Autonics
Line Beam Mapping Sensor [CC-LINK]
BWML Series
INSTRUCTION MANUAL

CE KC

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.
⚠**Warning** Failure to follow these instructions may result in serious injury or death.
⚠**Caution** Failure to follow these instructions may result in personal injury or product damage.
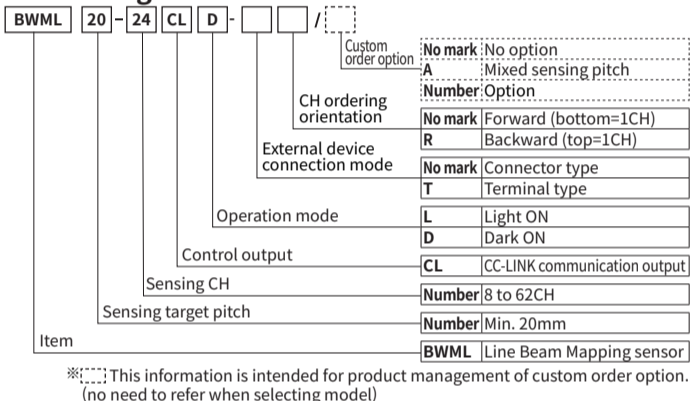
⚠ Warning

1. **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, fire or economic loss.
2. **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.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
4. **Check the color of cables before wiring.**
Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.
6. **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.
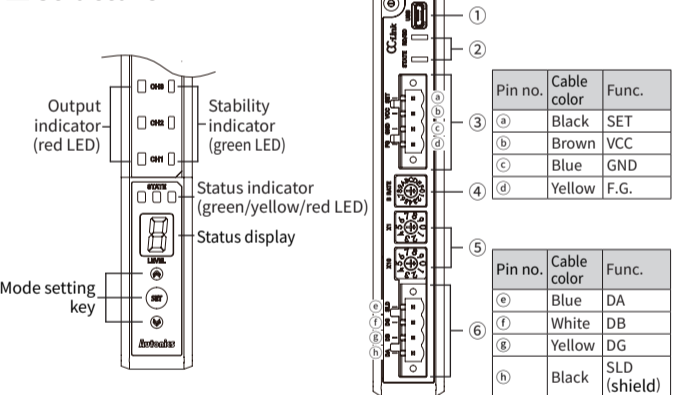
⚠ Caution

1. **Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
2. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.
3. **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.

■ Ordering Information

BWML | 20 | – | 24 | CL | D | – | □□ | / | □

- Custom order option
  - No mark: No option
  - A: Mixed sensing pitch
  - Number: Option
- CH ordering orientation
  - No mark: Forward (bottom=1CH)
  - R: Backward (top=1CH)
- External device connection mode
  - No mark: Connector type
  - T: Terminal type
- Operation mode
  - L: Light ON
  - D: Dark ON
- Control output
  - CL: CC-LINK communication output
- Sensing CH
  - Number: 8 to 62CH
- Sensing target pitch
  - Number: Min. 20mm
- Item
  - BWML: Line Beam Mapping sensor

※┄┄: This information is intended for product management of custom order option.
(no need to refer when selecting model)

■ Structure

Output indicator (red LED)
Stability indicator (green LED)
Status indicator (green/yellow/red LED)
Status display
Mode setting key

Pin no.	Cable color	Func.
ⓐ	Black	SET
ⓑ	Brown	VCC
ⓒ	Blue	GND
ⓓ	Yellow	F.G.

Pin no.	Cable color	Func.
ⓔ	Blue	DA
ⓕ	White	DB
ⓖ	Yellow	DG
ⓗ	Black	SLD (shield)

①USB port: This port is only for firmware upgrade, channel setting, and A/S.
　Do not use this port for the another purpose, or the product can malfunction.
②Comm. status indicator: It displays the communication status through LED.
③Power cable connector
④Comm. speed setting switch (B RATE): You can set CC-LINK communication speed.
⑤Comm. address setting switch: You can set CC-LINK address. (X10: 10¹, X1: 10⁰)
⑥CC-LINK comm. connector

■ Function

◎ **Background sensing mode**
This function instructs adjusting angle to install the product by displaying presence of the background object in the status display when installing the product. Use this function when sensing is unstable due to the reflection from the background object or any obstacle.
◎ **Installation guide mode**
This function displays whether the sensing target is in the stable position of the guide line when installing the product through the output indicator. Entering installation guide mode and pressing ◉ key starts teaching.
◎ **Sensing level setting**
This function sets sensitivity by dividing receiving light into 5 levels for stable sensing. Use this function when some of the channels shows low sensing level due to the bent glass plate or diffused reflection. Factory default is level 5.
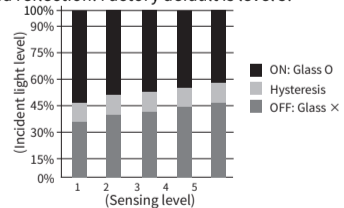
◎ **Output option**
After setting output option, press ◉ key to set additional option.

Output option (status display)	Description	Additional option	Output option (status display)	Description	Additional option
0	Returning to operation mode	—	4	Changing error output	R: A point / b: B point
1	Status display orientation	F: Forward / b: Backward	5	CC-LINK version	1: Ver 1.1 / 2: Ver 2.0
2	Channel ordering		6	CC-LINK station and points	1: 1 station 32 points / 2: 2 station 64 points
3	Operation mode	L: Light ON / d: Dark ON			

◎ **Self-diagnosis**
This function runs self-diagnose periodically in normal operation and displays the part in error at the status display when error occurs. (Refer to '■Operation Indicator'.)
· Channel interference alarm: Outputs alarm when interference from another sensing target and external object in a channel area.
· Disturbing light sensing alarm: Outputs alarm when the receiver received external light besides light from the emitter. When the amount of disturbing light is under the affective level, the product operates normally in disturbing light operation mode.
· Emitter/Receiver damage alarm: Outputs alarm when emitter/receiver is damaged due to the long-term usage of emitter/receiver elements or strong impact to the product.
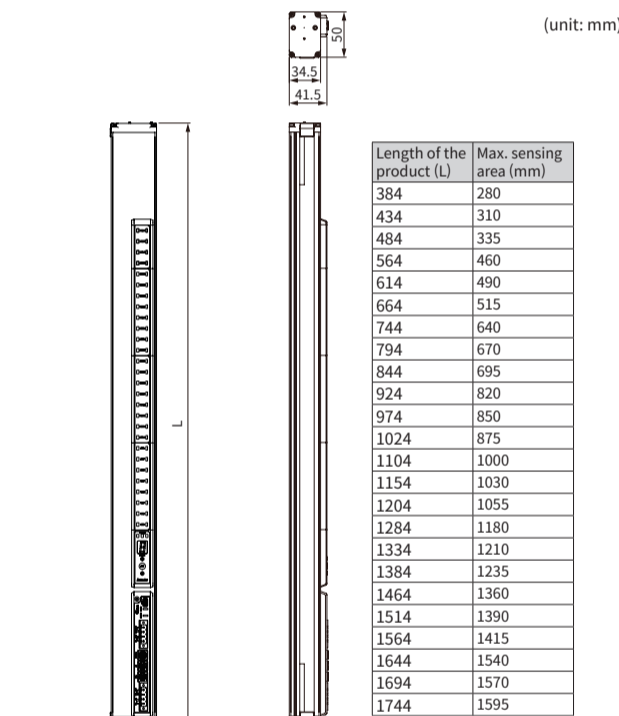
※The above specifications are subject to change and some models may be discontinued without notice.
※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).
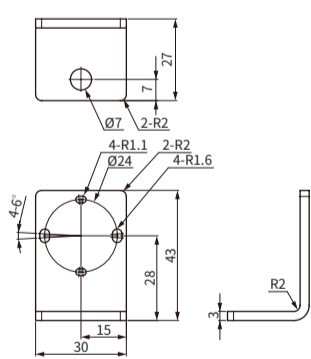
■ Specifications

Model	BWML-□-□CL□-□□/□	
Sensing type	Reflective type	
Sensing distance	95mm ±10mm	
Sensing target	Transparent or opaque glass plate	
Sensing area	280 to 1595mm	
Sensing target pitch[*2]	20mm to ordered specification	
Sensing CH[*1]	8 to 62CH	
CH ordering orientation	Forward (bottom=1CH) / Backward (top=1CH) (parameter setting)	
Beam pattern	Line beam type	
Power supply	24VDC⎓ (ripple P-P: max. 10%)	
Protection circuit	Reverse polarity protection	
Current consumption	Max. 1.0A	
Operation mode	Light ON/Dark ON (parameter setting)	
Response time	Max. 120ms	
Control output	Version	CC-LINK Ver 1.1 / CC-LINK Ver 2.0
	Type of Station	Remote Device station
	Extended cyclic	— / 1 time (single)
	Number of occupied stations	1 station 32 points module, 2 station 64 points module
	Transmission speed	156kbps/625kbps/2.5Mbps/5Mbps/10Mbps
	Max. number of connection[*2]	42 units
	Number of I/O points	1 station: 32 points (I/O allocation) / 2 station: 64 points (I/O allocation)
Noise immunity	The square wave noise by the noise simulator (voltage: 500V, period: 10ms, pulse width: 1us)	
Dielectric strength	· Between all power input terminals and F.G. terminal: 500VAC 50/60Hz for 1 min · Between communication input terminals and F.G. terminal : 1000VAC 50/60Hz for 1 min · Between power input terminals and communication input terminals : 1000VAC 50/60Hz for 1 min	
Insulation resistance	Over 20MΩ (at 500VDC megger)	
Vibration	1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	210m/s² (approx. 21G) in each X, Y, Z direction for 3 times	
Environ-ment	Allowable temp.	15 to 35°C, storage: -10 to 50°C
	Allowable humi.	35 to 55%RH, storage: 35 to 85%RH
Material	Case: aluminum, sensing part and indicator part: polymethyl methacrylate	
Accessory	Bracket A: 4, bracket B: 4, bolt: 8	
Protection structure	IP40 (IEC standard)	
Approval	CE, KC, CC-LINK	
Weight[*3]	Approx. 4.8kg (approx. 3.64kg) (based on BWML82-20CLL)	

※1: This product is order made.
※2: The number of connectable units = 16×A+54×B+88×C≤2304
　- A: remote I/O station, max. 64 units
　- B: remote device station, max. 42 units
　- C: local, intelligent station, max. 26 units
※3: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

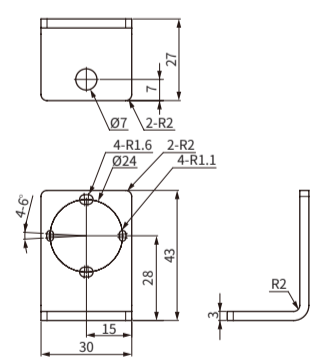## ■ Dimensions

(unit: mm)

Length of the product (L)	Max. sensing area (mm)
384	280
434	310
484	335
564	460
614	490
664	515
744	640
794	670
844	695
924	820
974	850
1024	875
1104	1000
1154	1030
1204	1055
1284	1180
1334	1210
1384	1235
1464	1360
1514	1390
1564	1415
1644	1540
1694	1570
1744	1595

※Max. sensing area = 20+{sensing target pitch×(the total number of sensing target-1)}
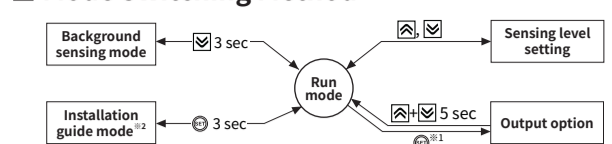
● Bracket A **● Bracket B**

■ Installation and Adjustment

①Install the right side of the sensing target with the bracket.
②Adjust the height of the product to the place where the first glass of the full cassette is aligned with the installation guide line.

Installation guide line
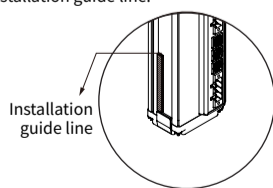
③Supply the power.
④Enter to the background sensing mode to detect background.
　If any background object is detected, reinstall the product, changing the installation angle.
⑤Finish installation, when all channels are turned on after placing full cassette.
⑥If all channels are not turned on, enter to the installation guide mode and adjust the product up and down. Return to the run mode and finish installation, when all channels are turned on.

※If there is disturbing light (fluorescent light) near the product, install the product vertically away from the disturbing light.
※Use the product only for sensing the glass under the 6.5 generation.
　If the product is used for sensing the glass under the 6.5 generation, the product can malfunction.

■ Mode Switching Method

Background sensing mode — ⊡⊡ 3 sec — Run mode — ⚠⚠ — Sensing level setting
Installation guide mode[*2] — ⊡⊡ 3 sec — Run mode — ⚠+⊡⊡ 5 sec[*1] — Output option

※1: When the status display is 0, press ◉ key to return to the run mode.
※2: Entering to the installation guide mode and pressing ◉ key starts teaching, and the product returns to the run mode after teaching completed.

■ Operation Timing Diagram
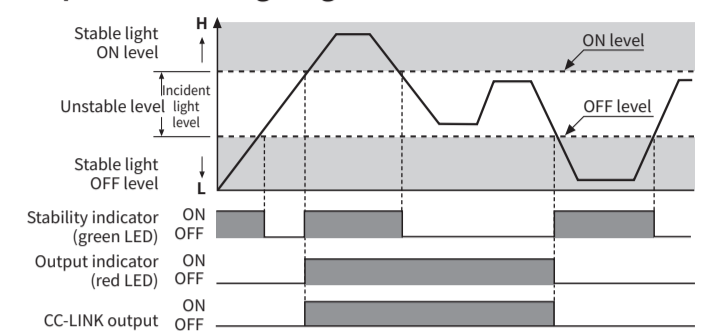
※The waveforms of 'Operation indicator' and 'CC-LINK output' are for Light ON. The waveforms are reversed for Dark ON.

■ CC-LINK Baud Rate and Address Setting

· For CC-LINK setting, communication speed of PLC Master and BWML should be the same.
· Address is available from 1 to 64 and it should not be duplicated.
· When changing CC-LINK setting, turn OFF the power of this unit and re-supply the power.

Setting		Setting range
B RATE	Baud rate	0: 156kbps, 1: 625kbps, 2: 2.5Mbps / 3: 5Mbps, 4: 10Mbps, 5 to F: not used
X10, X1	Address of unit	0: Master, 01 to 64: settable address, 65 to 99: not used / E.g.) To set 12 as address, set X10 to 1 and X1 to 2.

■ Operation Indicator

● CH indicator　　(☼: light ON, ●: light OFF, ◑: flashing at 0.5 sec interval)

Item	Output indicator (red LED)	Stability indicator (green LED)
Stable light ON	☼	☼
Unstable light ON	☼	●
Unstable light OFF	●	●
Stable light OFF	●	☼

● Status indicator

Item		Output indicator (red LED)	Stability indicator (green LED)	Status Green	Status Yellow	Status Red	Status display	Communication output
Normal operation		—	—	☼	●	●	Sensing level	—
Background sensing mode	Sensed	ON (all CHs)	OFF (all CHs)	●	●	☼	b	Outputting ON at All CHs, outputting 'H' at N+1
	Not sensed	OFF (all CHs)	ON (all CHs)	☼	●	●		Outputting ON at All CHs
Installation guide mode	Optical axis coinciding CH	ON (LED of the CH)	ON (all CHs)	☼	●	●	n	Outputting ON at All CHs
	Optical axis not coinciding CH	OFF (LED of the CH)		●	◑	●		
	While teaching	OFF (all CHs)		☼	●	●	E twice	Outputting ON at All CHs
	Teaching passed	Displaying result and flashing all CHs twice		☼	●	●	Flashing E twice	—
	Teaching failed	Flashing alternately passed/failed CH twice		●	●	◑	Flashing E twice	Outputting ON at All CHs, outputting 'H' at N+1
Channel interference error		Flashing alternately relevant CH at 0.5 sec interval	ON (all CHs)	☼	◑	●	—	Outputting ON at All CHs, outputting 'H' at N+1
Disturbing light sensing alarm		Flashing alternately even and odd CH at 0.5 sec interval	ON (all CHs)	◑	☼	☼	—	Outputting alternately even and odd CH, outputting 'H' at N+2
Emitter/ receiver damage alarm[*1]	Emitter damage	ON (damaged CH)	ON (emitter)	●	●	☼	b	Outputting 'H' at emitter/ receiver damaged CH, outputting 'H' at N+1
	Receiver damage	ON (CH 7, 8)	ON (re-ceiver)					
Comm. error	Product ↔ CH indicator	Flashing at 0.25 sec interval		◑	●	◑	E	Outputting ON at All CHs, outputting 'H' at N+1
	Product ↔ emitter/ receiver	Flashing (malfunctioning CH)	ON (CH 1)	☼	●	☼	C	

※1: If emitter and receiver are damaged at the same time, output of receiver is prior to that of emitter, and lower number of channel indicator is turned on.
The indicator of damaged channel is flashed at 0.25 second interval.
※N stands for all channel.

● Communication status indicator

CC-LINK		Comm. status indicator
STATE	RUN	ON (green LED)
RD/SD		OFF
STATE	Error	ON (red LED)
RD/SD		ON (red/green/yellow LED)

■ Troubleshooting

Malfunction	Cause	Troubleshooting
Not operate	Power	Supply the rated power.
	Cable cut, disconnection	Check the wiring.
Not operate in sometimes	Sensor cover pollution by dirt	Remove dirt by soft brush or cloth and set sensitivity again.
	Connector connection failure	Check the connection area of connector.
Output is ON without a target	Initial sensitivity setting goes wrong	Remove the cause and set sensitivity again.
	There is a strong electric wave or noise generator.	Put away motor, electric generator, or high voltage line.

■ Cautions during Use

1. Follow instructions in 'Cautions during Use'.
Otherwise, it may cause unexpected accidents.
2. 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. Use the product, 1 sec after supplying power.
When using separate power supply for the sensor and load, supply power to sensor first.
4. When using switching mode power supply to supply the power, ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
5. When connecting a DC relay or other inductive load, remove surge by using diodes or varistors.
6. Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise.
7. This unit may be used in the following environments.
　①Indoors (in the environment condition rated in 'Specifications')
　②Altitude max. 2,000m
　③Pollution degree 2
　④Installation category II