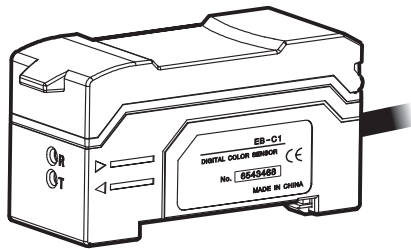# Intelligent digital color sensor
# EB - C1 series' manual



- Patent No:201420375898.6
- Thank you for your purchase.
- Please read this manual carefully before using it and keep the manual for easy access at any time.

## Please read the following information carefully

⚠ **Warning**

- EB-C1 is only used to detect the subject matter and shall not be used for safety circuit ,to ensure personal safety;
- EB-C1 has no explosion-proof structure and must not be used in situations containing any combustible gas, liquid or powder;
- EB-C1 is a DC type sensor , using AC power will cause explosions or fire;
- Please do not look directly at the LED beam.

## Part name

■ Amplifier module
  EB−C1

Display screen (please refer to P3 display screen for details)

Manual control button
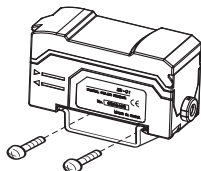
Mode button

Set button
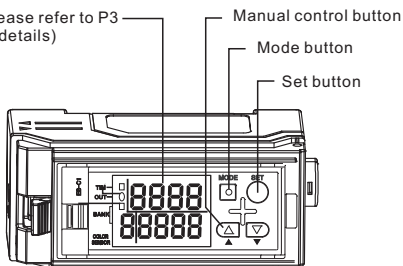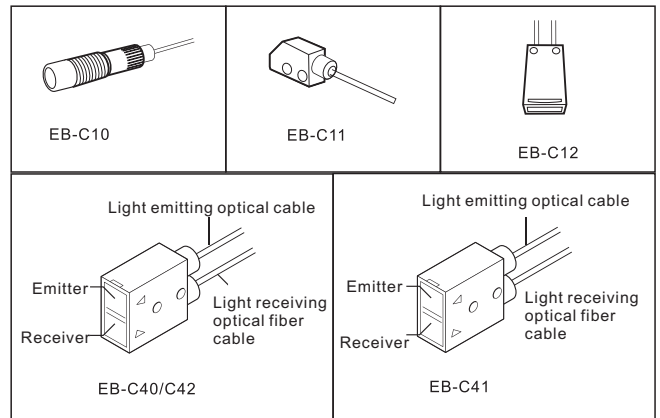


## Install the amplifier module

■ IInstalled on the DIN track

Hook the bottom of the amplifier module to the DIN track. Push the amplifier module in the direction of arrow 1, at the same time, push downward the direction of arrow 2. To remove the amplifier module, push the fuselage in the direction of arrow 1 and lift the body in the direction of arrow 3 at the same time.
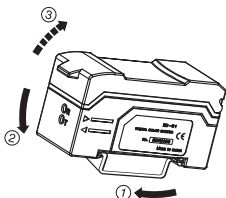
■ IInstall on a bracket

Install the amplifier module according to the supplied mounting rack shown in the figure.



---

■ **Sensor head**
EB−C10/C11/C12/C40/C41/C42



| EB-C10 | EB-C11 | EB-C12 |
| --- | --- | --- |

| Light emitting optical cable | Light emitting optical cable |
| --- | --- |
| Emitter — Receiver — Light receiving optical fiber cable | Emitter — Receiver — Light receiving optical fiber cable |
| EB-C40/C42 | EB-C41 |

## Accessory

■ Amplifier module

- Mounting bracket 1
- Instruction manual1

Along with the EB - C1



## Specification

■ Amplifier

|  | EB−C1 | EB−C1P |
| --- | --- | --- |
| Light source | Red LED, Green LED, Blue LED | |
| Reaction time | 300μs（HSP）/ 1ms（FINE） | |
| Indicator light | Output: Red LED<br>External synchronous input: Blue LED<br>Match rate/receive light intensity: LED(Red)<br>Set value: LED(Green) | |
| Error display | | |
| Correction methods | Single points/two points correction | |
| Differential identification model | | |
| Output mode selection | Match output: open when object is in line with record color<br>Mismatch output: when the object color is different from the record color | |
| External synchronous input | No voltage input, reaction speed: maximum 500us | |
| External calibration input | No voltage input, input reaction time: minimum 20ms | |
| Record color selection | 8 database selection (external input or key operation)<br>No voltage input, input reaction time: minimum 20ms | |
| Control output | NPN collector open: maximum 40VDC (maximum 100ma)<br>Residual voltage: maximum 1.0V | |
| Protection circuit | Reverse electrode protection (power), overcurrent protection (output), overvoltage (output) | |
| Power | 12~24VDC+/-10%, Pulse (P - P) : maximum 10% | |
| Current consumption | Maximum 75mA | |
| Environmental photometric | Incandescent light: up to 5000lux<br>White light: up to 10000lux | |
| Ambient temperature | -10~55℃ | |
| Relative humidity | 35~85% | |
| Vibration resistance | 10~55HZ,1.5mm, X,Y,Z double amplitude, 2 hours each | |
| Impact resistance | 500m/s goes in X,Y, Z, 3 times in each direction | |
| Shell material | Polycarbonate | |
| Weight (with 2m cable) | About 115g | |

■ **Sensor head**

| Type | Reflection | | | | | |
|---|---|---|---|---|---|---|
| | Adjustable small type | Small tests can be adjusted | Long distance detection | Long distance detection | Small points of light | Regional beam |
| Type No | EB–C10 | EB–C11 | EB–C40 | EB–C42 | EB–C41 | EB–C12 |
| Detection distance | 10~30mm | 3~15mm | 70+/-20mm | 60+/-10mm | 16+/-4mm | 5~20mm |
| Minimum spot diameter | Diameter 0.9~3.5mm | Diameter 0.9~1.5mm | Diameter 6mm | Diameter 2mm | Diameter 1mm | — |
| Minimum bending radius | R25mm | | R25mm | | R15mm | R25mm |
| Protection class | IP40 | | IP67 | | | — |
| Ambient temperature | -40~+70℃,no freeze | | | | | |
| Relative humidity | 35~85%,no freeze | | | | | |
| Fiber length | 2m (Free cutting) | 1m | 2m (Free cutting) | | | |
| Shell material | Lens case: aluminum Fiber housing: stainless steel | | Polycarbonate, Optical fiber: plastic | | | |
| Weight | About 5g | About 13g | About 27g | | | About 19g |

## Installation sensing head

■ The external light
High-frequency lighting equipment, such as the optical fiber sent by a fluorescent lamp converter, will detect errors when it enters or reflects into the emitter. In this case, the position of the sensor should be used to change the sensor.
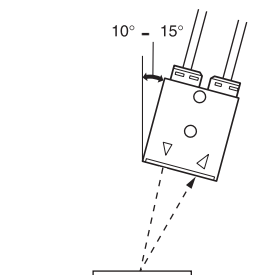


Cover board
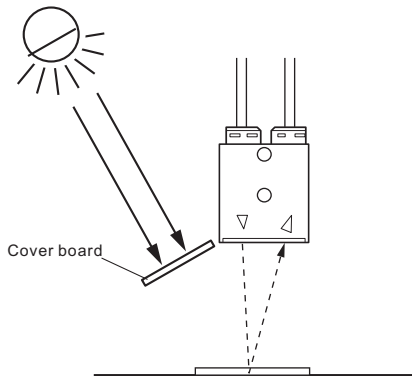
■ The subject matter moves and sensor bearing



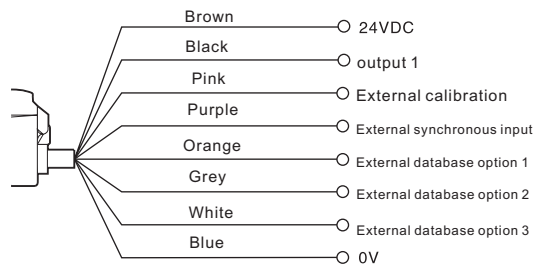Direction of movement          Direction of movement
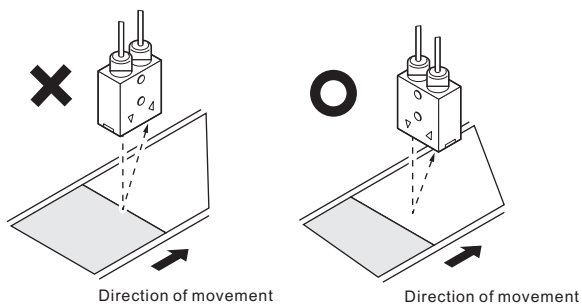
■ When examining a metal surface or smooth subject matter

If the subject has a metal or smooth surface, the tuning/identification will fail. To detect such a subject, the sensor head should be tilted about 10~15 degrees.
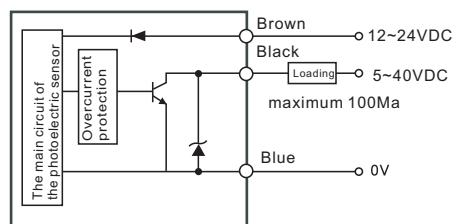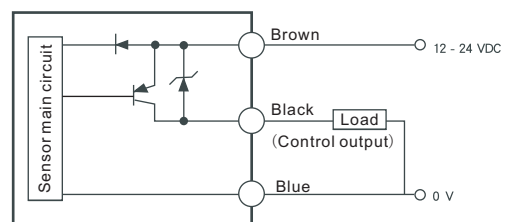


10° - 15°

## Input/output circuit diagram

■ Connection diagram



| Brown | 24VDC |
| Black | output 1 |
| Pink | External calibration |
| Purple | External synchronous input |
| Orange | External database option 1 |
| Grey | External database option 2 |
| White | External database option 3 |
| Blue | 0V |

■ **NPN Output circuit diagram**



Brown — 12~24VDC
Black — 5~40VDC
maximum 100Ma
Blue — 0V

■ **PNP Output circuit diagram**



Brown — 12 - 24 VDC
Black (Control output) — Load
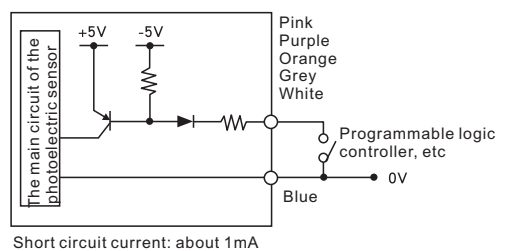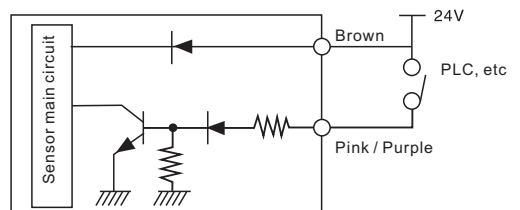Blue — 0 V

■ **Input circuit**

External synchronous input
External calibration input
External database option1~ 3
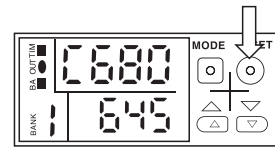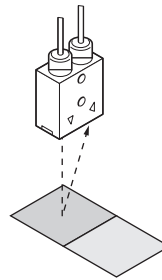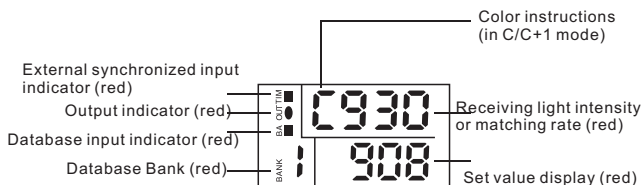Specific connection mode refer to the following connection diagram

EB–C1



+5V   -5V
Pink
Purple
Orange
Grey
White
Programmable logic controller, etc
0V
Blue

Short circuit current: about 1mA

EB–C1P



24V
Brown
PLC, etc
Pink / Purple

## Test mode

| Mode | Instruction | Sensitivity setting method |
|---|---|---|
| C mode | Test the subject matter by color composition (red, green, blue) | Please refer to page 3 |
| C+1 mode | The subject matter is detected according to the composition of the colors (red, green, blue) and light intensity (the number of light received) | |
| Super1 mode | Test the subject matter according to the light intensity (the number of light received) | Please refer to page 4 |

### ■ Display



- External synchronized input indicator (red)
- Output indicator (red)
- Database input indicator (red)
- Database Bank (red)
- Color instructions (in C/C+1 mode)
- Receiving light intensity or matching rate (red)
- Set value display (red)

## The operation steps of using C/C+1 mode

### ■ Display instructions

Match rate display screen     Received light intensity / power mode display panel



- Match rate
- Set the value according to MODE
- Received light intensity
- Power mode (response time)
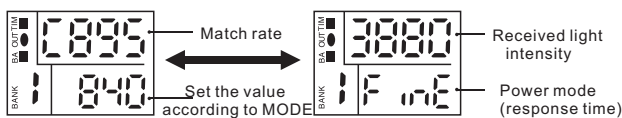
Select the display channel: press the MODE (mode) button and at the same time press the UP or DOWN button.

Matching rate
Display the degree of consistency between the subject matter that is tuned as a reference and the color of the subject matter in the current test.
Set range: 0 to 999 (the greater the value, the higher the matching rate)

Set value
It is shown that the degree of consistency between the current color of the subject matter and the target color of the tuning can be judged to be the same color.

Received light intensity
Display the amount of light that is currently accepted

Power mode (response time)
Display the current selected power mode

## Setting sensitivity

### ■ Single point tuning (test specified single color)

The color is used as the reference object to be placed in the beam focus position of the emitted light. Press the set button once.

- ■ The setting value is green.



### ■ 2 point tuning (used to distinguish two kinds)

1、The color is used as the reference object to be placed in the beam focus position of the emitted light. Press the set button once.

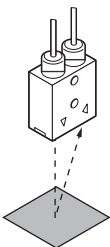- ■ On the set value monitor, set is displayed as green.



2、Place the subject matter whose color needs to be distinguished. Press the set button once.

- ■ The setting value is green.

Note: if the sensitivity is not sufficient, the set value monitor will display the green "---".



## Fine-tune the sensitivity

### ■ Fine-tune the sensitivity by changing the set value

The larger the set value, the more strict the detection is, the smaller the set value is, the rougher the detection is.

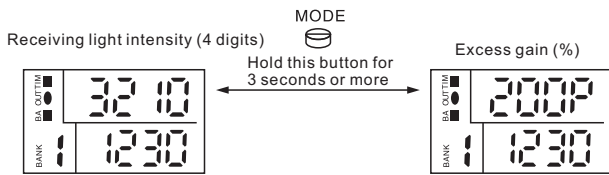To change the set value (shown in green digits), please press the UP or DOWN button.
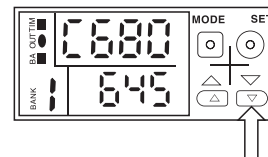


## Allow color to be uneven

In single-point tuning, the sensor continues to sample while holding down the SET button. The sampling color setting is judged as the same color.
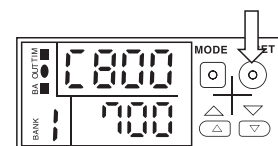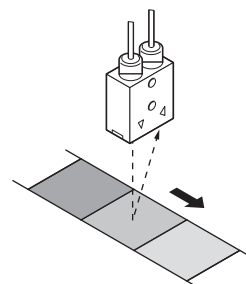
## The operation steps of using SUPER I mode

### ■ Display specification

Receiving light intensity (4 digits)

MODE

Hold this button for 3 seconds or more

Excess gain (%)



■ Redundant gain display

By converting the set value to 100P (%) convert to the light.
• Obtain a stable LIGHT state of 100P (%) or above.
• Obtain a stable DARK state of 90P (%) or above.
Use the UP/DOWN button to show the enable sensitivity mediation.

■ Receive light intensity display

By defining a maximum of approximately 4000, the receiving light is strong by 4 digits.
The maximum/minimum value of the fiber module is different.
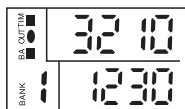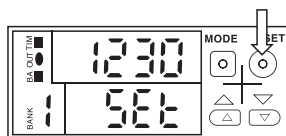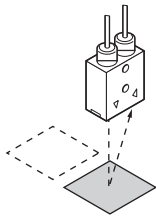
■ Set value display

Display the current set value. Use the UP/DOWN button to show the enable sensitivity mediation. The maximum/minimum value of the fiber module is different.
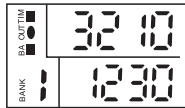
### Setting sensitivity

#### ■ 2 point tuning (basis)

1. Use its color as the reference object to be placed in the beam focus position of the emitted light. Press SET button once.
On the SET value monitor, SET is shown as green.



2. Press the set button once when there is no subject matter.
The setting value is green.

Note: if the sensitivity is not sufficient, the set value monitor will display the green "---".

#### ■ Set maximum sensitivity

1. Hold the set button only for 3 seconds when there is no subject matter.

2. Check the SET button when the object crosses the optical axis.

#### ■ When the SET button is pressed, the object passes through the optical axis.

1. When the SET button is pressed, the object passes through the optical axis.

2. After checking the SET flash, release the SET button.



---
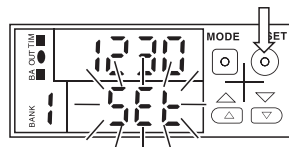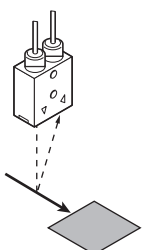
■ Location tuning (positioning of the subject matter)

1. Press the set button when there is no subject matter.
On the set value monitor, set is shown as green.
2. Place the subject matter where you want it. Hold the SET button for at least three seconds.
3. After checking the SET, release the SET button.
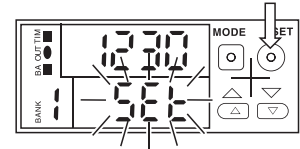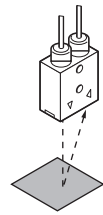


### Fine-tune the sensitivity

■ Fine-tune the sensitivity by changing the set value
To change the set value (shown in green digits), please press the UP or DOWN button.
The maximum/minimum value of the fiber module is different.
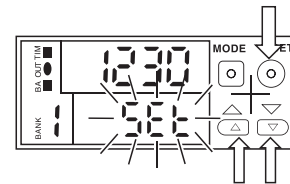


### Other functions

■ Boot self-inspection
EB-C1 is used to self-check the digital tube characters on the screen, and the display screen is displayed from top to bottom --- and the self-check time is 3S.

■ Change the channel
According to the inspection mode, sensitivity can be set for each channel in the following quantities.
C/C+1MODE：Eight channels   Super I MODE：Eight channels
The steps to select the display channel are as follows:
Hold the MODE button while pressing the UP or DOWN button.



■ Display specification



| CH channel | CH channel | CH channel | CH channel |
| 1 | 2 | 3 | 4 |
| CH channel | CH channel | CH channel | CH channel |
| 5 | 6 | 7 | 8 |
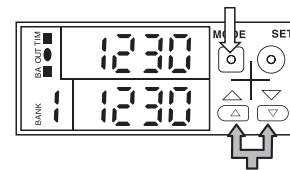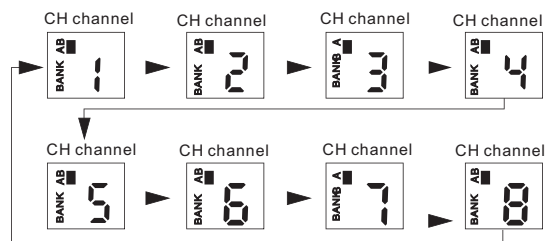
■ The key lock
Make keystroke operation unable to change the setting.
Hold down the UP button for at least three seconds while holding down the MODE key.
Cancellation method is the same as the lock .

■ Use external input to select record colors (database)
  1. Use external input to set sensitivity
  2. External database cable allows you to select 1-8 record colors.

Function table display

Hold down the MODE button for at least three seconds.

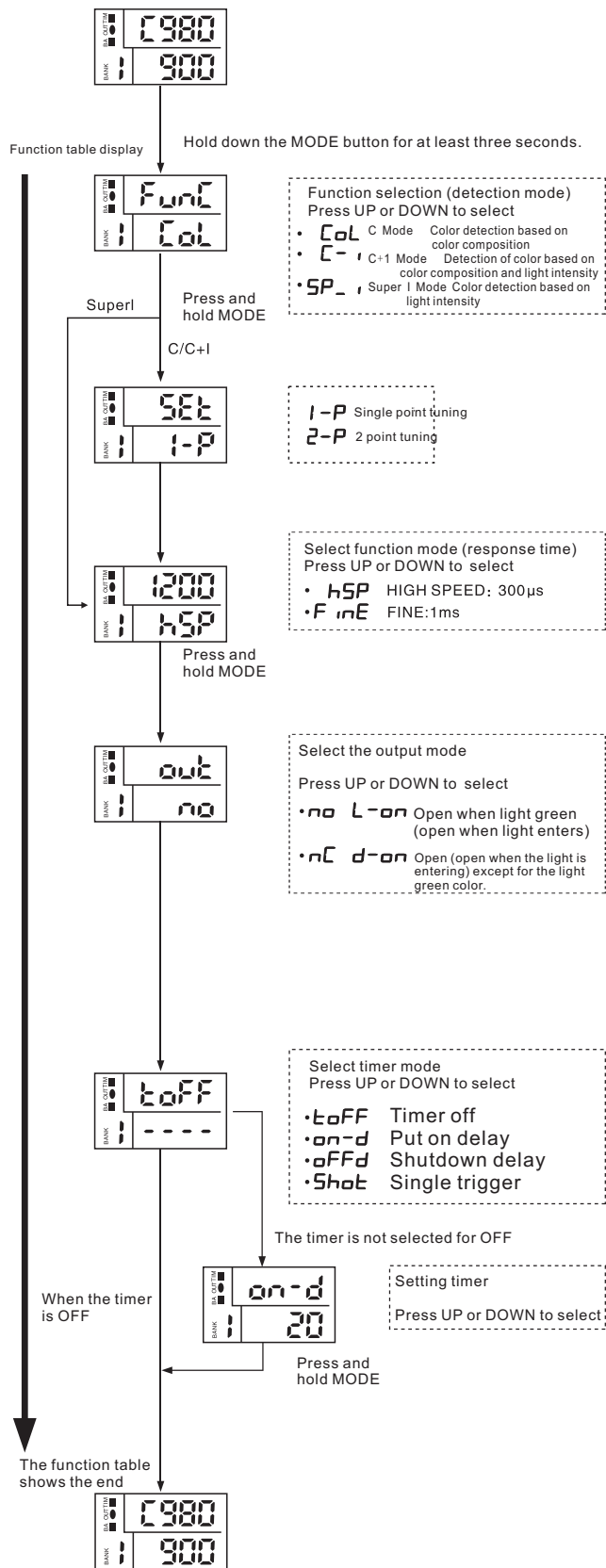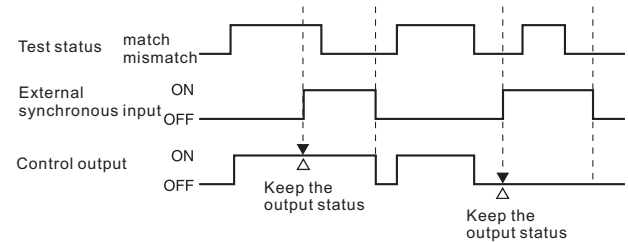**Function selection (detection mode)**
Press UP or DOWN to select
- **CoL** C Mode    Color detection based on color composition
- **C-i** C+1 Mode   Detection of color based on color composition and light intensity
- **SP_i** Super I Mode  Color detection based on light intensity

Superl

Press and hold MODE

C/C+I

**SEt** 1-P
- **1-P** Single point tuning
- **2-P** 2 point tuning

**Select function mode (response time)**
Press UP or DOWN to select
- **hSP**  HIGH SPEED：300μs
- **FinE**  FINE:1ms

Press and hold MODE

**Select the output mode**
Press UP or DOWN to select
- **no L-on** Open when light green (open when light enters)
- **nC d-on** Open (open when the light is entering) except for the light green color.

**Select timer mode**
Press UP or DOWN to select
- **toFF** Timer off
- **on-d** Put on delay
- **oFFd** Shutdown delay
- **Shot** Single trigger

The timer is not selected for OFF

When the timer is OFF

**on-d** 20
**Setting timer**
Press UP or DOWN to select

Press and hold MODE

The function table shows the end

Hold the MODE button for at least three seconds, and the function table will be displayed.
Each pattern can be configured from the menu.
If you want to exit the function table during the setting, press the MODE button again for at least three seconds.

Brown ——○ 24VDC
Blue ——○ 0V
Orange ——○ External database option 1
Grey ——○ External database option 2
White ——○ External database option 3

| Cable color / Database | Orange | Grey | White |
|---|---|---|---|
| 1 | X | X | X |
| 2 | ● | X | X |
| 3 | X | ● | X |
| 4 | ● | ● | X |
| 5 | X | X | ● |
| 6 | ● | X | ● |
| 7 | X | ● | ● |
| 8 | ● | ● | ● |

● : ○–⟋ ○
X : ○  ○

■ External synchronization
When the external synchronous input cable (purple) receives a signal (connected to 0V), the control output retains the state of that moment.

Test status  match / mismatch
External synchronous input  ON / OFF
Control output  ON / OFF
Keep the output status
Keep the output status

■ The following contents of the LED monitor display the error event.

● Use the following strategies to correct the problem.

| Error display | Cause | Strategy |
|---|---|---|
| ⊓⊓⊓⊓ | Insufficient light intensity received | ● Install the sensor within the specified detection distance.<br>● Check whether the cable is inserted into the deepest end of the sensor. (about 20 mm).<br>● Delay response time. |
| ⊔⊔⊔⊔ | Excessive amount of light received | ● Tilt the test head about 10~15 degrees. |

| Function (check function) | C Mode |
|---|---|
| Tuning mode | Single point tuning |
| Power mode (response time) | FINE |
| Output mode | NO(L-on) |
| Timer mode | OFF(timer value 20ms) |

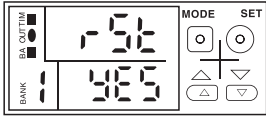■ Reset to default Settings

  1. Hold the MODE button and press the SET button five times.

  ● Monitor display
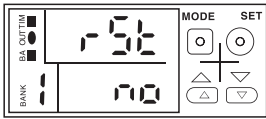
2. Press UP button.
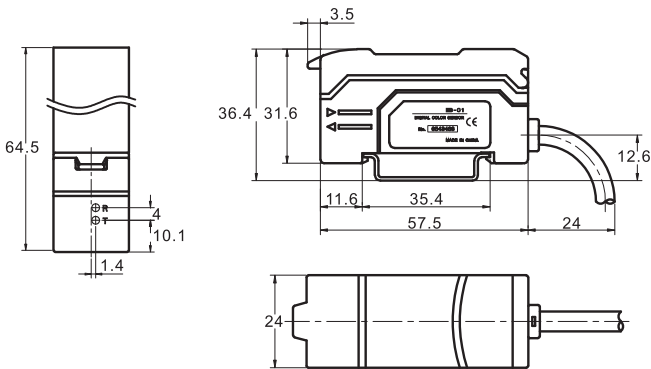
Monitor display "rSt/YES"



3. Press UP button.
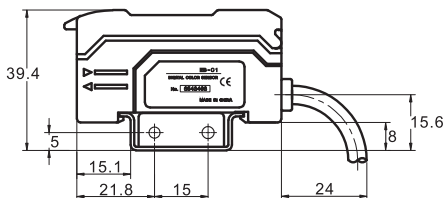The sensor returns to the default state.
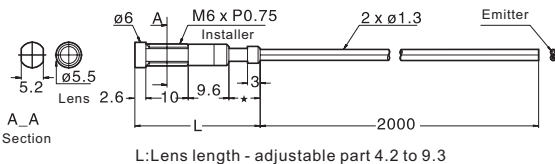To undo the reset, select NO in step 2 and hold the MODE button.

## Product size

### EB–C1
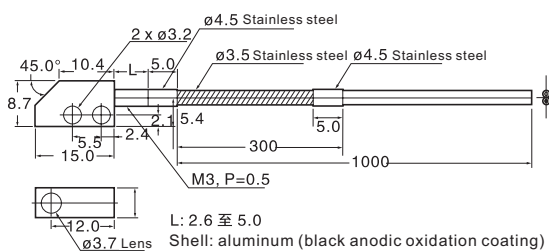


When attached mounting bracket (with EB-C1 amplifier)



### ■ Sensor head

### EB–C10
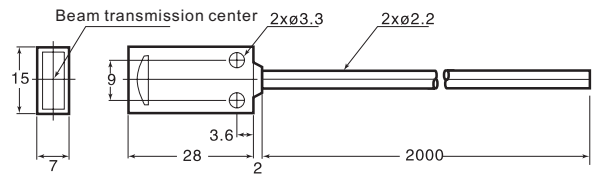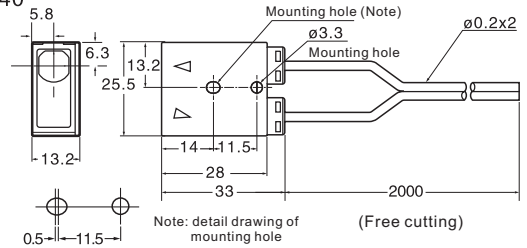


L:Lens length - adjustable part 4.2 to 9.3

### EB-C11



L: 2.6 至 5.0
Shell: aluminum (black anodic oxidation coating)
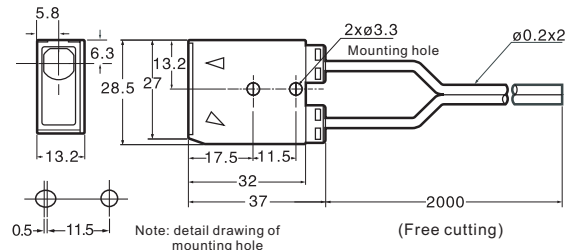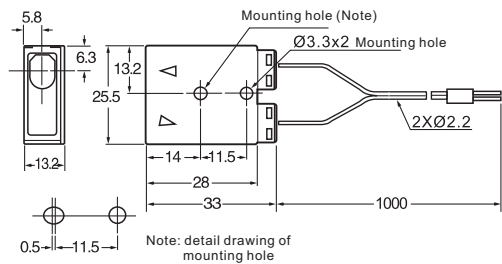
### EB-C12



Beam transmission center

### EB-C40



Note: detail drawing of mounting hole      (Free cutting)

### EB-C41



Note: detail drawing of mounting hole      (Free cutting)

### EB-C42



Note: detail drawing of mounting hole

## Safety precautions

Isolate the sensor cable from the power line or high voltage line.

Using these lines in the same pipeline will cause interference and will cause failure.

When a variety of colors enter the beam point, the identification will be divided, resulting in the color output preset color.

To extend the amplifier cable, the cross-sectional area of the cable used shall not be less than 0.3mm, and the length shall not exceed 100m.

When using commercially available light type stabilizer, ensure the grounding of the frame and grounding terminals.
Don't use the senor outdoors.

Even when the same color is detected, the value may be different due to the individual characteristics of the amplifier, the cable length of the sensor sensor and the different installation conditions.

## Product warranty

1.Expiration date
The warranty period is 1 year, starting from the date when the product is sent to the place designated by the purchaser.

2.Warranty coverage
 （i）We will repair the products free of charge if there is not a fault in the above warranty period.
Failure to comply with the requirements specified in the user technical manual, the incorrect operation or improper use of the user's technical manual.
The failure is not due to product defects, but is caused by the buyer's equipment or software design.
Failure caused by modification or repair by the purchaser.
We are not responsible for the warranty due to the failure caused by natural disasters such as fire, earthquake and flood, or abnormal voltage, etc.
（ii）Warranty scope is limited to the conditions as stipulated in article (1), for the purchasers' indirect losses caused by these equipment (equipment damage, loss of opportunity, loss of profit, etc.) or other loss, we will not undertake any responsibility.

3. In order to improve product performance, the contents of this manual may be modified without prior notice.