Autonics

Cylindrical Photoelectric Sensor
BRQ SERIES (front sensing type)

INSTRUCTION MANUAL

Cable type | Connector type | Reflector (MS-2A) | Reflective tape (MST Series)

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, economic loss or fire.
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 disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.
4. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
5. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.

⚠ 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.

▣ Ordering Information

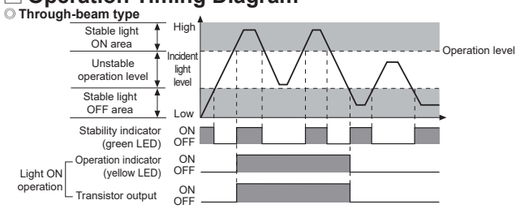
BRQ T □ 5 M - T D T □ A - C - P

Item		
	BRQ	Cylindrical photoelectric sensor
Case material	T	Stainless steel 316L
	M	Brass, Ni-plate
	P	Plastic
Form of sensing	No mark	Front sensing type
Sensing distance	Number	Sensing distance
Sensing distance unit	No mark	mm
	M	m
Sensing type	T	Through-beam type
	P	Retroreflective type (built-in polarizing filter)
	D	Diffuse reflective type
Power supply	D	DC power
Output type	T	Transistor output
Emitter/Receiver	1	Emitter
	2	Receiver
Appearance	A	Standard
	B	Short body※1
Connection	No mark	Cable type
	C	Connector type
Control output	No mark	NPN open collector output
	P	PNP open collector output

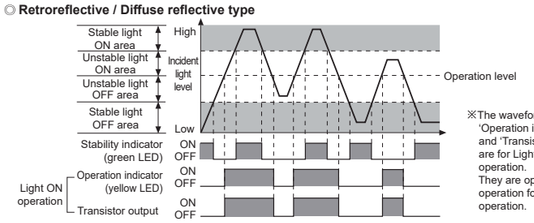
※1: This is only for BRQP Series.
※□: This information is intended for product management of through-beam type. (no need to refer when selecting model)

▣ Operation Timing Diagram

◎ **Through-beam type**



◎ **Retroreflective / Diffuse reflective type**



※The waveforms of 'Operation indicator' and 'Transistor output' are for Light ON operation. They are opposite operation for Dark ON operation.

※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	NPN open collector output	BRQ□5M-TDT□-□	BRQ□20M-TDT□-□	BRQ□30M-TDT□-□	BRQ□3M-PDT□-□	BRQ□100-DDT□-□	BRQ□400-DDT□-□	BRQ□1M-DDT□-□
	PNP open collector output	BRQ□5M-TDT□-□-P	BRQ□20M-TDT□-□-P	BRQ□30M-TDT□-□-P	BRQ□3M-PDT□-□-P	BRQ□100-DDT□-□-P	BRQ□400-DDT□-□-P	BRQ□1M-DDT□-□-P
Sensing type		Through-beam type			Retroreflective type (built-in polarizing filter)	Diffuse reflective type		
Sensing distance		5m	20m	30m	3m※1	100mm※2	400mm※2	1m※3
Sensing target		Opaque materials of min. Ø7mm			Opaque materials of min. Ø75mm	Opaque, translucent materials		
Hysteresis		—				Max. 20% at rated sensing distance		
Response time		Max. 1ms						
Power supply		10-30VDC⎓ ±10% (ripple P-P: max.10%)						
Current consumption		Emitter/Receiver: max. 20mA			Max. 30mA			
Light source		Red LED (660nm)				Infrared LED (850nm)	Red LED (660nm)	
Sensitivity adjustment		Sensitivity adjuster						
Operation mode		Selectable Light ON or Dark ON by control wire (white)						
Control output		NPN or PNP open collector output · Load voltage: max. 30VDC⎓ · Load current: max. 100mA · Residual voltage: max. 2VDC⎓						
Protection circuit		Power/Output reverse polarity protection circuit, output short over current protection circuit, interference prevention function (except through-beam type)						
Indicator		Operation indicator: yellow LED, Stability indicator: green LED (emitter power indicator of through-beam type: red LED)						
Connection		Cable type, connector type						
Insulation resistance		Over 20MΩ (at 500VDC megger)						
Noise immunity		±240V the squre wave noise (pulse width:1μs) by the noise simulator						
Dielectric strength		1,000VAC 50/60Hz for 1 minute						
Vibration		1.5mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 2 hours						
Shock		500m/s² (approx. 50G) in X, Y, Z direction for 3 times						
Environment	Ambient illu.	Sunlight: max. 11,000lx, Incandescent lamp: max. 3,000lx (receiver illumination)						
	Ambient temp.	-25 to 60°C, storage: -30 to 70°C						
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH						
Protection structure		· BRQT Series: IP67 (IEC standard), IP69K (DIN standard) · BRQM, BRQP Series: IP67 (IEC standard)						
Material		· Case: BRQT Series - stainless steel 316L / BRQM Series - brass, Ni-plate BRQP Series - polycarbonate · Lens, Lens cover: polymethyl methacrylate acrylic						
Cable※4		Ø4mm, 4-wire, 2m (emitter of through-beam type: Ø4mm, 2-wire, 2m) (AWG26, core diameter: 0.52mm, number of cores: 20, insulator out diameter: Ø1mm)						
Accessory	Individual	—			Reflector (MS-2A)	—		
	Common	M18 fixing nut: 4, adjustment screwdriver			M18 fixing nut: 2, adjustment screwdriver			
Approval		cULus						
Weight※5	Cable type	BRQT-A/BRQM-A: approx. 220g (approx. 140g) BRQP-A: approx. 160g (approx. 110g) BRQP-B: approx. 150g (approx. 100g)			BRQT-A/BRQM-A: approx. 150g (approx. 70g) BRQP-A: approx. 120g (approx. 60g) BRQP-B: approx. 120g (approx. 50g)			
	Connector type	BRQT-A/BRQM-A: approx. 160g (approx. 50g) BRQP-A: approx. 110g (approx. 25g) BRQP-B: approx. 100g (approx. 20g)			BRQT-A/BRQM-A: approx. 140g (approx. 30g) BRQP-A: approx. 110g (approx. 15g) BRQP-B: approx. 100g (approx. 10g)			

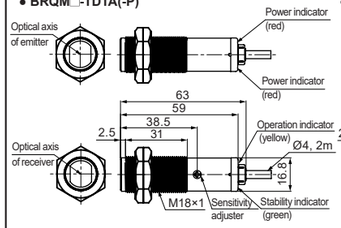
※1: The sensing distance is specified with the MS-2A reflector.
The distance between the sensor and the reflector should be set over 0.1m.
When using reflective tapes, the reflectivity will vary by the size of the tape. Please refer to the catalog or web site.
※2: Non-glossy white paper 100×100mm.
※3: Non-glossy white paper 300×300mm.
※4: M12 connector cable is sold separately.
※5: The weight includes packaging. The weight in parenthesis is for unit only.
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation.

▣ Dimensions

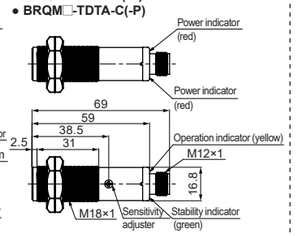
(unit: mm)

◎ **Through-beam type**

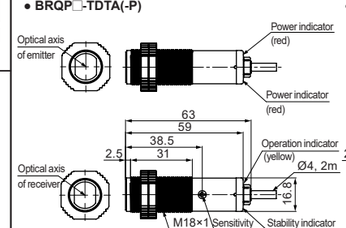
● **BRQT□-TDTA(-P)**
● **BRQM□-TDTA(-P)**



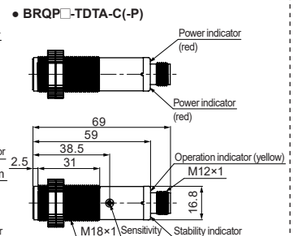
● **BRQT□-TDTA-C(-P)**
● **BRQM□-TDTA-C(-P)**



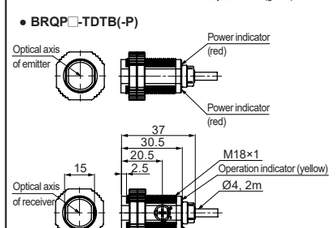
● **BRQP□-TDTA(-P)**



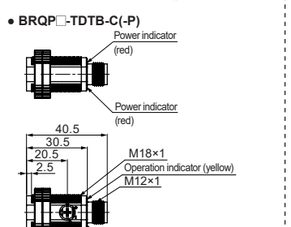
● **BRQP□-TDTA-C(-P)**



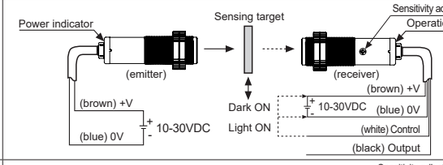
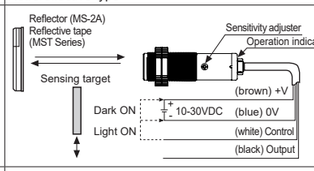
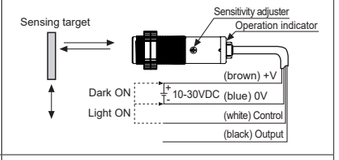
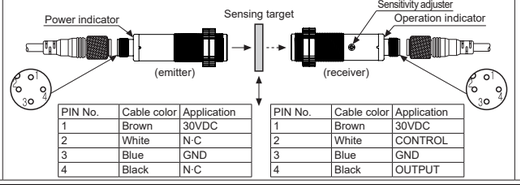
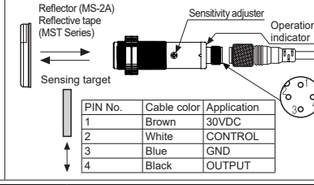
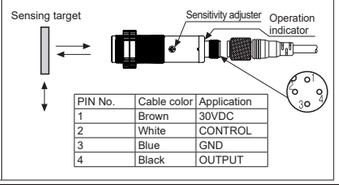
● **BRQP□-TDTB(-P)**



● **BRQP□-TDTB-C(-P)**



▣ Connections

	Through-beam type	Retroreflective type	Diffuse reflective type
Cable type			
Connector type			

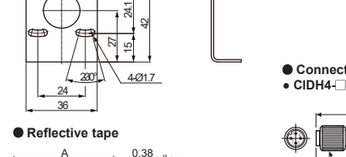
PIN No.	Cable color	Application
1	Brown	30VDC
2	White	N·C
3	Blue	GND
4	Black	N·C

PIN No.	Cable color	Application
1	Brown	30VDC
2	White	CONTROL
3	Blue	GND
4	Black	OUTPUT

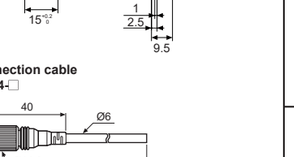
PIN No.	Cable color	Application
1	Brown	30VDC
2	White	CONTROL
3	Blue	GND
4	Black	OUTPUT

◎ **Retroreflective/Diffuse reflective type**

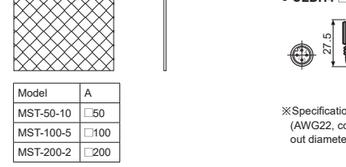
● **BRQT□-DDTA(-P)/BRQM□-DDTA(-P)**
● **BRQT3M-PDTA(-P)/BRQM3M-PDTA(-P)**



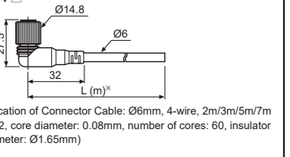
● **BRQT□-DDTA-C(-P)/BRQM□-DDTA-C(-P)**
● **BRQT3M-PDTA-C(-P)/BRQM3M-PDTA-C(-P)**



● **BRQP□-DDTA(-P)**
● **BRQP3M-PDTA(-P)**



● **BRQP□-DDTA-C(-P)**
● **BRQP3M-PDTA-C(-P)**



● **BRQP□-DDTB(-P)**
● **BRQP3M-PDTB(-P)**

● **BRQP□-DDTB-C(-P)**
● **BRQP3M-PDTB-C(-P)**

● **M18 fixing nut**

● **Reflector (MS-2A)**

◎ **Sold separately**

● **Bracket(BK-BR-A)**

● **Fixing cap**
(BK-BR-B, only for BRQP□-□□□B-□)

● **Reflective tape**

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

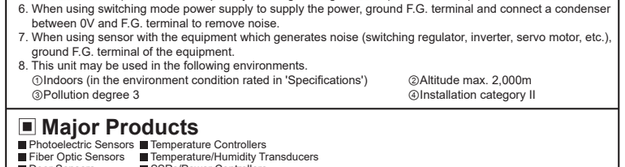
● **Connection cable**
● **CIDH4-□**

● **CLDH4-□**

※Specification of Connector Cable: Ø6mm, 4-wire, 2m/3m/5m/7m (AWG22, core diameter: 0.08mm, number of cores: 60, insulator out diameter: Ø1.65mm)

▣ Control Output Circuit Diagram

NPN open collector output		PNP open collector output	
Photoelectric sensor circuit	Connection	Photoelectric sensor circuit	Connection



※Before using this unit, select Light ON/Dark ON with control wire.
(Light ON: connect control wire with 0V/Dark ON: connect control wire with +V)
※If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the output short over current protection circuit.

▣ Installation and Sensitivity Adjustment

Install the sensor to the desired place and check the connections.
Supply the power to the sensor and adjust the optical axis and the sensitivity as following.
When using the reflective type photoelectric sensors closely over three units, it may result in malfunction due to mutual interference.
When using the through-beam type photoelectric sensors closely over two units, it may result in malfunction due to mutual interference.
When installing the product, tighten the screw with a tightening torque of 14.7N·m for BRQT/BRQM and 0.39N·m for BRQP.

◎ **Through-beam type**
1. Supply the power to the photoelectric sensor, after setting the emitter and the receiver facing each other.
2. Set the receiver in center of position in the middle of the operation range of indicator by adjusting the receiver or the emitter right and left, up and down.
3. After adjustment, check the stability of operation putting the object at the optical axis.

※If the sensing target is translucent body or smaller than Ø7mm, it can be missed by sensor cause light penetrate it.

◎ **Retroreflective type**
1. Supply the power to the photoelectric sensor, after setting the photoelectric sensor and the reflector (MS-2A) or reflective tape in face to face.
2. Set the photoelectric sensor in the position which indicator turns on, as adjusting the reflector or the sensor right and left, up and down.
3. Fix both units tightly after checking that the unit detects the target.

※Sensitivity adjustment: Refer to the diffuse reflective type's.

◎ **Diffuse reflective type**
1. The sensitivity should be adjusted depending on a sensing target or mounting place.
2. Set the target at a position to be detected by the beam, then turn the sensitivity adjuster until position ⓐ where the operation indicator turns ON from min. position of the sensitivity adjuster.
3. Take the target out of the sensing area, then turn the sensitivity adjuster until position ⓑ where the operation indicator turns ON. If the indicator dose not turn ON, max. position is ⓑ.
4. Set the sensitivity adjuster at the center of two switching position ⓐ, ⓑ.

※Be sure that it can be different by size, surface and gloss to target.

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
2. When connecting a DC relay or other inductive load to the output, remove surge by using diodes or varistors.
3. Use the product, 0.5 sec after supplying power.
   When using separate power supply for the sensor and load, supply power to sensor first.
4. 10-30VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
5. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
6. 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.
7. When using sensor with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground F.G. terminal of the equipment.
8. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 3
   ④Installation category II

▣ Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connectors/Sockets
- Switching Mode Power Supplies
- Control Switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper Motors/Drivers/Motion Controllers
- Graphic/Logic Panels
- Field Network Devices
- Laser Marking System (Fiber, CO_2, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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