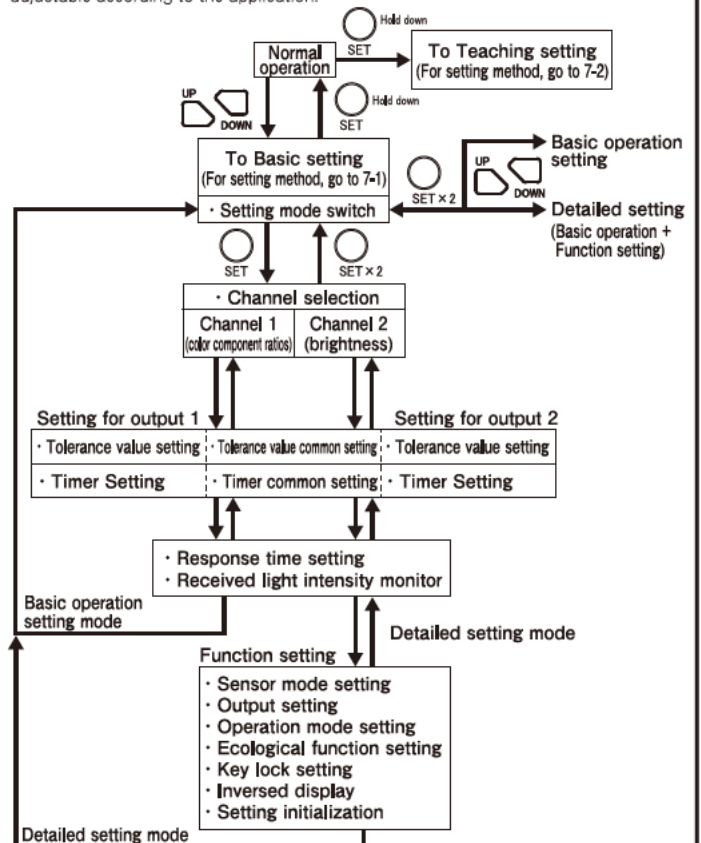


#### 6-4-2 During Setting Mode

Setting parameters and setting values are displayed. While the green indicator of the setting parameter is flashing, press either the [UP] or [DOWN] button. The red indicator of the setting parameter flashes, and the parameter can be selected by the [SET] button or the [UP]/[DOWN] button. Pressing the [SET] button twice in quick succession makes the flashing display of the red color to the lit state, determining the selected setting.

## 7 SETTING AND OPERATION

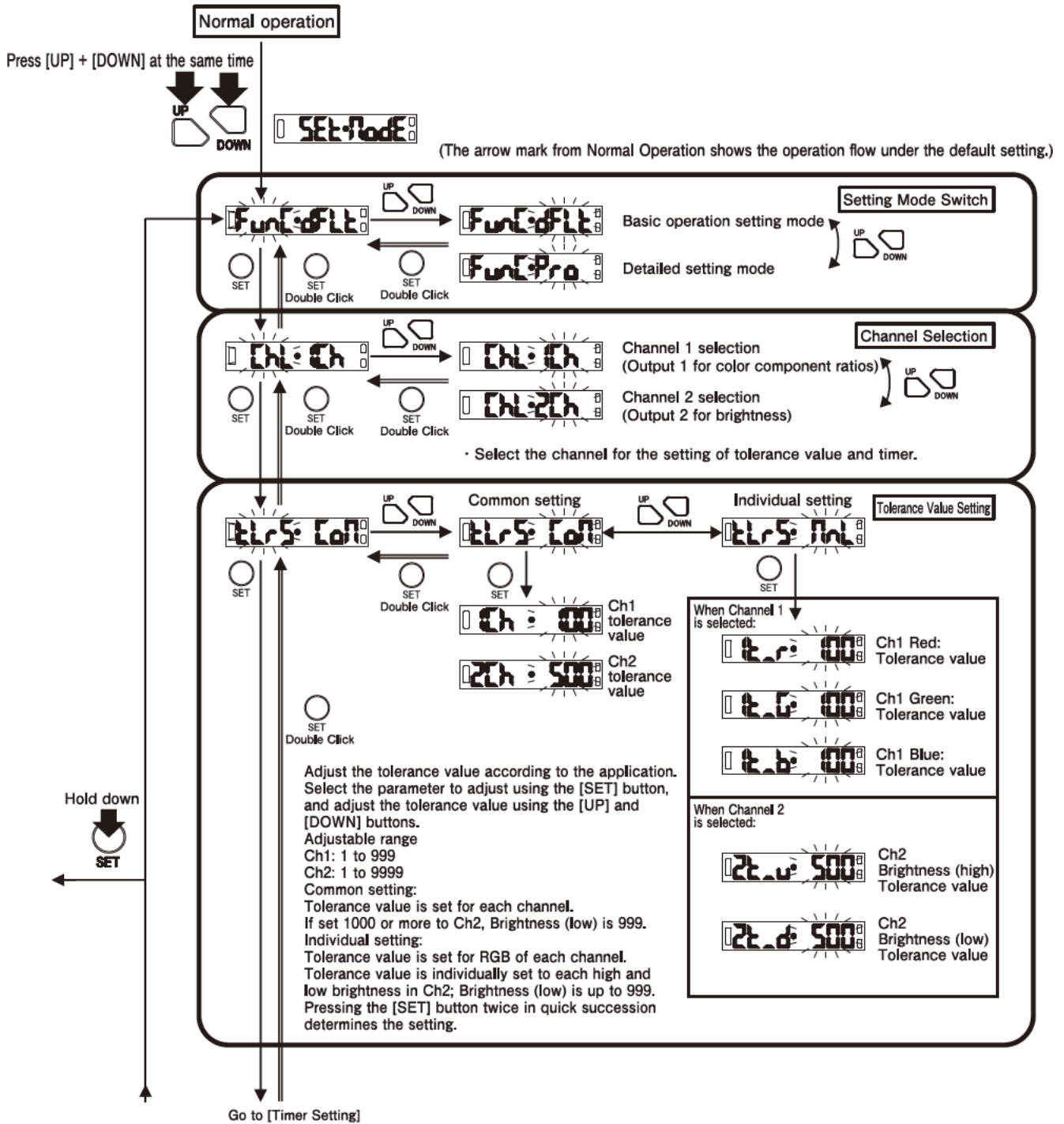
- The following sequence shows how to move from normal operation to the setting mode.
- In the setting mode, the basic settings for identifying the color and brightness are available. In the detailed setting mode, functional settings for each sensor are available in addition to the basic setting.
- The color component ratios of the reference color can be set through teaching. The default tolerance values for identification is set to 100 for the difference of color component ratio, and to 500 for the brightness difference. Both of these values are adjustable according to the application.



7-1 Setting

- Simultaneously pressing the [UP] and [DOWN] buttons during normal operation enters the basic operation setting mode.
- Holding down the [SET] button while in the basic operation setting returns to normal operation.

● Basic Operation Setting



From [Tolerance Value Setting]

Common setting

dELy:OFF

SET

UP

DOWN

SET Double Click

Common setting

dELy:On

SET

UP

DOWN

SET Double Click

Individual setting

dELy:SPrt

SET

UP

DOWN

SET Double Click

Timer Setting

Channel 1 selection

lond: 0 Ch1 ON Delay

loff: 0 Ch1 OFF Delay

lsh: 0 Ch1 One Shot

Channel 2 selection

2ond: 0 Ch2 ON Delay

2loff: 0 Ch2 OFF Delay

2sh: 0 Ch2 One Shot

Select Timer using the [SET] button. Using the [UP] and [DOWN] button can increment/decrement the value in 1 ms from 0 to 999 ms. When 1 or more value is set to One Shot, ON delay and OFF delay are invalid. Pressing the [SET] button twice in quick succession determines the setting.



SPEd:Auto

SET

UP

DOWN

SET Double Click

SET Double Click

Response Time Setting

SPEd: 50

SPEd: 100

SPEd: 250

SPEd: 500

Response Time Setting

Select Response Time using the [UP] and [DOWN] button. Pressing the [SET] button twice in quick succession determines the setting.

Response time [ms]	
Auto	Auto is the response time automatically set in the teaching (min: 10 ms).
50	Auto is alternatively displayed with other response values.
100	Auto is alternatively displayed with other response values.
250	Auto cannot be set to a value less than the response time set in the teaching.
500	Auto cannot be set to a value less than the response time set in the teaching.

\*When the response time is changed, perform teaching again.

rEd: 123

SET

UP

DOWN

SET Double Click

SET Double Click

Received Light Intensity Monitor

rEd: 123 Red: Received light intensity

Grn: 123 Green: Received light intensity

blu: 123 Blue: Received light intensity

toP: 123 Entire received light intensity

Received Light Intensity Monitor

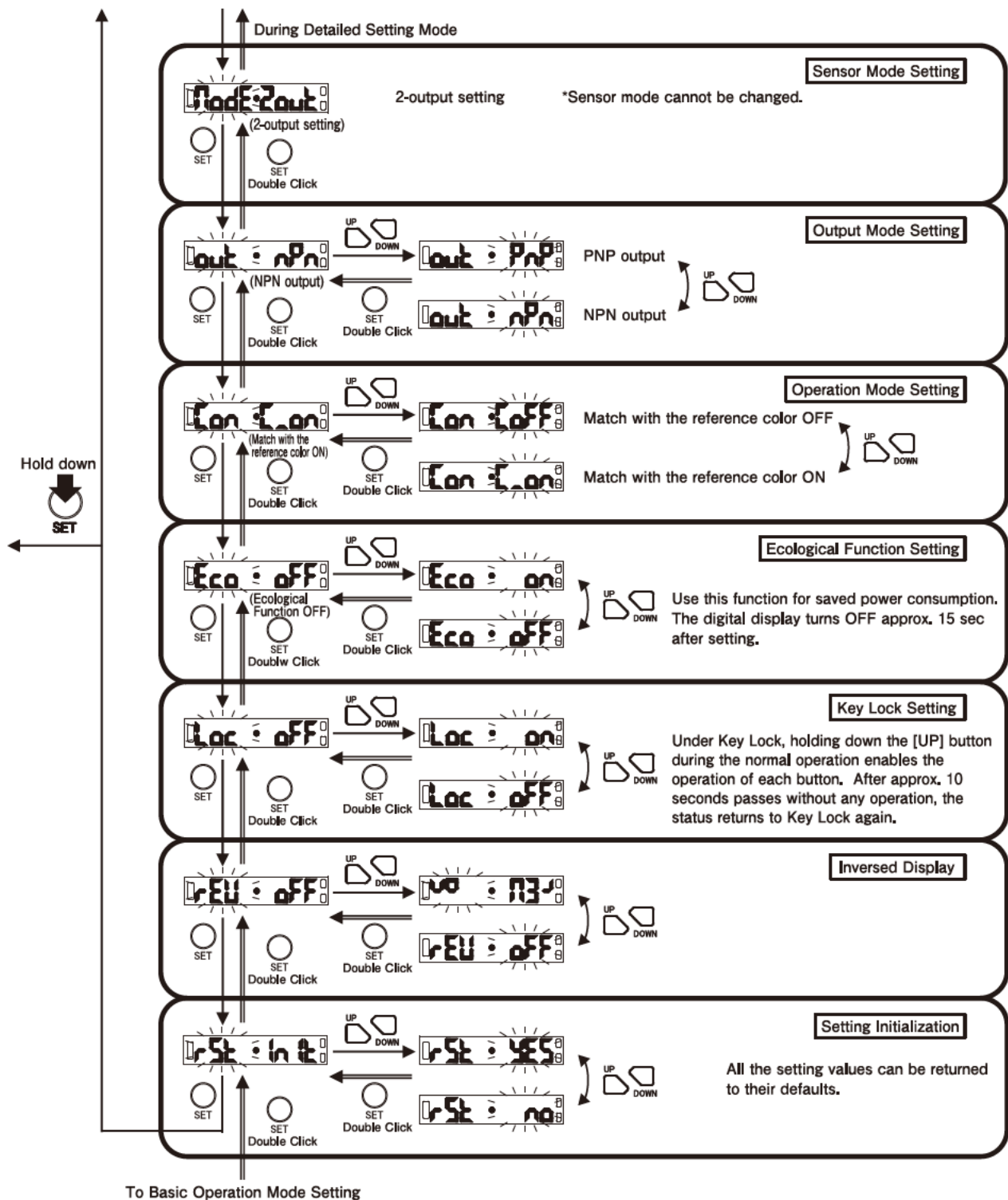
The received light intensity of each color component and the entire received light intensity are displayed. Select optimum item by using [UP] and [DOWN] button.

Under Basic Operation Mode

Under Detailed Setting Mode

To function setting

● Function setting



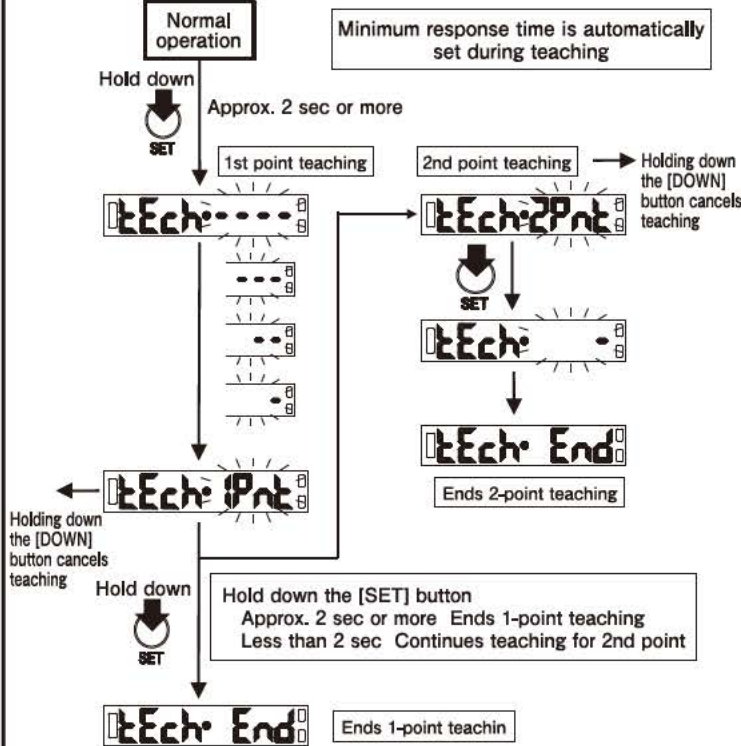
## 7-2 Teaching Settling

There are two teaching methods:

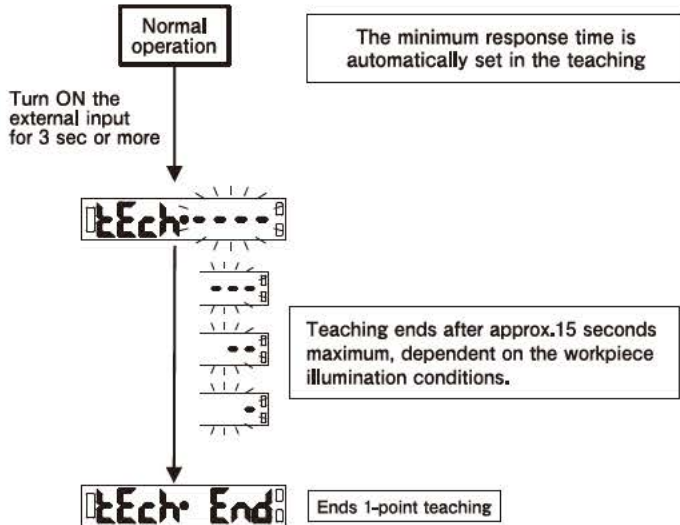
- Using the [SET] button of the sensor
- Using the external input (only for Mode 1)

### ● Teaching using the [SET] button

Holding down the [SET] button from normal operation begins teaching. Two kinds of teaching: 1-point teaching and 2-point teaching are available.

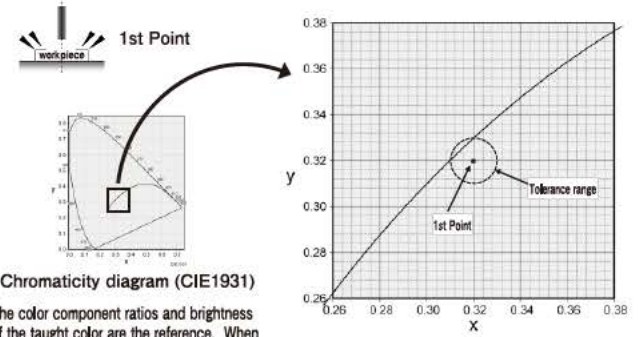


### ● Teaching via external input



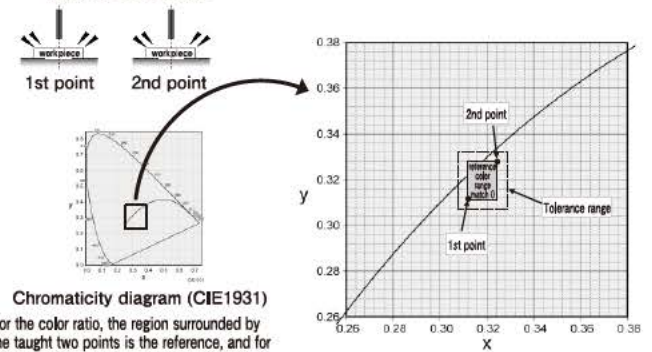
### 1-point teaching

Identifies a single color

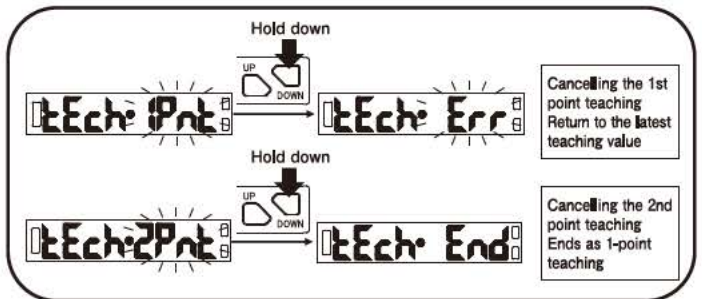


### 2-point teaching

Identify color range



### ● Cancelling the teaching



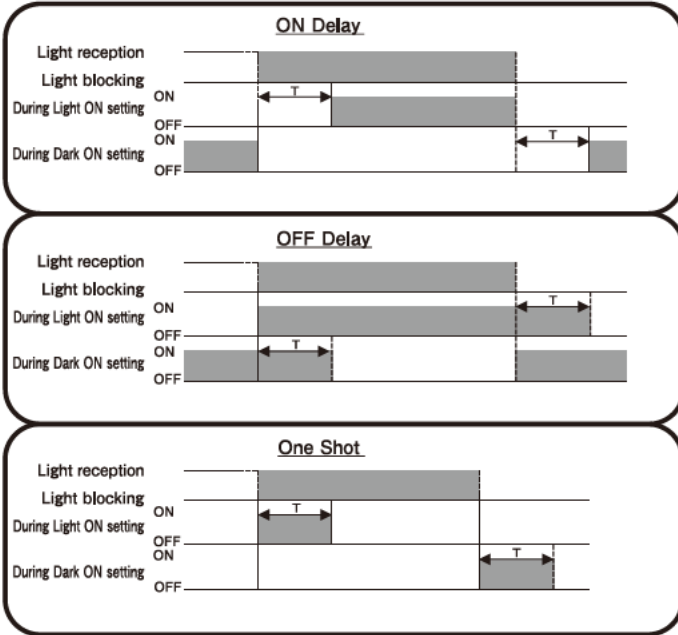
### ● Teaching error

The table below explains a teaching error during teaching. (When a teaching error occurs, the original tolerance values are retained and normal operation is resumed.)

Error display	Digital indication during RUN
tEch: Err	Lo <sup>o</sup> 9999 (The received light intensity is excessively small) The received light intensity is small. Increase the light intensity so that the Lo indication disappears.
tEch: Err	oVer <sup>o</sup> 9999 (The received light intensity is saturated) The received light intensity is saturated. Decrease the light intensity so that the oVer indication disappears.

## 8 TIMER FUNCTION

Three kinds of timer settings are available (for setting, see 7-1). For each channel, common/individual settings are available. When simultaneously setting ON Delay and OFF Delay, the ON-OFF-Delay setting is available. When setting 1 or more values for One Shot, One Shot is valid, ON Delay and OFF Delay are invalid.



## 9 SPECIFICATION

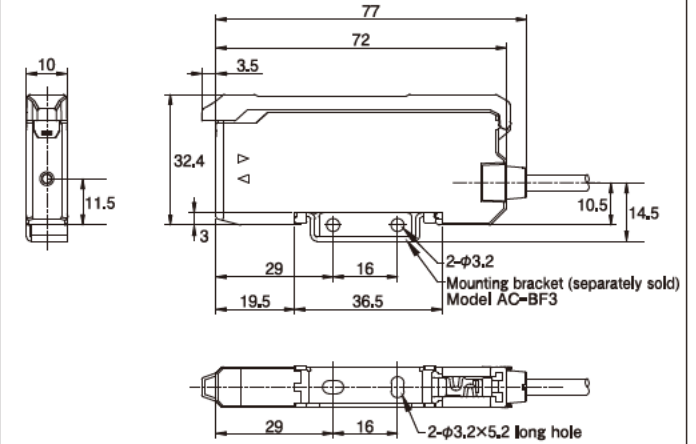
Model	CST-R85
Detection method	Identification of color ratios and brightness through R/G/B light receptive elements
Detection distance	Depends on the use environment
Standard detection target	Light source emitting visible lights
Power Supply	12 to 24 V DC $\pm 10\%$ , Ripple 10% or less
Current consumption	1000mW or less (40mA or less) at 24V DC
Reference color registration	Via teaching: 1 color
Reference color setting	1-point teaching / 2-point teaching
External input/output	1 input, 2 outputs (Output 1: color ratio identification output, Output 2: brightness identification output)
External teaching input	No-voltage input (With or without contact point)
Output mode	NPN/PNP open collector output (operation switch) Load current: 50mA (30V DC) or less, Residual voltage: 2V or less
Operation mode	Switch "Match ON" / "Match OFF" with the reference color
Timer	ON Delay / OFF Delay / One Shot / No timer
	Delay time: 1 to 999 ms (setting available in an interval of 1ms)
Response time	Auto (10 ms or less at maximum, depending on the illumination conditions of the workpiece) / 50 ms or less / 100 ms or less / 250 ms or less / 500 ms or less (selectable)
Indicators	Operation indicator, Setting indicator, Match ON (NO) and Match OFF (NC) Indicator: Orange LED
Display	Tolerance value display: Green LED, 4-digit/ Maximum difference display of color ratios: Red LED, 4-digit
Protection circuit	Protection against power reversed connection and output short-circuit
Material	P C
Connection method	Attached cable type ( $\phi 4.2$ mm o.d.) 0.2 mm <sup>2</sup> x 5-core, 2m
Accessories	Instruction manual

## Environmental Specification

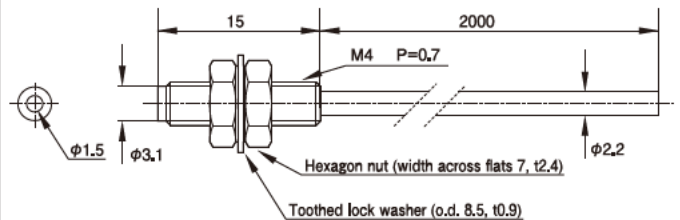
Ambient temperature	-25 to +55°C at storage (no freezing)
Ambient humidity	30 to 85 % RH (no condensation)
Protection structure	IP40
Anti-vibration	10 to 55 Hz, double amplitude 1.5 mm, X, Y, Z directions, 2 hour each
Shock	500m/s <sup>2</sup> , 3 times each in X, Y and Z directions
Dielectric withstand voltage	1000V AC for 1 minute
Insulation resistance	20M $\Omega$ or more with 500V DC Megger

## 10 DIMENSIONS (in mm)

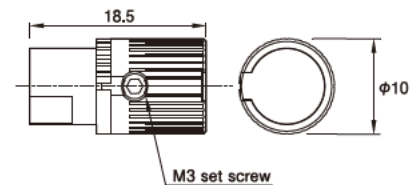
### Model CS-R85 (with the mounting bracket attached)



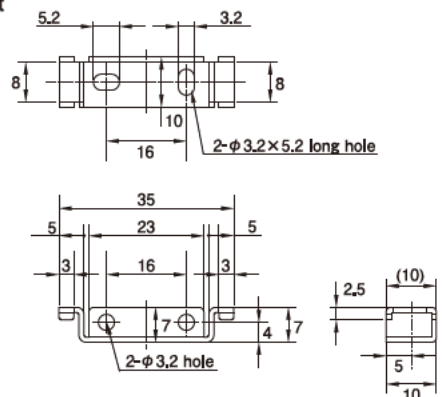
### Model FT105BC-CS (separately sold)



### Aperture unit Model CS-ND (separately sold)



### Mounting bracket Model AC-BF3 (separately sold)



## 11 WARRANTY

The product is covered by a warranty based on the Quality Regulations of Takenaka Electronic Industrial Co., LTD. (Takenaka). Regarding the warranty, please feel free to ask any questions to Takenaka, Takex sales office or authorized distributors.

### 1 《Warranty period》

The warranty period is one (1) year after delivery to a designated location. This warranty does not apply to expendable supplies like batteries or relays, and products of other manufacturers which Takenaka markets.

### 2 《Scope of warranty》

If any defect is found during the warranty period. Takenaka will, at its option, repair or replace the defective product at the location of delivery. This warranty is void and of no effect if the product is subject to improper use or handling, improper maintenance, modification, repair made by persons not authorized by Takenaka or a lack of reasonable care. The warranty does not cover defects caused by the other product, reason including fire, flood, earthquake, lighting surge and other natural disasters.

- ① If the product is used inappropriately or used under inappropriate conditions that are not described in the instruction manual or specifications.
- ② If the defect is caused by improper maintenance, including a failure to replace consumable or periodical parts as described in the instruction manual or specifications.
- ③ If the defect is not directly caused by the warranted product.
- ④ If the products is modified or repaired by persons not authorized by Takenaka.
- ⑤ If the defect is caused by rough handling, dropping, or collision after the product is delivered.
- ⑥ If the defect could not be predicted from a technical viewpoint at the time Takenaka made the agreement for, manufactured, or installed the product.
- ⑦ If the defect is caused by a natural disaster such as a fire, flood, earthquake, lightning (including a lightning surge) and so on, or an accident such as an abnormal voltage that Takenaka is not responsible for.

The warranty provided here is only for the Takenaka product and does not cover any secondary damage caused by problems related to the product.

### 3 《Target of Warranty》

- (1) In case that the product is used in combination with other products or as a part of a system, Buyer should confirm the compatibility of the product to the application by relevant laws, decrees, standards and regulations.
- (2) This product is designed and manufactured for use in general industries. This warranty does not cover the application of the product to:
  - ① Nuclear power facilities including power station, incineration plant, public utilities including railway, vehicle and airway facilities, medical devices, amusement machines, safety devices and facilities that are governed by regulation of government or industrial organization.
  - ② Facilities that may cause danger or serious effects on human life and assets.
  - ③ Utilities like electricity, gas or water facilities. Facilities that are required 24 hour continuous operation.
  - ④ Outdoor use or use in improper conditions or environment.
  - ⑤ Other facilities which requires broad and detailed consideration concerning safety and reliability equivalent to the above.

This warranty may cover these application in case that Takenaka is notified about the application of the product before sale and Buyer approves the compatibility and the specifications of the product by written agreement and / or by providing required safety measures.

## 12 DISCLAIMER

- This product is designed to detect a presence or passage of an object. This product does not have any function to prevent accidents, death or injuries.

Takenaka will assume no responsibility for damages or losses resulting from accidents or disasters caused by a failure of the product, complete wiring or installation or any act that does not follow the instruction manual.
- Earthquakes, lightning (including lightning surges), fires that we are not responsible for, acts or incidents caused by third parties, intentional or accidental misuse, or usage under other abnormal conditions.
- Any secondary damage caused by the usage, faulty operation, or malfunction of the product like suspended operation or malfunction of a connected device or system, damage to a device, loss of profit, interruption of business, corruption or loss of memory contents, cost of restoration, etc.
- Misuse, failure related to maintenance, installation or deinstallation, or failure to follow the contents of the instruction manual.
- Any malfunction (including false alarm or lost alarm) caused by the combination with a connected device or software over that we have no control.
- The responsibility of Takenaka is limited to the extent of repair or replacement of the product. The expenses we are liable for will not exceed the original product cost.