# **BH Series INSTRUCTION MANUAL**

TCD210054AA

**Autonics** 

Thank you for choosing our Autonics product.

Read and understand the instruction manual and manual thoroughly before using the product.

For your safety, read and follow the below safety considerations before using. For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

Keep this instruction manual in a place where you can find easily.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice. Follow Autonics website for the latest information.

#### Safety Considerations

• Observe all 'Safety Considerations' for safe and proper operation to avoid hazards. • A 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.) ailure 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.

re to follow this instruction may result in explosion or fire. 03. Do not disassemble or modify the unit.

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

Failure to follow this instruction may result in fire.

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

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

#### 01. Use the unit within the rated specifications.

ilure 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. ailure to follow this instruction may result in fire

#### **Cautions during Use**

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- When connecting an inductive load such as DC relay or solenoid valve to the output, remove surge by using diodes or varistors.
- Use the product after 0.5 sec of the power input.

When using a separate power supply for the sensor and load, supply power to the sensor first

• 12-24 VDC --- power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.

• Wire as short as possible and keep it away from high voltage lines or power lines to prevent surge and inductive noise.

- When using switching mode power supply (SMPS), ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
- When using a sensor with a noise-generating equipment (e.g., switching regulator, inverter, and servo motor), ground F.G. terminal of the equipment. • This unit may be used in the following environments.
- Indoors (UL Type 1 Enclosure)
- Altitude max. 2,000 m
- Pollution degree 3
- Installation category II

## Product Components

Sensing type	Through-beam	Polarized retroreflective	Diffuse reflective	
Product components	Product, instruction manual			
Reflector	-	MS-2A	-	
Adjustment screwdriver	$\times 1$	×1	×1	
M18 fixing nut / Fixing cap	× 2	×1	×1	
Bracket	× 2	×1	×1	
M3 bolt / nut	× 4	× 2	× 2	

#### Ordering Information

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

Sensing type

T: Through-beam

# BH **0** - **2** D T

Sensing distance Number: Sensing distance (unit: mm)

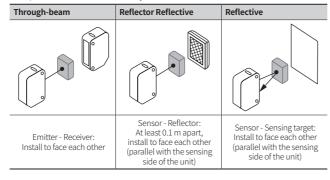
P: Polarized retroreflective Number+M: Sensing distance (unit: m) D: Diffuse reflective

# Sold Separately

- Reflector: MS Series
- Retroreflective tape: MST Series

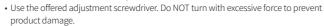
#### **Cautions during Installation**

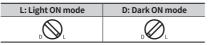
- Be sure to install this product by following the usage environment, location, and
- Installation environment and background (reflected light)
- Sensing distance and sensing target
- Direction of target's movement
- interference.
- correctly to prevent the twisting of the sensor's optical axis.
- the product's water resistance.
- Use this product after the test. Check whether the indicator works appropriately for the positions of the detectable object.



#### **Setting Operation Mode**

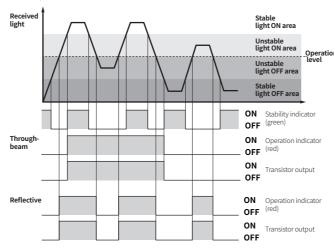
• Be sure to set the mode before power-on.





# **Operation Timing Chart**

#### Light ON mode



#### In Dark ON mode, the waveforms are reversed

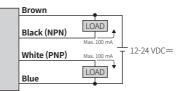
ation indicator and transistor output differ from the sensing method.

# Connections

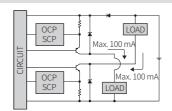
Emitter



# Receiver, Polarized retroreflective, Diffuse reflective type



Circuit



- OCP (over current protection), SCP (short circuit protection
- · If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the protection circuit.

## Sensitivity Adjustment

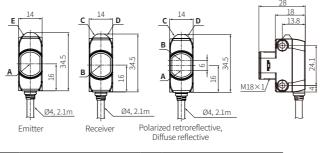
- Set the adjuster for stable Light ON area, minimizing the effect of the installation environment.
- Use the offered adjustment screwdriver. Do NOT turn with excessive force to prevent product damage.

STEP	Status	Description	-
<ul> <li>The st</li> </ul>	eps below are	e based on Li	ght ON mode.

STEP	Status	Description	
01	Received	+	Turn the adjuster from MIN ( $-$ ) to MAX ( $+$ ) sensitivity and check the position (A) where the operation indicator activates under the light ON area.
02	Interrupted	<sup>B</sup>	Turn the adjuster from (A) to MAX (+) and check the position (B) where the operation indicator activates under the light OFF area. If the operation indicator does NOT activate at the MAX (+, maximum sensitivity): MAX = (B).
03	-	A B	Set the adjuster at the mid position between (A) and (B) for optimal sensitivity.

#### Dimensions

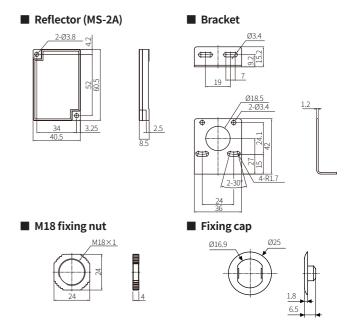
• Unit: mm, For the detailed drawings, follow the Autonics website.



Α	Optical axis of emitter	D	Stability indicator (green)
В	Optical axis of receiver	E	Power indicator (green)
С	Operation indicator (red)		

- specified ratings. Consider the listed conditions below

- Feature data
- When installing multiple sensors closely, it may result in malfunction due to mutual
- For installation, tighten the screw with a torque of 0.5 N m. Mount the brackets
- Do not impact with a hard object or bend the cable excessively. That could decrease



#### Specifications

Model	BH20M-TDT	BH4M-PDT	BH -DDT	
Sensing type	Through-beam	Polarized retroreflective	Diffuse reflectiv	/e
Sensing distance	20 m	4 m <sup>01)</sup>	300 mm <sup>02)</sup>	1 m <sup>03)</sup>
Sensing target	Opaque materials	Opague materials	-	
Min. sensing target	≥Ø20mm	≥Ø75mm	-	
Hysteresis	-	-	$\leq$ 20 % of sense	sing distance
Response time	$\leq 1  \text{ms}$			0
Light source	Red	Red	Red	Infrared
Peak emission wavelength	660 nm	660 nm	660 nm	850 nm
Sensitivity adjustment	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)	
Mutual interference prevention	-	YES	YES	
Operation mode	Light ON mode - Dark	ON mode selectable (Adjust	er)	
Indicator	Operation indicator (n	ed), stability indicator (green),	, power Indicator	(green) 04)
Approval	CE () 113	CE :@num [f][	CE (@muma [f][	
Unit weight (packaged)	≈ 120 g (≈ 190 g)	≈ 60 g (≈ 140 g)	≈ 60 g (≈ 130	g)
<ul><li>3) Non-glossy white paper</li><li>3) Only for the emitter</li></ul>				
Power supply	12-24 VDC== ±10 % (			
· ·	It depends on the ser	0.11		
Through-beam	Emitter: ≤ 20 mA, rec	0.11		
Through-beam Polarized retroreflective	Emitter: ≤ 20 mA, rec ≤ 30 mA	0.11		
Through-beam Polarized retroreflective Diffuse reflective (300 mm)	Emitter: $\leq 20$ mA, rec $\leq 30$ mA $\leq 30$ mA	0.11		
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m)	Emitter: ≤ 20 mA, rec ≤ 30 mA ≤ 30 mA ≤ 35 mA	reiver : ≤ 20 mA		
Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b>	$\begin{array}{l} \mbox{Emitter:} \leq 20 \mbox{ mA, rec}\\ \leq 30 \mbox{ mA}\\ \leq 30 \mbox{ mA}\\ \leq 35 \mbox{ mA}\\ \mbox{NPN open collector -} \end{array}$	0.11	eous output	
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage	$\begin{array}{l} \mbox{Emitter:} \leq 20\mbox{ mA, rec}\\ \leq 30\mbox{ mA}\\ \leq 30\mbox{ mA}\\ \leq 35\mbox{ mA}\\ \mbox{NPN open collector-}\\ \leq 26.4\mbox{ VDC==} \end{array}$	reiver : ≤ 20 mA	eous output	
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load current	Emitter: ≤ 20 mA, rec ≤ 30 mA ≤ 30 mA ≤ 35 mA NPN open collector ≤ 26.4 VDC== ≤ 100 mA	eiver : ≤ 20 mA	eous output	
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load current Residual voltage	Emitter: ≤ 20 mA, rec ≤ 30 mA ≤ 30 mA ≤ 35 mA NPN open collector- ≤ 26.4 VDC= ≤ 100 mA NPN: ≤ 1 VDC=, PNF	eiver : ≤ 20 mA PNP open collector simultan P: ≤ 2.5 VDC==		opcieruit
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load current Residual voltage <b>Protection circuit</b>	Emitter: ≤ 20 mA, rec ≤ 30 mA ≤ 30 mA ≤ 35 mA NPN open collector- ≤ 26.4 VDC== ≤ 100 mA NPN: ≤ 1 VDC=, PNF Reverse power protect	ever : ≤ 20 mA PNP open collector simultan P: ≤ 2.5 VDC≕ tion circuit, output short ove		on circuit
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load voltage Protection circuit Insulation resistance	Emitter: ≤ 20 mA, rec ≤ 30 mA ≤ 30 mA ≤ 35 mA NPN open collector- ≤ 26.4 VDC= ≤ 100 mA NPN: ≤ 1 VDC=, PNF Reverse power protec ≥ 20 MΩ (500 VDC=	eiver : ≤ 20 mA PNP open collector simultan PNP open collector simultan collector si collector simultan collector simultan collector simult		on circuit
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load current Residual voltage <b>Protection circuit</b> <b>Insulation resistance</b> <b>Dielectric strength</b>	Emitter: $\leq 20$ mA, rec $\leq 30$ mA $\leq 30$ mA $\leq 35$ mA NPN open collector- $\leq 26.4$ VDC= $\leq 100$ mA NPN: $\leq 1$ VDC=, PNF Reverse power protector $\geq 20$ M $\Omega$ (500 VDC= $1,000$ VAC $\sim 50/60$ Hz 1.5 mm double ampli	eiver : ≤ 20 mA PNP open collector simultan PNP open collector simultan collector si collector simultan collector simultan collector simult	ercurrent protecti	
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load current Residual voltage <b>Protection circuit</b> <b>Insulation resistance</b> <b>Dielectric strength</b>	$\begin{array}{l} \mbox{Emitter:} \leq 20 \mbox{ mA, rec} \\ \leq 30 \mbox{ mA} \\ \leq 30 \mbox{ mA} \\ \leq 35 \mbox{ mA} \\ \leq 35 \mbox{ mA} \\ \mbox{NPN open collector} \\ \leq 26.4 \mbox{ VDC} = \\ \leq 100 \mbox{ mA} \\ \mbox{NPN:} \leq 1 \mbox{ VDC} = , \mbox{PNF} \\ \mbox{Reverse power protee} \\ \geq 20 \mbox{ m} \mbox{ (500 \mbox{ VDC} = ) } \\ \mbox{1,000 \mbox{ VAC}} \sim 50/60 \mbox{ Hz} \\ \mbox{L5, mm double amplited inection for 2 hours} \end{array}$	ever : ≤ 20 mA PNP open collector simultan P: ≤ 2.5 VDC== tion circuit, output short ove megger) for 1 min tude at frequency of 10 to 55	ercurrent protecti Hz (for 1 min) in	
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Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load voltage Load current Residual voltage <b>Protection circuit</b> <b>Insulation resistance</b> <b>Dielectric strength</b> <b>Vibration</b> <b>Shock</b> <b>Ambient illuminance</b> <b>(receiver)</b>	$\begin{array}{l} \mbox{Emitter:} \leq 20 \mbox{ mA, rec}\\ \leq 30 \mbox{ mA}\\ \leq 30 \mbox{ mA}\\ \leq 35 \mbox{ mA}\\ \leq 35 \mbox{ mA}\\ \mbox{NPN open collector} \\ \leq 100 \mbox{ mA}\\ \mbox{NPN:} \leq 1 \mbox{VDC} \\ \approx 1 \mbox{VDC} \\ \approx 20 \mbox{ mA}\\ \mbox{NPN:} \leq 1 \mbox{VDC} \\ \approx 20 \mbox{ mA}\\ \mbox{NOV C} \\ \approx 20 \mbox{ mA}\\ \mbox{NOV C} \\ \approx 500 \mbox{ mA}\\ \mbox{Source} \\ \$	eiver : ≤ 20 mA PNP open collector simultan P: ≤ 2.5 VDC== tion circuit, output short ove megger) for 1 min tude at frequency of 10 to 55 each X, Y, Z direction for 3 tim	ercurrent protecti Hz (for 1 min) in nes	
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Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) Control output Load voltage Load current Residual voltage Protection circuit Insulation resistance Dielectric strength Vibration Shock Ambient illuminance (receiver) Ambient temperature Ambient humidity	$\begin{array}{l} \mbox{Emitter:} \leq 20 \mbox{ mA, rec} \\ \leq 30 \mbox{ mA} \\ \leq 30 \mbox{ mA} \\ \leq 35 \mbox{ mA} \\ \leq 35 \mbox{ mA} \\ \leq 35 \mbox{ mA} \\ \mbox{Emitters} \\ \leq 100 \mbox{ mA} \\ \mbox{PN:} \leq 1 \mbox{VDC}\mbox{=} \\ \leq 100 \mbox{ mA} \\ \mbox{PN:} \leq 1 \mbox{VDC}\mbox{=} \\ \geq 20 \mbox{ mA} \\ \mbox{Source} \\ \geq 20 \mbox{ mA} \\ \mbox{Source} \\ \m$	eiver : $\leq 20 \text{ mA}$ PNP open collector simultan PNP open collector simultan $2: \leq 2.5 \text{ VDC} =$ tition circuit, output short ove megger) for 1 min tude at frequency of 10 to 55 each X, Y, Z direction for 3 tim incandescent lamp: $\leq 3,000$ 40 to 70 °C <sup>(B)</sup> (no freezing or	ercurrent protecti Hz (for 1 min) in nes D k condensation)	
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (1 m) <b>Control output</b> Load output Load ourrent Residual voltage Protection circuit Insulation resistance Dielectric strength Vibration Shock Ambient illuminance (receiver) Ambient temperature Ambient humidity	$\begin{array}{l} \mbox{Emitter:} \leq 20\mbox{ mA, rec}\\ \leq 30\mbox{ mA}\\ \leq 30\mbox{ mA}\\ \leq 35\mbox{ mA}\\ \mbox{Sigma}\\ \leq 35\mbox{ mA}\\ \mbox{NPN open collector-}\\ \leq 264\mbox{ VDC=}\\ \leq 100\mbox{ mA}\\ \mbox{NPN:} \leq 1\mbox{VDC=}\\ 100\mbox{ mA}\\ \mbox{NPN:} \leq 1\mbox{VDC=}\\ 100\mbox{VDC=}\\ 20\mbox{ mA}\\ \mbox{NOV OC=}\\ 1000\mbox{ VAC-}\\ 500\mbox{ mA}\\ \mbox{Collector}\\ 1.5\mbox{ mdouble amplitdirection for 2 hours}\\ 500\mbox{ m/s}^2\mbox{ (so 06) in e}\\ \mbox{Sunlight:} \leq 11,000\mbox{ k},\\ -25\mbox{ to 55\mbox{ °C, storage:}}\\ 35\mbox{ to 85\mbox{ %RH, storage}} \end{array}$	eiver : $\leq 20 \text{ mA}$ PNP open collector simultan PNP open collector simultan $2: \leq 2.5 \text{ VDC} =$ tition circuit, output short ove megger) for 1 min tude at frequency of 10 to 55 each X, Y, Z direction for 3 tim incandescent lamp: $\leq 3,000$ 40 to 70 °C <sup>(B)</sup> (no freezing or	ercurrent protecti Hz (for 1 min) in nes D k condensation)	
Through-beam Polarized retroreflective Diffuse reflective (300 mm) Diffuse reflective (400 mm) Control output Load voltage Load voltage Protection circuit Insulation resistance Dielectric strength Vibration Shock Ambient illuminance (receiver) Ambient temperature Ambient humidity Protection rating	$\begin{array}{l} \mbox{Emitter:} \leq 20\mbox{ mA, rec}\\ \leq 30\mbox{ mA}\\ \leq 30\mbox{ mA}\\ \leq 35\mbox{ mA}\\ \mbox{MNPN open collector-}\\ \leq 26.4\mbox{VDC=}\\ \leq 26.4\mbox{VDC=}\\ \leq 26.4\mbox{VDC=}\\ \geq 20\mbox{ mA}\\ \mbox{NPN:} \leq 1\mbox{VDC=}\\ 1.000\mbox{VAC} \sim 50/60\mbox{UC=}\\ 1.000\mbox{VAC} \sim 50/60\mbox{UC=}\\ 1.5\mbox{ mm double amplid}\\ \mbox{direction for 2 hours}\\ 500\mbox{m/s}^2 (\approx 50\mbox{ G})\mbox{ in e}\\ \mbox{Sunlight:} \leq 11,000\mbox{ kx}, \mbox{-}25\mbox{to 55\mbox{ °C}, storage:}\\ \mbox{35 to 85\mbox{ %RH, storage}}\\ \mbox{IPC} (IEC\mbox{standard}) \end{array}$	eiver : ≤ 20 mA PNP open collector simultan PNP open collector simultan PNP open collector simultan Collector simultan exect 2.5 VDC= tion circuit, output short over megger) for 1 min tude at frequency of 10 to 55 each X, Y, Z direction for 3 tim incandescent lamp: ≤ 3,000 40 to 70 °C <sup>(1)</sup> (no freezing or : 35 to 85 %RH (no freezing or	ercurrent protecti Hz (for 1 min) in nes D k condensation)	
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01) UL approved ambient temperature 40°C