Autonics

• 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.) 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 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.
- 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.

Cautions during Use

Safety Considerations

- 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.
- The 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 (in the environment condition rated in 'Specifications')
 Altitude max. 2,000 m
- Altitude max. 2,000 m - Pollution degree 3
- Installation category II
- installation category i

Product Components

Sensing type	Through-beam	Polarized retroreflective	Diffuse reflective		
Product components	Product, instruction manual				
Reflector	-	MS-2A	-		
Adjustment screwdriver	×1	×1	×1		
M18 fixing nut	× 4	× 2	× 2		

Cylindrical Photoelectric Sensors



BRQ Series (front sensing type) 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

- Excellent noise immunity and minimal influence from ambient light
- Reverse power protection circuit, reverse output protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam type)
- Sensitivity adjuster
- Light ON/Dark ON mode selectable by control wire
- Various materials : Plastic, Metal (Ni-plated Brass), SUS316L
- Long sensing distance : 30 m (through-beam type)
- Body size
- BRQT, BRQM : Standard
- BRQP : Standard, Short body
- Protection rating
- BRQT : IP67 (IEC standard), IP69K (DIN standard)
- BRQM, BRQP : IP67 (IEC standard)



Ordering Information

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

BRQ 0 0 0 - 0	5 6 7 - 8 - 9			
Material	Power supply			
T: SUS316L	D: 10 - 30 VDC===			
M: Brass, Ni-plate	Output			
P: Plastic	T: Solid state (transistor)			
Sensing direction	Appearance			
No mark: Front	A: Standard			
Sensing distance	B: Short body (plastic material model)			
Number: Sensing distance (unit: mm)	Onnection			
Number+M: Sensing distance (unit: m)	No mark: Cable type			
Sensing type	C: Connector type			
T: Through-beam	Control output			
P: Polarized retroreflective	No mark: NPN open collector output			
D: Diffuse reflective	P: PNP open collector output			

Sold Separately

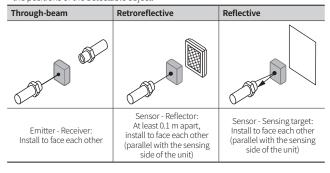
Reflector: MS Series

Bracket: BK-BR-A

- Retroreflective tape: MST Series • M12 connector cable: C□D(H)4-□-□
- · Fixing cap for plastic short body: BK-BR-B

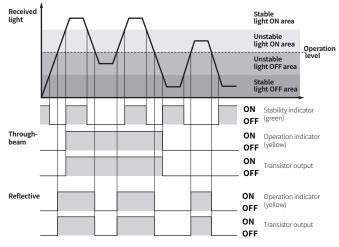
Cautions during Installation

- 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
- Characteristic curves
- When installing multiple sensors closely, it may result in malfunction due to mutual interference.
- For installation, tighten the screw with a torque of 14.7 N m (SUS316L, Brass, Niplate material model), 0.39 N m (plastic material model).
- Mount the brackets correctly to prevent the twisting of the sensor's optical axis. · 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.



Operation Timing Chart and Indicators

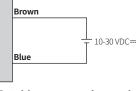
Light ON mode



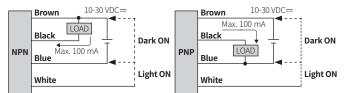
In Dark ON mode, the waveforms are reversed.
Operation indicator and transistor output differ from the sensing method.

Connections

Cable type: Emitter



Cable type: Receiver, Polarized retroreflective, **Diffuse reflective type**



Connector type





Connector pin ②, ④ are N.C (not connected) terminal for the emitter.

Operation mode selection

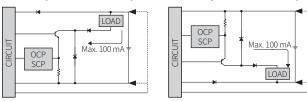
 Δ Be sure to connect the control wire when selecting the operation mode Failure to this instruction may result in product damage.

Operation mode	Wiring
Dark ON	Connect the control wire (white) to +V (brown)
Light ON	Connect the control wire (white) to 0 V (Blue)

Circuit

NPN open collector output

PNP open collector output



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
- The steps below are based on Light 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		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	-		Set the adjuster at the mid position between (A) and (B) for optimal sensitivity.			

Dimensions

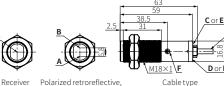
Emitter

- · Unit: mm, For the detailed drawings, follow the Autonics website
- This dimensions shows the cable type. Refer to the 'Specifications' for the core, wiring, and connector,

A Optical axis of emitter		D	Stability indicator (green)
в	Optical axis of receiver	E	Power indicator of emitter (red)
с	Operation indicator (yellow)	F	Sensitivity adjuster

SUS316L, Ni-plate, Brass material model

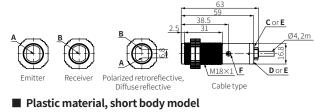
Diffuse reflective

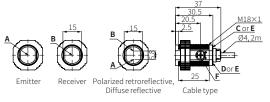




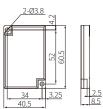
Ø4,2m

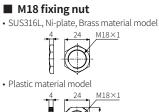






Reflector (MS-2A)





Specifications

Model	BRQ			BRQ 3M-PDT	BRQ	BRQ DDT		
Sensing type	Throug	Through-beam		Polarized retroreflective	Diffuse re	Diffuse reflective		
Sensing distance	5 m 20 m 30 m		30 m	3 m ⁰¹⁾	100 mm	400 mm	1 m 03)	
Sensing target	Opaque	e materia	ls	Opaque materials	Opaque, t	Opaque, translucent materials		
Min. sensing target	≥Ø7mm			≥ Ø 75 mm	-	-		
Hysteresis	-	-		-	≤ 20 % o	≤ 20 % of sensing distance		
Response time	$\leq 1 \text{ms}$					C		
Light source	Red	Red		Red	Infrared	Red	Red	
Peak emission wavelength	660 nm	660 nm		660 nm	850 nm	660 nm	660 nm	
Sensitivity adjustment	YES (Ad	ljuster)		YES (Adjuster)	YES (Adju	YES (Adjuster)		
Mutual interference prevention		-		YES	YES	YES		
Operation mode	Light ON mode - Dark ON			N mode selectable (Control wire)				
Indicator	Operati	on indica	tor (yello	w), stability indicator (gree	n), power in	dicator (red)	04)	
Approval	CE YA (SALus ERE CE YA (SALus ERE CE YA (SALus ERE							

01) Reflector (MS-2A)

02) Non-glossy white paper 100 \times 100 mm 03) Non-glossy white paper 300 \times 300 mm

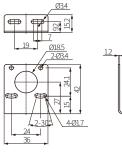
04) Only for the emitter

Unit weight (packaged)	Material	Through-beam	Polarized retroreflective, Diffuse reflective
	SUS316L	≈ 140 g (≈ 220 g)	≈ 70 g (≈ 150 g)
Cablatura	Brass, Ni-plate	≈ 140 g (≈ 220 g)	≈ 70 g (≈ 150 g)
Cable type	Plastic	≈ 110 g (≈ 160 g)	$\approx 60 \text{g} (\approx 120 \text{g})$
	Plastic (short)	≈ 100 g (≈ 150 g)	≈ 50 g (≈ 120 g)
	SUS316L	≈ 50 g (≈ 160 g)	≈ 30 g (≈ 140 g)
Compostoriture	Brass, Ni-plate	≈ 50 g (≈ 160 g)	≈ 30 g (≈ 140 g)
Connector type	Plastic	≈ 25 g (≈ 110 g)	≈ 15 g (≈ 110 g)
	Plastic (short)	≈ 20 g (≈ 100 g)	\approx 10 g (\approx 100 g)

Power supply	10-30 VDC== ±10 % (ripple P-P: ≤ 10 %)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Reflective	\leq 30 mA
Control output	NPN open collector output / PNP open collector output model
_oad voltage	≤ 30 VDC==
oad current	≤ 100 mA
Residual voltage	NPN: ≤ 2 VDC=, PNP: ≤ 2 VDC=
Protection circuit	Reverse power/output protection circuit, output short overcurrent protection circuit
nsulation resistance	\geq 20 M Ω (500 VDC== megger)
Noise immunity	\pm 240 VDC== the square wave noise (pulse width: 1 µs) by the noise simulator
Dielectric strength	Between the charging part and the case: 1,000 VAC \sim 50/60 Hz for 1 min
/ibration	1.5 mm double amplitude at frequency of 10 to 55 Hz 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 (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 60 °C, storage: -30 to 70 °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) SUS316L material model: IP67 (IEC standard), IP69K (DIN standard)
Connection	Cable type / Connector type model
Cable spec.	Ø 4 mm, 4-wire, (Emitter: 2-wire), 2 m
Nire spec.	AWG26 (0.52 mm, 20-core), insulator outer diameter: Ø 1 mm
Connector	M12 4-pin plug type
Material	Case: It depends on the model. (refer to 'Ordering Information'), lens and lens cover: PMMA

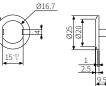
Sold Separately: Bracket (BK-BR-A)

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



Sold Separately: Fixing Cap (BK-BR-B)

- Unit: mm, For the detailed drawings, follow the Autonics website.
- Only for the plasic material short body model Ø25



Sold Separately: M12 Connector Cable

• For detailed information, refer to the 'M8/M12 Connector Cable' manual.

Appearance	Power	Connector 1	Connector 2	Length	Feature	Model
				2 m		CIDH4-2
		M12 (Socket-	4-wire	3 m	Oil resistant	CIDH4-3
				5 m	PVC	CIDH4-5
	DC			7 m		CIDH4-7
	DC	Female) 4-pin		2 m		CIDH4-2-A
				3 m	Oil resistant PVC	CIDH4-3-A
				5 m	c SN us	CIDH4-5-A
				7 m		CIDH4-7-A
				2 m		CLDH4-2
				3 m	Oil resistant	CLDH4-3
				5 m	PVC	CLDH4-5
m	DC	M12 (Socket-	4 wiro	7 m		CLDH4-7
		Female) 4-pin, L type	4-wire	2 m		CLDH4-2-A
				3 m	Oil resistant PVC	CLDH4-3-A
				5 m	PVC • SU IS	CLDH4-5-A
				7 m		CLDH4-7-A
			M12 (Plug- Male) 4-pin	1 m	Oil resistant PVC	C1DH4-1
	DC	M12 (Socket- Female) 4-pin		3 m		C1DH4-3
				5 m		C1DH4-5
				7 m		C1DH4-7
				1 m		C2DH4-1
		M12 (Socket-	M12 (Plug-	3 m	Oil resistant	C2DH4-3
	DC	Female) 4-pin, L type	Male) 4-pin, L type	5 m	PVC	C2DH4-5
		F 7 3F	F 7 3F	7 m		C2DH4-7
				1 m		C3DH4-1
4		M12 (Socket-	M12 (Plug- Male) 4-pin, L type	3 m	Oil resistant	C3DH4-3
	DC	Female) 4-pin		5 m	PVC	C3DH4-5
				7 m		C3DH4-7
				1 m		C4DH4-1
(T)		M12 (Socket-	M12 (Plug-	3 m	Oil resistant	C4DH4-3
	DC	Female) 4-pin, L type	Male) 4-pin	5 m	PVC PVC	C4DH4-5
		. pin, c opc		7 m		C4DH4-7
		M12 (Plug-	M12 (Plug.	2 m	PVC	C1D4-2P
		Male) 4-pin	M12 (Plug- Male) 4-pin	5 m		C1D4-5P

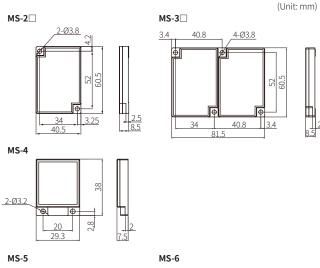
Sold Separately: Reflector MS Series

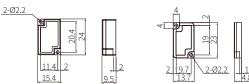
Appearance	Size (W \times H)	Reflectance	Sensing type	Model
. Salasan		Typical reflectivity	Retroreflective	MS-2
	40.5 × 60.5 mm	Typical reflectivity	Polarized retroreflective	MS-2A
		High reflectivity	Polarized retroreflective	MS-2S
	81.5 × 60.5 mm	Typical reflectivity	Retroreflective	MS-3
	81.5 × 60.5 mm	High reflectivity	Polarized retroreflective	MS-3S
	29.3 × 38 mm	Typical reflectivity	Retroreflective	MS-4
	15.4 × 24 mm	Typical reflectivity	Retroreflective	MS-5
	13.7 × 23 mm	Typical reflectivity	Retroreflective	MS-6

• Material: PMMA / ABS (front part / rear part)

Installation: Bolt mounting

Dimensions





Cautions during Installation

- Select a reflector size that is suitable for the installation space and operating environment of the sensors.
- In general, a bigger size of the reflector results in a longer sensing distance.
- Reflectors with high reflectivity increase the sensing distance compared to typical reflectors.
- The reflectance may vary depending on the operating environment for the sensors.

Sold Separately: Retroreflective Tape MST Series

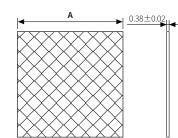
Appearance	Size (W \times H)	Approval	Packaged unit	Sensing type	Model
	50 × 50 mm	EAC	10	Retroreflective Polarized retroreflective	MST-50-10
	100 × 100 mm	EAC	5	Retroreflective Polarized retroreflective	MST-100-5
	200 × 200 mm	EAC	2	Retroreflective Polarized retroreflective	MST-200-2

Material: PMMA / PC / Acrylic (surface film / prism layer / adhesive layer)
 Ambient temperature: -35 to 65 °C (temperature for adhesion: 10 to 30 °C)
 Installation: Tape cutting (installation distance: ≥ 20 mm)

Reflectance of MST Series

Series	Sensing type	MST-50-10	MST-100-5	MST-200-2
BTS		95%	100%	100%
BM	Retroreflective	70%	110%	170%
BMS		90%	120%	190%
BEN		90%	130%	140%
BX		90%	100%	110%
BJ		40%	60%	100%
BJR		35%	45%	55%
BJX		35%	45%	55%
BH		60%	80%	140%
BEN	Polarized retroreflective	70%	90%	120%
BX	renorencence	30%	40%	60%
BRQ		40%	50%	80%
BRQP (plastic material type)		40%	80%	85%
BRQPS (side sensing type)		25%	30%	35%

Dimensions



Model	A
MST-50-10	50
MST-100-5	□ 100
MST-200-2	200

(Unit: mm)

Cautions during Installation

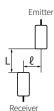
- Select a retroreflective tape that is suitable for the installation space and operating environment of the sensors.
- In general, a bigger size of retroreflective tape results in a longer sensing distance.

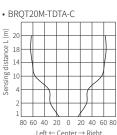
Be sure to check the reflectance of the MST series for proper use.

- The reflectance may vary depending on the operating environment for the sensors. • Before applying the tape, clean the adhesive side of the reflective tape with a dry
- cloth.
- Do not press or damage the surface of the retroreflective tape.
- Regularly clean the tape to maintain optimal performance, using only neutral detergents. Do not use chemical solvents.

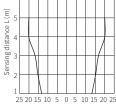
Characteristic Curves: Through-beam Type

Sensing area

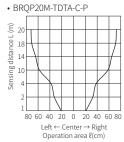




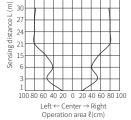


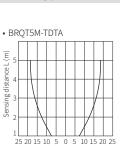


Left ← Center → Right Operation area ℓ(cm)





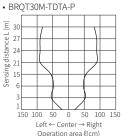


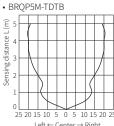


nce L (m)

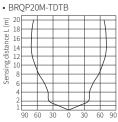
Sensing distar

25 20 15 10 5 0 5 10 15 20 25 Left ← Center → Right Operation area ℓ(cm)

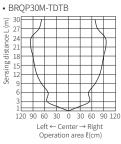




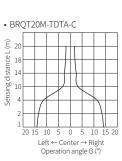
Left ← Center → Right Operation area ℓ(cm)

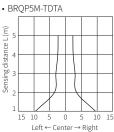




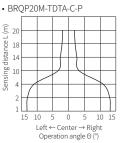


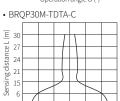
Receiver





Operation angle Θ (°)





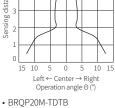
Left ← Center → Right Operation angle ⊖ (°)

3

Sensing distance L (m) 1 6 2 0 2 Left \leftarrow Center \rightarrow Right Operation angle Θ (°) • BRQT30M-TDTA-P Sensing distance L (m) 30 27 24 21 15 6 1 <u>.</u> 20 15 10 0 Left \leftarrow Center \rightarrow Right Operation angle Θ (°) • BRQP5M-TDTB Sensing distance L (m)

• BRQT5M-TDTA

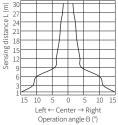
4



10 15

Sensing distance L (m) 20 18 16 14 10 Left \leftarrow Center \rightarrow Right Operation angle Θ (°)



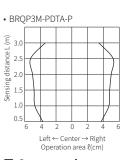


Emitter angle

Characteristic Curves: Polarized Retroreflective Type

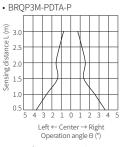
Sensing area



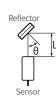


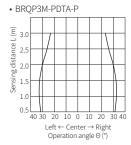
Sensor angle

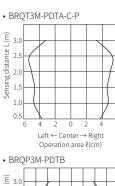


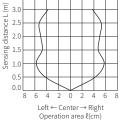


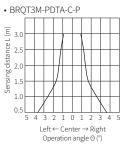
Reflector angle

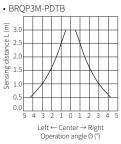


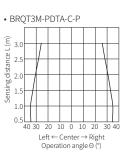




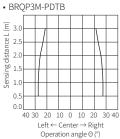






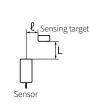


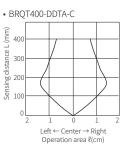


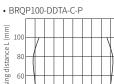


Characteristic Curves: Diffuse Reflective Type

Sensing area



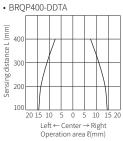




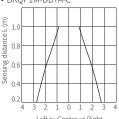
Sensing distance L (mm)

4(

25 20 15 10 5 0 5 10 15 Left \leftarrow Center \rightarrow Right Operation area (mm)



• BRQP1M-DDTA-C



Left ← Center → Right Operation area ℓ(cm)

