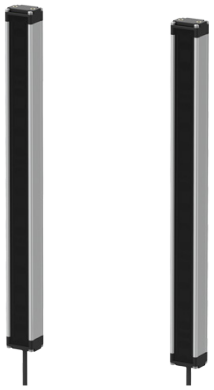
# Cross-Beam Area Sensors



# BWC Series

## PRODUCT MANUAL

**For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.**
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

## Features

- 3-point cross-beam type detection minimizes non-detection area
- Long sensing distance up to 7 m
- 14 configurations (number of optics: 4 to 20 / optical pitch: 40, 80 mm / detection area: 120 to 1,040 mm)
- Easy installation with installation mode function
- Mutual interference prevention function, self-diagnosis function
- Self-diagnosis output: sensing screen pollution and blocking of optical axis can be checked from external device (patent)
- Bright LED indicators on emitter and receiver
- Korean Railway Standard compliant (BWC80-14HD models)
- IP67 protection structure (IEC standard) (patent)

## Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

**⚠ Warning** Failure to follow instructions may result in serious injury or death.

**01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
Failure to follow this instruction may result in personal injury, economic loss or fire.

**02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.

**03. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.

**04. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.

**05. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.

**06. This product is not safety sensor and does not observe any domestic nor international safety standard.**
Do not use this product with the purpose of injury prevention or life protection, as well as in the place where economic loss maybe present.

**⚠ Caution** Failure to follow instructions may result in injury or product damage.

**01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.

**02. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.

**03. Do not use a load over the range of rated relay specification.**
Failure to follow this instruction may result in fire, relay broken, contact melt, insulation failure or contact failure.

## Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- 12 - 24 VDC⎓ power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use the product, 1 sec after supplying power. When using separate power supply for the sensor and load, supply power to sensor first.
- When using switching mode power supply to supply the power, ground F.G. terminal and connect a condenser between 0 V and F.G. terminal to remove noise.
- When connecting a DC relay or other inductive load, remove surge by using diodes or varistors.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category II

CE KC EAC

## Cautions during Installation

- Be sure to install this product by following the usage environment, location, and specified ratings. Consider the listed conditions below.
  - Installation environment and background (reflected light)
  - Sensing distance and sensing target
  - Direction of target's movement
  - Feature data
- If the installation environment has reflected light from the wall or floor, a interval distance of at least 0.5 m is required.
- When installing multiple sensors closely, it may result in malfunction due to mutual interference. Install it by referring to the interference protection and the installation method in the manual.
- Do not use in places where the light-receiving sensor is exposed to direct sunlight or where the ambient illumination is higher than the specification.
- Do not impact with a hard object or bend the cable excessively. That could decrease the product's water resistance.
- Use this product after the test. Check whether the indicator works appropriately for the positions of the detectable object.

## Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

**BWC ❶ - ❷ ❸**

**❶ Optical axis pitch**
Number: Optical axis pitch (unit: mm)

**❷ Number of optical axes**
Number: 4 to 20

**❸ Operation mode**
H: Light ON
HD: Dark ON

## Product Components

- Product × 1
- Instruction manual × 1
- Bracket A × 4
- Bracket B × 4
- Fixing bolt × 8

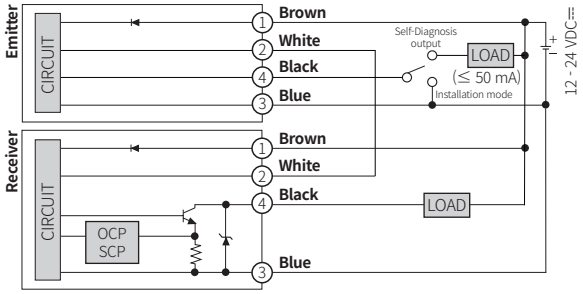
## Sold Separately

- Connection cable: CID4-□T(R) (1 set - emitter and receiver)

## Connections

- Pin number:

| 1 | 12 - 24 VDC⎓ | 2 | SYNC | 3 | 0 V | 4 | MODE (emitter) / OUT (receiver) |
|---|---|---|---|---|---|---|---|




- OCP (over current protection), SCP (short circuit protection)

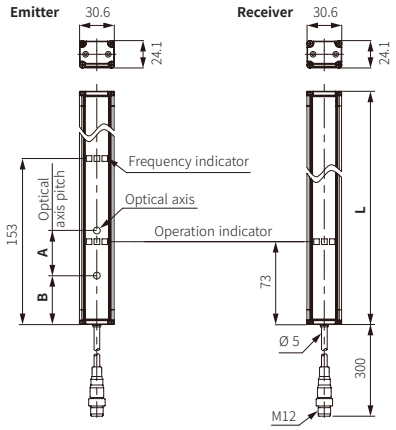
## Operation Indicator

| | | | | | |
|---|---|---|---|---|---|
| ☼ | ON | ◑ | Flashing at 0.5 sec interval | ▶◀ | Cross-flashing at 0.5 sec interval |
| ● | OFF | ◑◑ / ◑◑◑ | Flashing simultaneously at 0.5 sec interval | ▶▶▶ | Sequence flashing at 0.5 sec interval |

| Item | | Emitter indicator | | Receiver | | | Control output | |
|---|---|---|---|---|---|---|---|---|
| | | Green | Red | Green | Yellow | Red | Light ON | Dark ON |
| Power ON | | ☼ | ● | - | - | - | - | - |
| Break of emitter | | ▶▶ | ◀◀ | - | - | - | - | - |
| Break of light emitting element | | ▶ | ◀ | ▶ | ▶ | ▶ | OFF | OFF |
| Break of adjacent emitting element more than 2. | | ◑ | ◑ | ▶ | ▶ | ▶ | OFF | OFF |
| Installation mode | Normal installation | ● | ◑ | ☼ | ● | ◑ | OFF | OFF |
| | Hysterisis section | ● | ◑ | ● | ☼ | ◑ | | |
| | Abnormal installation | ● | ◑ | ● | ● | ◑ | | |
| Stable light ON | | ☼ | ● | ☼ | ● | ● | ON | OFF |
| Unstable light ON | | ☼ | ● | ☼ | ☼ | ● | ON | OFF |
| Unstable light OFF | | ● | ☼ | ● | ☼ | ☼ | OFF | ON |
| Stable light OFF | | ● | ☼ | ● | ● | ☼ | OFF | ON |
| Break of receiver | | - | - | ▶▶ | ● | ◀◀ | OFF | OFF |
| Over current | | - | - | ▶ | ◀ | ☼ | OFF | OFF |
| Synchronous line malfunction | | - | - | ◑ | ● | ◑ | OFF | OFF |
| Emitter failure (Time out) | | - | - | ◑ | ◑ | ◑ | OFF | OFF |
| Receiver failure (Time out) | | ◑ | ◑ | - | - | - | OFF | OFF |

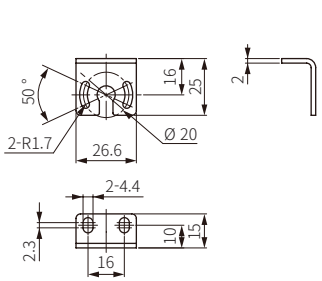
## Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.

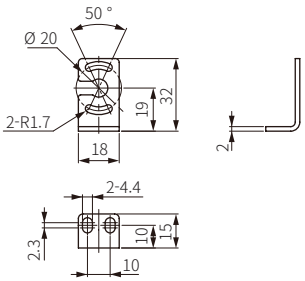



| Model | Number of optical axis | Sensing height | L | A | B |
|---|---|---|---|---|---|
| BWC40-04H/HD | 4 | 120 mm | 186 | 40 | 43 |
| BWC40-10H/HD | 10 | 360 mm | 426 | | |
| BWC40-12H/HD | 12 | 440 mm | 506 | | |
| BWC40-16H/HD | 16 | 600 mm | 666 | | |
| BWC40-18H/HD | 18 | 680 mm | 746 | | |
| BWC40-20H/HD | 20 | 760 mm | 826 | | |
| BWC80-14H/HD | 14 | 1,040 mm | 1146 | 80 | 83 |

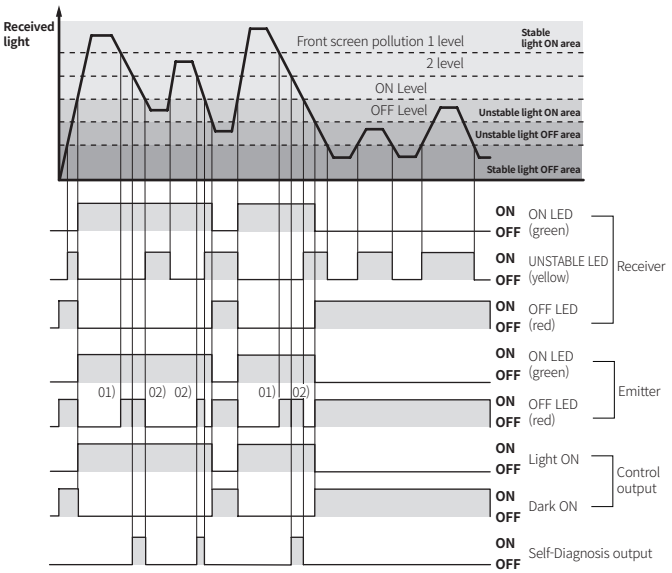
### ■ Bracket A




### ■ Bracket B




## Operation Timing Chart




01) [Self-diagnosis output] Front screen pollution level 1 / flashing at 1 sec interval
02) [Self-diagnosis output] Front screen pollution level 2, covering optical axis / flashing at 0.25 sec interval

## Installation Mode

This function is for stable installation.
For the first installation, enter installation mode.

1. Inputting 0 V to 4th terminal of emitter which is (black) MODE, supply power to the product to enter to the installation mode.
2. After entering installation mode, install the unit at the position where green LED of receiver operation indicator turns ON.
3. After installation, disconnect the 4th terminal of emitter (black) MODE and re-supply power to the unit.

## Specifications

| Model | BWC40-□□H | BWC40-□□HD | BWC80-14H | BWC80-14HD |
|---|---|---|---|---|
| **Sensing method** | Through-beam | | | |
| **Beam pattern** | 3-point cross beam netting type | | | |
| **Light source** | Infrared LED (850 nm modulated light) | | | |
| **Sensing distance** | 1.0 to 7.0 m | | | |
| **Sensing target** | Opaque material | | | |
| **Min. sensing target** | ≥ Ø 50 mm | | ≥ Ø 90 mm | |
| **Number of optical axes** | 4 / 10 / 12 / 16 / 18 / 20 | | 14 | |
| Sensing height | 120 to 760 mm | | 1,040 mm | |
| Optical axis pitch | 40 mm | | 80 mm | |
| **Response time** | ≤ 50 ms | | | |
| **Operation mode** | Light ON | Dark ON | Light ON | Dark ON |
| **Functions** | Self-diagnosis output (front screen pollution, covering optical axis), self-diagnosis | | | |
| **Installation mode** | YES | | | |
| **Interference protection** | Interference protection by frequency changing setting | | | |
| **Synchronization type** | Timing method by synchronous line | | | |
| **Indicator** | Emitter: Operation indicator (green, red), frequency indicator (green)<br>Receiver: Operation indicator (red, yellow, green) | | | |
| **Approval** | CE EAC | CE EAC | CE EAC | CE KC EAC |
| **Korean Railway Standards** | - | | | KRS SG 0068 |
| **Weight (packaged)** | ≈ 1.7 kg (≈ 2.1 kg) (based on BWC80-14H) | | | |

| | |
|---|---|
| **Power supply** | 12 - 24 VDC⎓ (ripple P-P: ≤ 10 %) |
| **Current consumption** | ≤ 100 mA |
| **Control output** | NPN open collector output |
| Load voltage | ≤ 30 VDC⎓ |
| Load current | ≤ 100 mA (self-diagnosis output: ≤ 50 mA) |
| Residual voltage | ≤ 1 VDC⎓ |
| **Protection circuit** | Reverse power protection circuit, output short overcurrent protection circuit |
| **Insulation resistance** | ≥ 20 MΩ (500 VDC⎓ megger) |
| **Noise immunity** | ± 240 V the square wave noise (pulse width: 1μs) by the noise simulator |
| **Dielectric strength** | 1,000 VAC~ 50 / 60 Hz for 1minute |
| **Vibration** | 1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours |
| **Shock** | 500 m/s² (≈ 50 G) in each X, Y, Z direction for 3 times |
| **Ambient illuminance** | Ambient light: ≤ 100,000 lx |
| **Ambient temperature** | -10 to 55 °C, storage: -20 to 60 °C (no freezing or condensation) |
| **Ambient humidity** | 35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation) |
| **Protection rating** | IP67 (IEC standard) |
| **Wire spec.** | Ø 5 mm, 4-wire, 300 mm |
| **Connector spec.** | M12 plug connector |
| **Material** | Case: AL, sensing part and indicator: acryl |

## Troubleshooting

| Malfunction | Cause | Troubleshooting |
|---|---|---|
| Non-operation | Power supply | Supply the rated power. |
| | Cable incorrect connection, or disconnection | Check the wiring connection |
| | Out of rated sensing distance | Use it within rated sensing distance. |
| Non-operation in sometimes | Pollution by dirt of sensor cover | Remove dirt by soft brush or cloth. |
| | Connector connection failure | Check the assembled part of the connector |
| Control output is OFF even though there is not a target object. | Out of the rated sensing distance | Use it within the rated sensing distance. |
| | There is an obstacle to cut off the emitted light between emitter and receiver. | Remove the obstacle. |
| | There is strong electric wave or noise generator such as motor, electric generator, or high voltage line, etc. | Put away the strong electric wave or noise generator. |
| Operation indicator displays break of emitter | Break of emitter | Contact our company. |
| Operation indicator displays break of receiver | Break of receiver | |
| Operation indicator displays break of light emitting element | Break of light emitting element | |
| Operation indicator displays emitter/receiver failure | Emitter or Receiver failure | Contact our company. |
| | Bad wiring connection of synchronous cable in emitter and receiver | Check the wiring connection in emitter and receiver. |
| Check the wiring connection in emitter and receiver. | Control output line is shorted out. | Check the wiring connection. |
| | Over load | Check the rated load capacity. |

## Function

### ■ Interference Protection (transmitted light frequency change)

When you install more than two products, there is a risk of mutual interference. Change the frequency to prevent this interference. To change transmitted light frequency, input 0V for over 1 second to 4th terminal, (black) MODE, in installation mode. Frequency type is displayed by frequency indicator.

| Transmitted light frequency | Frequency indicator (☼: ON, ●: OFF) | | |
|---|---|---|---|
| | Green 1 | Green 2 | Green 3 |
| **Frequency A** | ☼ | ● | ● |
| **Frequency B** | ● | ☼ | ● |
| **Frequency C** | ● | ● | ☼ |
| **Frequency D** | ☼ | ● | ☼ |
| **Frequency E** | ☼ | ☼ | ☼ |

### ■ Self-Diagnosis Output

This function outputs self-diagnosis signal, when front screen is contaminated with dust, optical axis is misaligned due to vibration, emitter is damaged due to the long-term usage, or light t is not received due to obstacle such as leaves and trash on the product. It operates in the operation mode, and you can check the status through an external device which is connected to 4th terminal of emitter, (black) MODE.

| Item | Emitter operation indicator | Control output | | Self-diagnosis output |
|---|---|---|---|---|
| | | Light ON | Dark ON | |
| **Front screen pollution level 1** | Red, flashing at 1 sec interval | ON | OFF | OFF |
| **Front screen pollution level 2, covering optical axis** | Red, flashing at 0.25 sec interval | ON | OFF | ON |

### ■ Self-Diagnosis

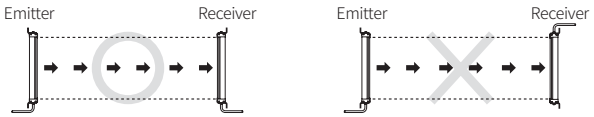
If there is checked malfunction during normal operation by regular self-diagnosis, control output turns OFF and operation indicator displays the state.
For more information, see the "Operation Indicator"

- Break of light emitting element
- Break of adjacent emitting element more than 2.
- Emitter failure
- Malfunction of synchronous cable
- Break of emitter
- Break of receiver
- Receiver failure

## Installations

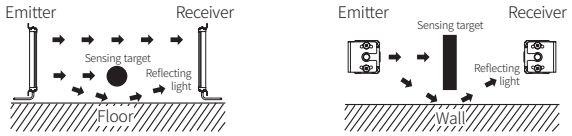
### ■ For direction of installation

Emitter and receiver should be installed in same up/down direction.




### ■ For reflection from the surface of wall and flat

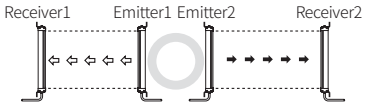
When installing it as below, the light reflected from the surface of wall and flat is not shaded. Please check whether it operates normally or not with a sensing target before using. (interval distance: ≥ 0.5 m)

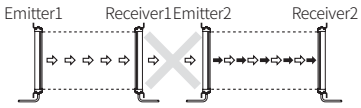


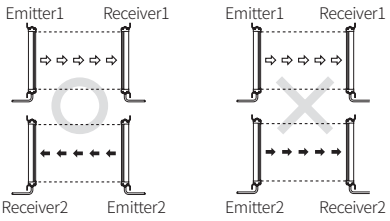

### ■ For protection of interference

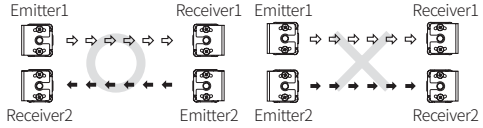
It may cause interference when installing more than 2 sets of the sensor. In order to avoid the interference of the sensor, please install as following figures and use the transmitted light frequency changing function.

- Transmission direction should be opposite between 2 sets.

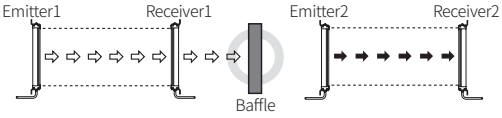


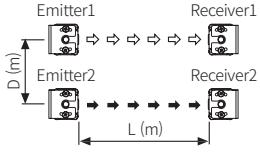




- Baffle should be installed between 2 sets.



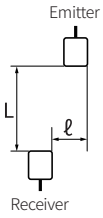

- It should be installed out of the interference distance.
  : It may be a little different based on installation environment.
  : Avoid using the unit in the place where the sensor is exposed directly to the fluorescent light with high speed start or high frequency.

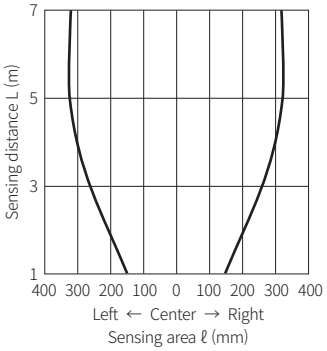



| L (sensing distance) | D (installation allowable distance) |
|---|---|
| 1 ~ 3 m | ≥ 0.4 m |
| ≥ 3 m | L × tan 8 ° = ≥ L × 0.14 |

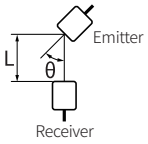
## Feature Data

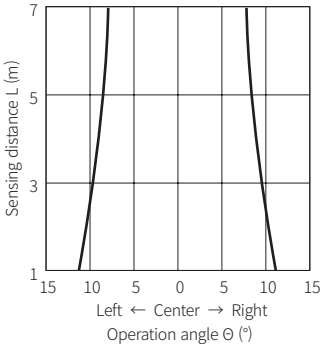
### ■ Parallel shifting characteristic



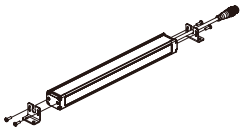

### ■ Angle characteristic



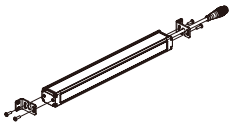




## Bracket Mounting

### ■ Bracket A

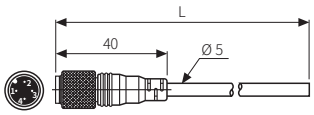


### ■ Bracket B



## Sold Separately: Connection Cable

- Connecting cable is as one set; each of emitter's and receiver's.




| Type | Model | L | Cable color |
|---|---|---|---|
| Emitter | CID4-□T | 3 / 5 / 7 / 10 / 15 m | Black |
| Receiver | CID4-□R | 3 / 5 / 7 / 10 / 15 m | Gray |


18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
**www.autonics.com | +82-2-2048-1577 | sales@autonics.com**