

Autonics Through-beam type Mapping Sensor [EtherCAT] BWM SERIES INSTRUCTION MANUAL



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.

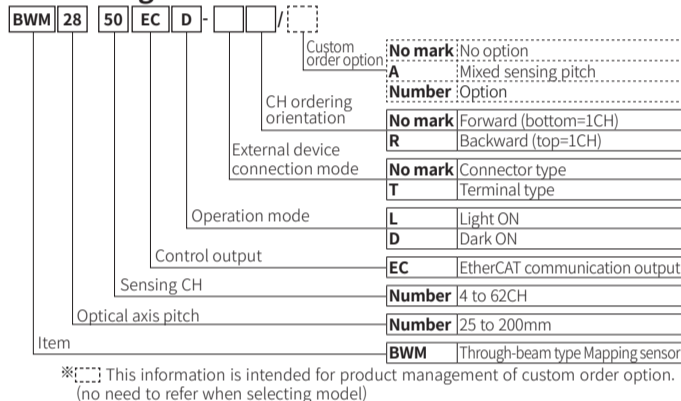
Warning

- 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.
- Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.
- 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.

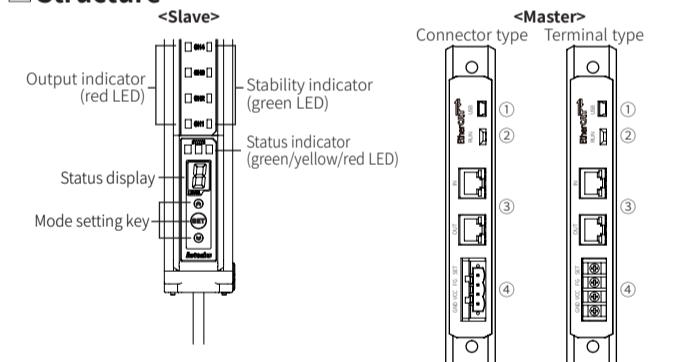
Caution

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



Structure



- 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.
- Comm. status indicator: It displays the communication status through LED.
- EtherCAT comm. input/output connector: It is with the communication status indicator which turns on or flashes according to the communication status.
- Power and synchronous cable terminal

Function

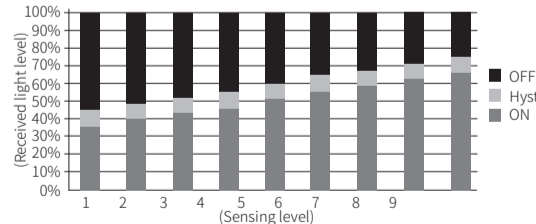
Installation guide mode

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.

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 receiving 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

When installing over 2 sensors closely, set the each frequency by the switch for frequency setting to prevent malfunction from mutual interference.

Mark	Freq.	Mark	Freq.
0	A	3	D
1	B	4 to 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' approx. 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 function

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

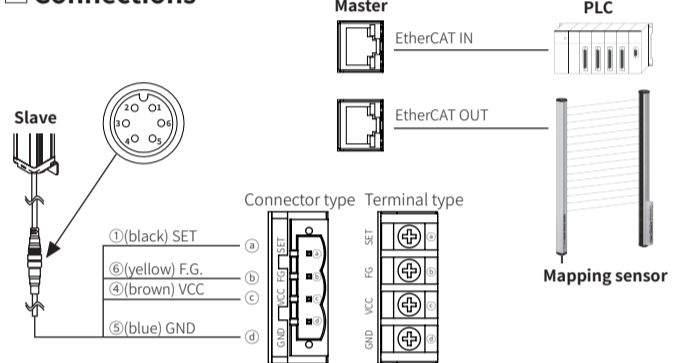
- (Refer to 'Operation Indicator')
 • Malfunction of synchronous line: If there is malfunction of synchronous line, it displays error and outputs signal.
 ※The above specifications are subject to change and some models may be discontinued without notice.
 ※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

Specification

Model	BWM
Sensing type	Through-beam type
Sensing distance	Glass +30%
Sensing target	Transparent or opaque glass plate
Optical axis pitch ^{※1}	25 to 200mm
Sensing CH ^{※1}	4 to 62CH
CH ordering orientation ^{※1}	Forward (bottom=1CH) / Backward (top=1CH)
Beam pattern	Double scan type
Power supply	24VDC= (ripple P-P: max. 10%)
Synchronization type	Synchronized by synchronous cable
Protection circuit	Reverse polarity protection circuit
Current consumption	Master: max. 200mA, slave: max. 150mA
Operation mode ^{※1}	Light ON/Dark ON
Response time	Max. 120ms
Light source	Infrared LED (850nm modulated)
Control output	Comm. protocol: EtherCAT protocol Transmission speed: 100Mbps Physical layer: 100BASE-TX (IEEE802.3u) Comm. medium: Over CATEGORY 5/E (must be shield cable) Connection method: Daisy chain Comm. range: Distance between nodes: max. 100M Address setting: Software (EtherCAT Master) Address range: 0 to 65,535 (16-bit)
Noise immunity	The square wave noise by the noise simulator (voltage: 500V, period: 10ms, pulse width: 1us)
Dielectric strength	Between all power input terminal and F.G. terminal : 500VAC 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/s ² (approx. 21G) in each X, Y, Z direction for 3 times
Environment	Allowable illum.: Max. 5,000lx of light bulb or semiconductor Allowable temp.: 15 to 35°C, storage: 15 to 35°C Allowable humi.: 35 to 85%RH, storage: 35 to 85%RH
Material	Case: aluminum, sensing part and Indicator part: polymethyl methacrylate
Connector	connector type: 4-pin connector (5.08mm pitch) terminal type: 4-pin terminal
Cable	Ø5mm, 6-wire, 250mm, M17 connector
Accessory	Bracket A: 4, bracket B: 4, bolt: 8
Approval	CE
Weight ^{※2}	Approx. 5.52kg (approx. 3.42kg) (base on BWM28-50ECD-T model)

- ※1: This product is order made.
 ※2: The weight includes packaging. The weight in parenthesis in for unit only.
 ※Environment resistance is rated at no freezing or condensation.

Connections



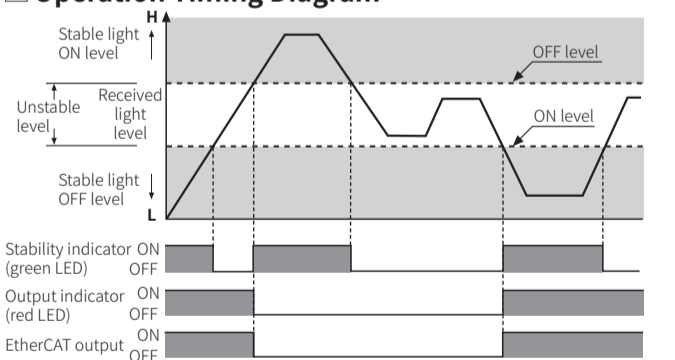
EtherCAT I/O DATA Structure

※HIGH: ON, LOW: OFF for bit status.

1st Word	Description	2nd Word	Description
I/O0 [BIT0]	CH1 status	I/O0 [BIT0]	CH17 status
I/O1 [BIT1]	CH2 status	I/O1 [BIT1]	CH18 status
I/O2 [BIT2]	CH3 status	I/O2 [BIT2]	CH19 status
I/O3 [BIT3]	CH4 status	I/O3 [BIT3]	CH20 status
I/O4 [BIT4]	CH5 status	I/O4 [BIT4]	CH21 status
I/O5 [BIT5]	CH6 status	I/O5 [BIT5]	CH22 status
I/O6 [BIT6]	CH7 status	I/O6 [BIT6]	CH23 status
I/O7 [BIT7]	CH8 status	I/O7 [BIT7]	CH24 status
I/O8 [BIT8]	CH9 status	I/O8 [BIT8]	ERROR output BIT
I/O9 [BIT9]	CH10 status	I/O9 [BIT9]	ALARM output BIT
I/O10 [BIT10]	CH11 status		
I/O11 [BIT11]	CH12 status		
I/O12 [BIT12]	CH13 status		
I/O13 [BIT13]	CH14 status		
I/O14 [BIT14]	CH15 status		
I/O15 [BIT15]	CH16 status		

※Since the above is based on the product of 24 CH, the number of I/O is changeable by product.
 EtherCAT I/O data structure consists of the number of CH+ERROR output BIT+ALARM output BIT.

Operation Timing Diagram

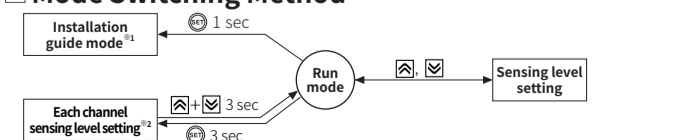


※The waveforms of 'Operation indicator' and 'EtherCAT output' are for Dark ON. The waveforms are reversed for Light ON.

Installation and Adjustment

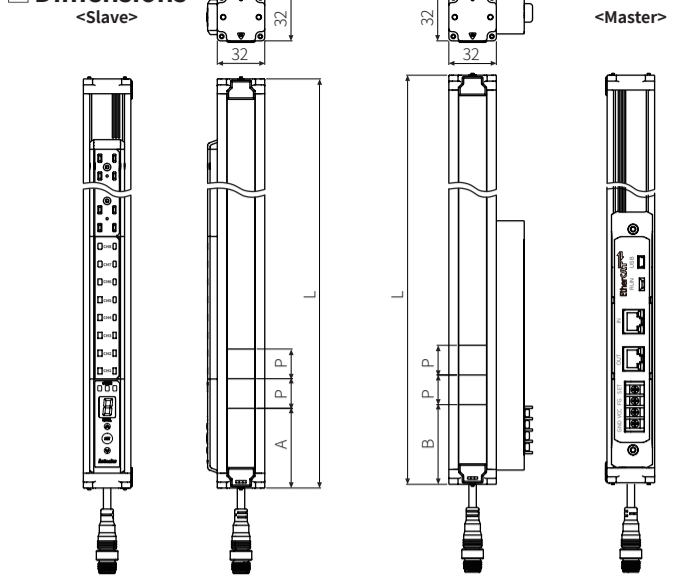
- Mount Master and Slave to face each other.
 - Place a glass plate at the guide line and adjust sensor height.
 - Touch **⏻** key of Slave once without a glass plate and it enters installation guide mode. (Shorting SET (gray) and GND (blue) has same function.)
 - Adjust Master and Slave up/down/right/left, and check the place where output/stability indicators flash (displaying 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).
 - Pressing **⏻** key for over 3 sec completes teaching and operates the device in RUN mode.
- ※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) flash at 0.5 sec interval. Please re-adjust 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.

Mode Switching Method



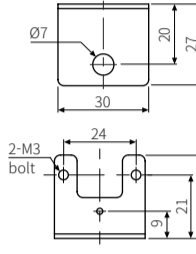
- ※1: Entering to the installation guide mode and pressing **⏻** key for 3 seconds starts teaching, and the product returns to the run mode after teaching completed.
 ※2: When the status display is **Ⓜ**, select channel to change using **⏻** key and press **⏻** key. When number of channel is direction, set sensing level using **⏻** key.

Dimensions

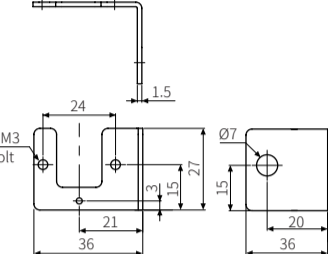


※Length of the product can be different by its ordered specification. Refer to the followings.
 length of the product (L) = 105+(optical axis pitch (P) × (sensing CH-1))
 A: 45 to 65mm, B: 65 to 85mm

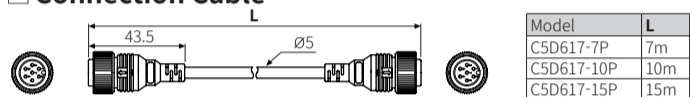
Bracket A



Bracket B



Connection Cable

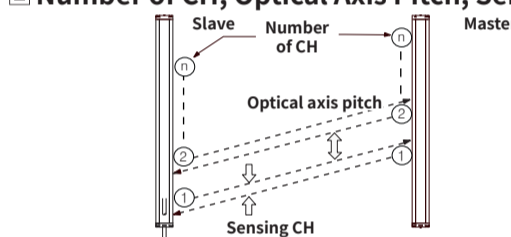


Output Connector

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

Specifications	Manufacture
Connector socket (4-pin)	OQ045510000G ANYTEK

Number of CH, Optical Axis Pitch, Sensing CH



Operation Indicator

● [Slave] CH indicator (⊙: light ON, ●: light OFF, ⊕: flashing at 0.5 sec interval)

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 (⊙: light ON, ●: light OFF, ⊕: flashing at 0.5 sec interval)

Item	CH indicator ^{※1}	Sensing level display part	Status	EtherCAT output
Normal operation	—	Sensing level	⊙ green / ⊕ yellow / ● red	—
Teaching error	Flashing (errored channel)	—	● ● ●	Outputting H at relevant CH, N+1
Malfunction of synchronous cable (communication error)	Flashing (all LED)	0 to 9 or ⊕	⊕ ⊕ ⊕	Outputting H at N+1, Outputting H or L at N+2
Low light intensity level	—	—	⊕ ⊕ ⊕	Outputting H at N+2
Emitter damage	Flashing at 0.25 sec interval (LED of the CH)	—	⊕ ● ●	Outputting H at 1 to N+1
Installation mode	Coinciding all CHs optical axis	Flashing (all CHs)	⊕ ● ●	—
	Optical axis coinciding CH	Flashing (LED of the CH)	● ● ●	—
	Optical axis not coinciding CH	OFF (LED of the CH)	● ● ●	Outputting H at all CHs
Teaching	Optical axis coinciding CH	ON (LED of the CH)	● ● ●	—
	Optical axis coinciding CH	OFF (LED of the CH)	● ● ●	—
Optical axis misalignment alarm	—	—	⊕ ⊕ ⊕	Outputting H at N+2
Individual optical axis control mode	Flashing (relevant CH)	0 to 9	● ⊕ ●	—

● [Master] Communication status indicator (⊙: light ON, ●: light OFF, ⊕: flashing at 0.5 sec interval)

Item	Comm. status indicator (green LED)	Item	Comm. status indicator (green LED)
Initial status	●	No connection	●
Pre operation status	Flashing at 200ms interval	L/A IN, L/A OUT	Flashing at 50ms interval
Safe operation status	Repeating 200ms ON and 100ms OFF	Disconnection in operation	⊕
Operation status	⊕		

- ※1: Except normal operation, stability indicator (green) stands for the master and output indicator (red) stands for the slave.
 ※N stands for all channel.

Troubleshooting

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

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 24VDC 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 0V 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. 2,000m
 - Pollution degree 2
 - Installation category II

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