Double-Scan Mapping Sensors

BWM Series (CC-Link)

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

- Stable glass substrate detection with using double scan method (patent)
- Sensing distance: glass G size +30 %
- Customized models available
  : sensing channels (4 to 62 channels), optical axis pitch (25 to 200 mm) (patent)
- Communication output: CC-Link (ver 1.1, 2.0), EtherCAT
- Easy installation with installation instruction mode
- Mutual interference prevention, bent optical axis alarm, 9-stage sensing level setting, emitter error alarm
- Bright status indicators on slave units

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.
- 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

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
- 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.

BWM	❶	-	❷	❸	❹	-	❺	❻

❶ Optical axis pitch
Number: Optical axis pitch (≥ 25 mm)

❷ Sensing CH
Number: 4 to 62 CH

❸ Control output
CL: CC-Link

❹ Operation mode
L: Light ON
D: Dark ON

❺ External device connection mode
No-mark: Connector type
T: Terminal type

❻ CH ordering orientation
No-mark: Forward (bottom = 1 CH)
R: Backward (top = 1 CH)

Product Components

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

Sold Separately

- M17 connector cable: C5D617-□P

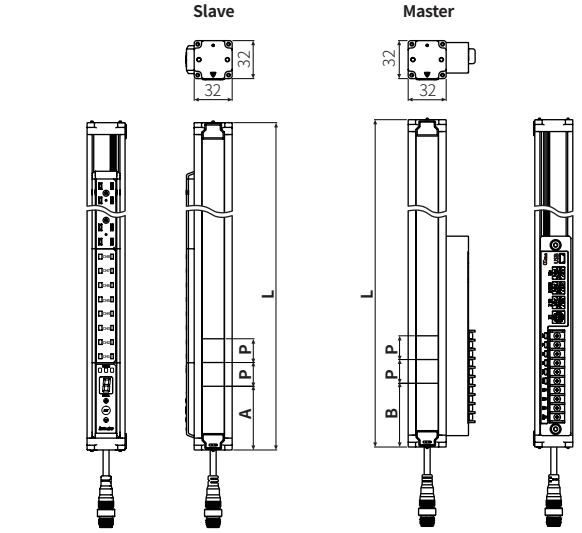
Output Connector

- 4-pin connector: TS04515B0000G, 6-pin connector: TS06515B0000G (5.08 mm pitch)
- Connector socket specification: Contact the manufacture for the socket and cable.

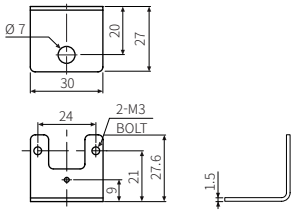
	Specifications	Manufacture
Connector socket (4-pin)	OQ0455510000G	ANYTEK
Connector socket (6-pin)	OQ0655510000G	ANYTEK

Dimensions

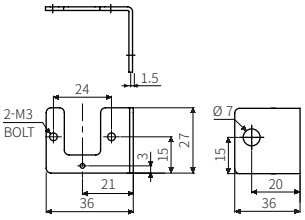
- Unit: mm, For the detailed drawings, follow the Autonics website.
- Length of the product can be different by its ordered specification. Refer to the followings.
  length of the product (L) = 105 + {optical axis pitch (P) × (sensing CH - 1)}
  A: 65 to 85 mm, B: 45 to 65 mm



■ Bracket A

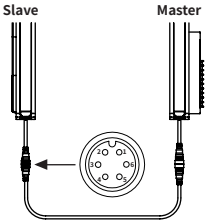


■ Bracket B



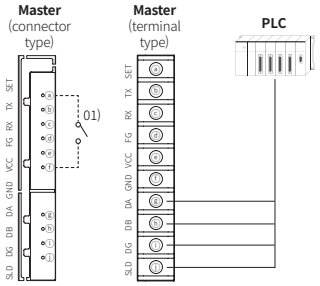
Connections

■ Synchronization line cable



Pin no.	Cable color	Function
1	Black	SET
2	White	TX
3	Orange	RX
4	Brown	+V
5	Blue	-V
6	Yellow	F.G.

■ Output part



Pin no.	Cable color	Function
ⓖ	Blue	DA
ⓗ	White	DB
ⓘ	Yellow	DG
ⓙ	Black	SLD (Shield)

01) Instead of [SET] key, you can use SET, GND terminal for teaching from external signal.

Specifications

Model	BWM
Sensing method	Through-beam
Beam pattern	Double scan type
Light source	Infrared LED (850 nm modulated light)
Sensing distance	Glass + 30 %
Sensing target	Transparent or opaque glass plate
CH ordering orientation 01)	Forward (bottom = 1 CH) / Backward (top = 1 CH)
Sensing CH 01)	4 to 62 CH
Optical axis pitch 01)	25 to 200 mm
Response time	≤ 120 ms
Operation mode 01)	Light ON / Dark ON
Function	Installation guide mode, sensing level setting, optical axis misalignment alarm (low light intensity alarm), emitter damage alarm, self-diagnosis
Interference protection	Interference protection by transmission frequency selection
Synchronization type	Timing method by synchronous line
Indicator	Output indicator (red), stability indicator (green), status indicator (green, yellow, red)
Approval	CE KC 02) CC-Link
Weight (packaged)	≈3.2 kg (≈ 5.3 kg) (based on BWM82-24CLD-T)

01) This product is order made.
02) Please refer to the website for KC certification model.

Power supply	24 VDC⎓ (ripple P-P: ≤ 10 %)
Current consumption	Master: ≤ 200 mA, slave: ≤ 150 mA
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC⎓ megger)
Noise immunity	The square wave noise by the noise simulator (voltage: 500 V, period: 10 ms, pulse width: 1 us)
Dielectric strength	Between the charging part and the case : 500 VAC~ 50 / 60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	210 m/s² (≈ 21 G) in each X, Y, Z direction for 3 times
Ambient illumination	Light bulb: 5,000 lx, semiconductor: 5,000 lx
Ambient temperature	15 to 35 °C, storage: 15 to 35 °C (no freezing or condensation)
Ambient humidity	35 to 85 %, storage: 35 to 85 % (no freezing or condensation)
Cable spec.	Ø 5 mm, 6-wire, 250 mm
Connector spec.	M17 plug connector
Output connector spec.	Connector type: 4-pin, 6-pin connector (5.08 mm pitch) / terminal type: 10-pin terminal
Material	Case: AL / ABS, sensing part and Indicator part: PMMA

Communication Interface

■ CC-Link

Control output	CC-Link
Version	CC-Link Ver 1.1 / CC-Link Ver 2.0
Association approval	CC-Link
Type of station	Remote Device Station
Extended cyclic	CC-Link Ver 1.1: - / CC-Link Ver 2.0: 1 time (single)
Number of occupied stations	1 station 32-point module, 2 station 64-point module
Transmission speed	156 kbps / 625 kbps / 2.5 Mbps / 5 Mbps / 10 Mbps
Max. number of connection 01)	42-unit
Number of I/O points	1 station: 32-point (I/O allocation), 2 station: 64-point (I/O allocation)

01) 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

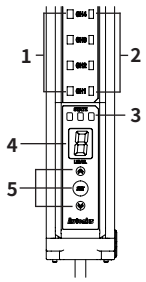
CC-Link Baud Rate and Address Setting

- For CC-Link setting, communication speed of PLC Master and BWM 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 it.
- Press [▲+SET+▼] key in the run mode and enter to the CC-Link setting mode to set the version and the number of occupied station.
  - The number of occupied station: status display 5, 1 (station 1), 2 (station 2)
  - Version: status display C, 1 (version 1.1), 2 (version 2.0)

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

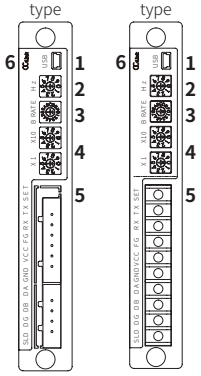
Unit Descriptions

■ Slave



1	Output indicator (red)
2	Stability indicator (green)
3	Status indicator (green, yellow, red)
4	Status display
5	Mode setting key

■ Master

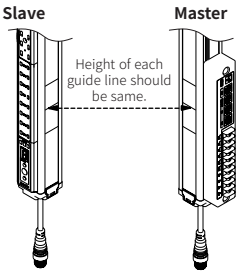


1	USB port: This port is only for firmware upgrade, run mode change, and A/S. Do not use this port for the another purpose, or the product can malfunction.
2	Frequency setting switch (Hz): This switch is for setting mutual interference prevention function.
3	Comm. speed setting switch (B RATE): You can set CC-Link communication speed.
4	Comm. address setting switch: You can set CC-Link address. (×10: 10^1, ×1: 10^0)
5	Output part
6	Comm. status indicator: It displays the communication status through LED.

Installation and Adjustment

- If optical axis are not coincident, yellow LED of the status indicator flashes at 0.5 sec interval, and output indicator (red, slave) and stable indicator (green, master) light off. Please readjust the position of Master and Slave and execute teaching again.
- Avoid using the unit in the place where the sensor is exposed directly to the fluorescent light with high speed start or high frequency.

01) Mount Master and Slave to face each other.
02) Place a glass plate at the guide line and adjust sensor height.
03) Touch [SET] key of Slave once without a glass plate and it enters installation guide mode. (shorting SET (gray) and GND (blue) has same function.)
04) Adjust Master and Slave up/down/right/left, and check the place where output/stability indicators flash (It displays coincidence of optical axis of all CHs.) and status indicator lights ON. Fix them at this place by tightening screws (tightening torque: 0.39 to 0.49 N m).
05) Pressing [SET] key for over 3 sec completes teaching and operates the device in RUN mode.



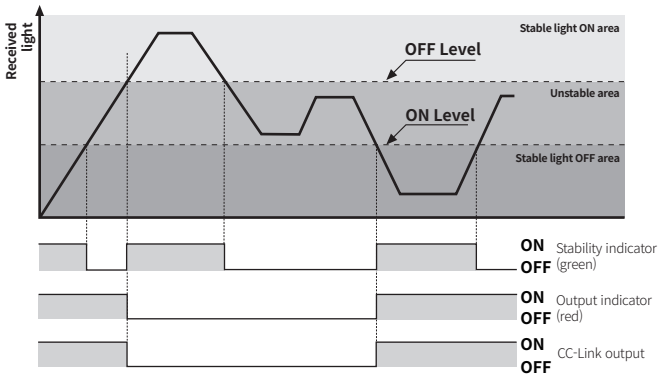
Mode Switching Method

RUN	[SET] 1 sec	→	Installation guide mode	[SET] 3 sec 01)	→	RUN
	[▲, ▼]	→	Sensing level setting	[▲, ▼]	→	
	[SET] 3 sec	→	Each channel sensing level setting 02)	[▲, ▼] 3 sec	→	
	[SET] 3 sec	→	CC-Link setting mode	[▲+SET+▼] 3 sec	→	

01) Entering to the installation guide mode and pressing [SET] key for 3 seconds starts teaching, and the product returns to the run mode after teaching completed.
02) When the status display is d, select channel to change using [▲, ▼] key and press key.
When number of channel is flashing, set sensing level using [▲, ▼] key.

Operation Timing Chart

■ Light ON mode



• In Dark ON mode, the waveforms are reversed.

Operation Indicator

☼	ON	●	OFF	◑	Flashing at 0.5 sec interval

■ [Slave] CH indicator

Item	Output (red)	Stability (green)	Item	Output (red)	Stability (green)
Stable light ON	●	☼	Stable light OFF	☼	☼
Unstable light ON	●	●	Unstable light OFF	☼	●
Teaching error	◑	◑			

■ [Slave] Status indicator

Item		CH indicator 01)	Status display	Operation indicator			CC-Link output 02)
				Green	Yellow	Red	
Normal operation		-	Sensing level	☼	●	●	-
Teaching error		Flashing (error channel)	-	●	◑	●	Outputting H at relevant CH, N+1
Malfunction of synchronous line (communication error)		Flashing (all LED)	0 to 9 or C	◑	◑	◑	Outputting H at N+1, Outputting H or L at N+2
Emitter damage		Flashing at 0.25 sec interval (LED of the CH)	n	◑	●	◑	Outputting H at 1 to N+1
Installation guide mode	Coinciding all CHs optical axis	Flashing (all CHs)	n	☼	●	●	Outputting H at all CHs
	Optical axis coinciding CH	Flashing (LED of the CH)		●	◑	●	
	Optical axis not coinciding CH	OFF (LED of the CH)		●	◑	●	
Teaching	Coinciding all CHs optical axis	ON (all CHs)	t	☼	●	◑	
	Optical axis coinciding CH	ON (LED of the CH)		●	◑	◑	
	Optical axis not coinciding CH	OFF (LED of the CH)		●	◑	◑	
Optical axis misalignment alarm		—	-	◑	☼	◑	Outputting H at N+2
Individual optical axis controlling mode		Flashing (relevant CH)	0 to 9	●	☼	☼	-
CC-Link setting change	No. of occupied station	Flashing (CH 1)	5	●	☼	☼	all CHs, Outputting N+1
	Version	Flashing (CH 2)	C	●	☼	☼	

01) Except normal operation, stability indicator (green) stands for the master and output indicator (red) stands for the slave.
02) N stands for all channel.

■ [Master] Communication status indicator

Item	Comm. status indicator
Connected status	Simultaneous ON (green, red)
Pre connection status	ON (green)
Error	ON (red)

Functions

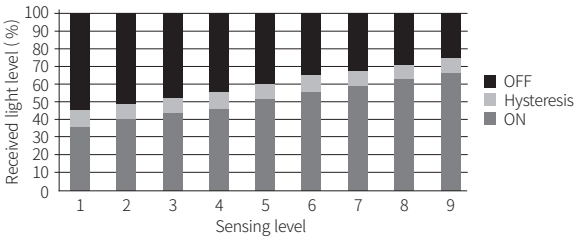
■ Installation guide mode

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 [SET] key starts teaching. When teaching, this function detects channels with unstable received light level and adjust received light level of all channels to the same level.

■ Sensing level setting

This function sets sensitivity by dividing received light into 9 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.

- You can change sensing level of each channel separately in the each channel sensing level setting mode.
- When using the sensing level setting function after setting each channel sensing level using the each channel sensing level setting mode, sensing level settings of each channel are reset.



■ Mutual interference prevention (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. Set the using the setting switch of the emitter / receiver.

Mark	FREQ.	Mark	FREQ.
0	A	3	D
1	B	4 ~ 9	Not used
2	C		

■ Optical axis misalignment alarm (low light intensity alarm)

Emitted light level can be reduced due to warped product or long-term usage. When nothing is detected during operation, this function checks received light level and outputs alarm at 'OFF level + ≈ 3 %' of received light level. Emitted light level is returned to the normal level with teaching.

■ Emitter damage alarm

Outputs alarm when emitter is damaged due to the long-term usage of emitter elements or strong impact to the product.

■ Self-diagnosis

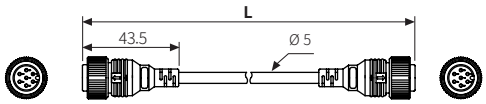
Mapping sensor is able to self-diagnose periodically in normal operation.
If error occurs, status indicator displays in which part error occurs.

- Malfunction of synchronous line
  : If there is malfunction of synchronous line, it displays error and outputs signal.

Troubleshooting

Malfunction	Cause	Troubleshooting
Non-operation	Power supply	Supply the rated power.
	Cable cut, disconnection	Check the wiring.
Non-operation 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.

Sold Separately: M17 Connector cable



Model	L
C5D617-7P	7 m
C5D617-10P	10 m
C5D617-15P	15 m