Autonics

PHOTOELECTRIC SENSOR
BA2M SERIES
M A N U A L

CE

Thank you very much for selecting Autoics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠ **Warning** Serious injury may result if instructions are not followed.
⚠ **Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
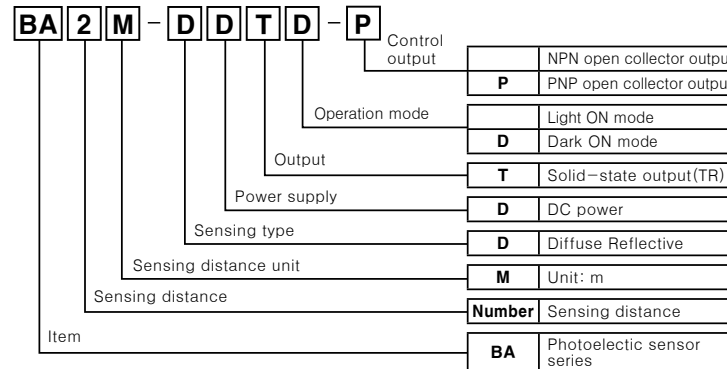⚠ Caution:Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machinery(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc) it is required to install fail-safe device, or contact us for information on type required.**
   It may cause serious human injury or a fire, property.
2. **Do not disassemble or modify this unit. Please contact us if it is required.**
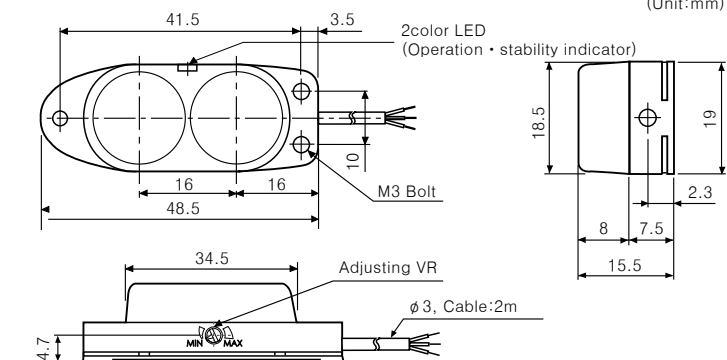   It may give an electric shock and cause a fire.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It might shorten the life cycle of the product or give an electric shock.
   Use this product inside only. Do not use the product outdoors or location subject to temperatures or humidity outside.(Example: rain, dirty, frost, sunlight, condensation, etc.)
2. **Do not use this unit in place where there is flammable or explosive gas.**
   It may cause a fire or explosion.
3. **Do not use this unit beyond rated power and do not supply AC power to DC power type.**
   It may cause a damage to product.
4. **Please check the polarity of power and wrong wiring.**
   It may cause a damage to product.
5. **Do not use this unit in place where there is vibration or impact.**
   It may cause a damage to product.
6. **In cleaning the unit, do not use water or an oil-based detergent.**
   It may cause a fire, give an electric shock or damage to product.
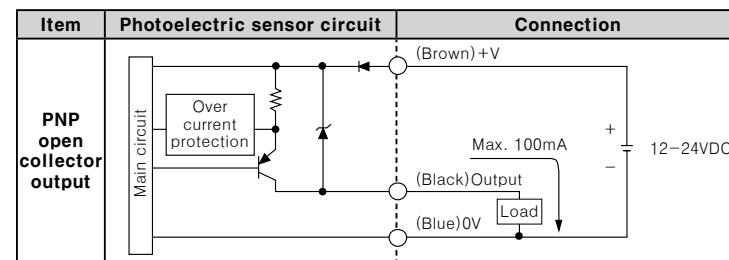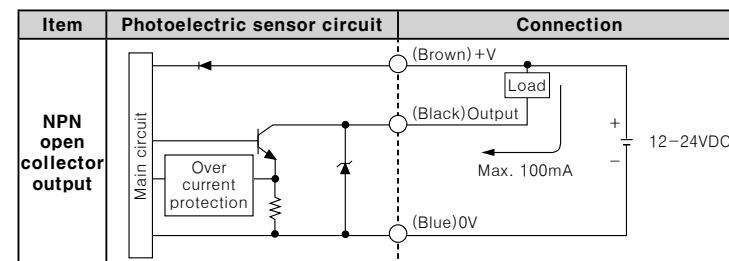
▣ Ordering information

BA 2M – DDTD – P

Control output	P	NPN open collector output
	P	PNP open collector output
Operation mode	D	Light ON mode
	D	Dark ON mode
Output	T	Solid-state output(TR)
Power supply	D	DC power
Sensing type	D	Diffuse Reflective
Sensing distance unit	M	Unit: m
Sensing distance	**Number**	Sensing distance
Item	BA	Photoelectric sensor series

▣ Dimensions

(Unit:mm)

41.5 3.5
2color LED (Operation · stability indicator)
18.5
19
16 16
10
48.5
M3 Bolt
2.3
8 7.5
15.5
34.5
Adjusting VR
4.7
ø 3, Cable:2m
MIN MAX

※ **The above specifications are subject to change without notice.**

▣ Specification

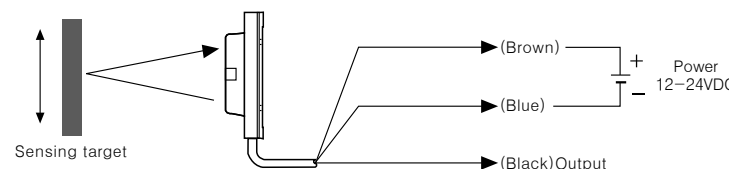| Model	NPN output	BA2M-DDT	BA2M-DDTD
	PNP output	BA2M-DDT-P	BA2M-DDTD-P
Sensing type		Diffuse Reflective	
Sensing distance		2m(Non-glossy white paper 200×200mm)	
Sensing target		Translucent, Opaque materials	
Hysteresis		Max. 20% at sensing distance	
Response time		Max. Approx. 1ms	
Power supply		12~24VDC ±10% Ripple(P-P) Max. 10%	
Current consumption		Max. 15mA(max. 30mA when the output is ON)	
Light source		Infrared LED(850nm modulated)	
Sensitivity adjustment		Light ON	Dark ON
Control output		NPN or PNP Open collector output • Load voltage: Max.26.4VDC • Load current: Max.100mA • Residual voltage ☞ NPN: Max.1V, PNP: Min.-2.5V of power supply	
Protection circuit		Reverse polarity protection, output short-circuit protection	
Receiver		Photo diode(Built-in IC)	
Indicator		Operation: Red, stability: Orange(Light On), Green(Dark On)	
Connection		Outgoing cable	
Insulation resistance		Min. 20MΩ(500VDC megger)	
Noise strength		±240V the square wave noise(pulse width:1μs) by the noise simulator	
Dielectric strength		1,000VAC 50/60Hz for 1minute	
Vibration resistance		1.5mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours	
Shock resistance		100m/s² in X, Y, Z directions for 3 times	
Environment	Ambient illumination	Sunlight: Max.11,000ℓx, Incandescent lamp: Max.3,000ℓx(Receiver illumination)	
	Ambient temperature	−25 ~ 55℃, Storage: −25 ~ 70℃	
	Ambient humidity	35 ~ 85%RH, Storage: 35 ~ 85%RH	
Protection		IP64(IEC standards)	
Material		Case: ABS, Sensing part: PC, Indicator: PC, VR: IXEF	
Cable		3P, ø3mm, Length: 2m(AWG24, Core wire ø0.08m, 40 strands of annealed copper solid wire, Insulator diameter ø1mm)	
Accessory		VR adjustment driver	
Approval		CE	
Weight		Approx. 50g	

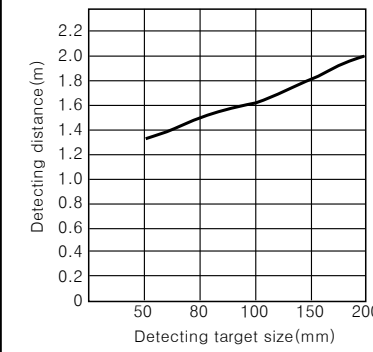※ Environment resistance is rated at no freezing or condensation.

▣ Control output circuit diagram

Item	Photoelectric sensor circuit	Connection
NPN open collector output	Main circuit / Over current protection	(Brown)+V Load (Black)Output 12-24VDC Max. 100mA (Blue)0V
PNP open collector output	Main circuit / Over current protection	(Brown)+V Max. 100mA 12-24VDC (Black)Output Load (Blue)0V

▣ Connection

Sensing target
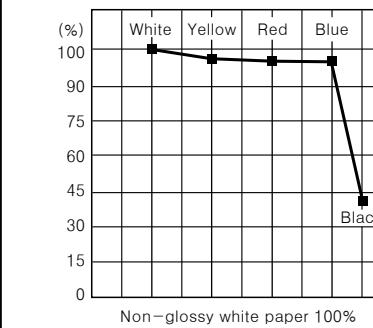(Brown) + Power 12-24VDC −
(Blue)
(Black)Output

▣ Detecting distance against the target size

※It shows the change of detecting distance by size of targets.
Standard targets: □200×200mm non-glossy white paper.

Detecting distance (m) vs Detecting target size(mm)

▣ Detecting distance against the target color

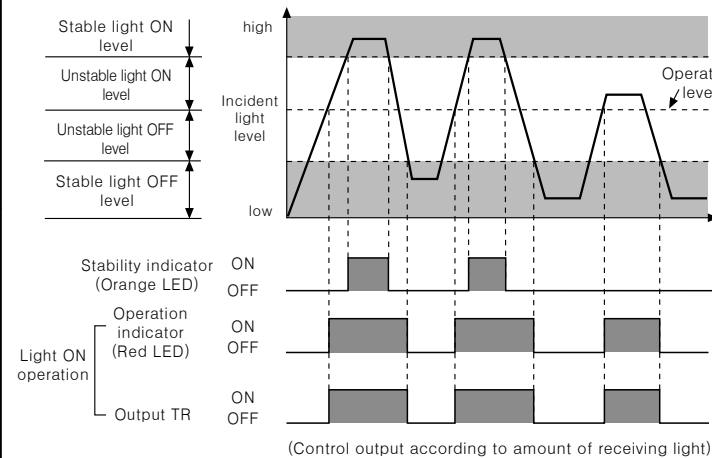White Yellow Red Blue Black

※It shows the rate of detecting distance by color of targets.
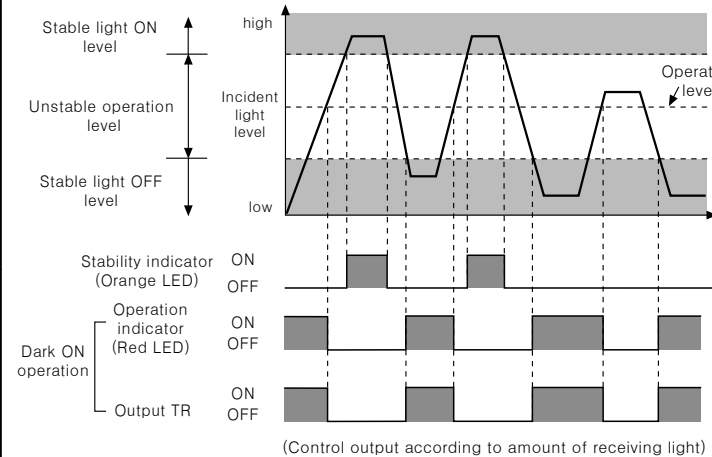
Non-glossy white paper 100%

▣ Operation mode

If the control output terminal is short-circuit or over current than the ratedcurrent flows the unit, the sensor does not operate normally by protection circuit.

● Light ON mode

Stable light ON level — high
Unstable light ON level
Unstable light OFF level — Incident light level
Stable light OFF level — low
Operating level

Stability indicator (Orange LED) ON / OFF
Operation indicator (Red LED) ON / OFF
Output TR ON / OFF

Light ON operation

(Control output according to amount of receiving light)

● Dark ON mode

Stable light ON level — high
Unstable operation level — Incident light level
Stable light OFF level — low
Operating level

Stability indicator (Orange LED) ON / OFF
Operation indicator (Red LED) ON / OFF
Output TR ON / OFF

Dark ON operation

(Control output according to amount of receiving light)

▣ Mounting & Adjustment

Please check wiring after setting the target and supply the power to this sensor.

● Optical axis adjustment

Sensing target
Optimal position
ⓐ
ⓑ
MIN MAX
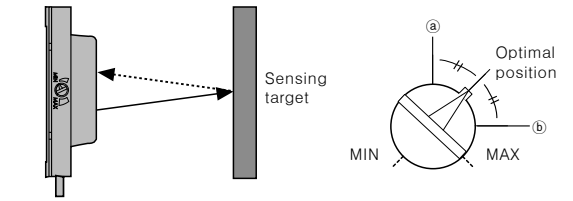
Mount this unit at center position where operation LED turns on as moving the unit toward right or left, up or down

● Adjustment

1. When sensing the object, set the sensitivity adjustment in stable Light ON area (orange: Light On, Green: Dark On) as shown 'operation mode chart'.
2. The sensitivity should be adjusted depending on a sensing target or mounting place.
3. Set the target at a position to be detected by the beam, then turn the adjuster until position ⓐ where the indicator turns on from min. position of the adjuster.
4. Take the target out of the sensing area, then turn the adjuster until position ⓑ where the indicator turns on. If the indicator dose not turn on, Max. position ⓑ.
5. Set the adjuster at the center of two switching position ⓐ, ⓑ.
   ※ The sensing distance indicated on specification chart is for 200 X 200mm of non-glossy white paper. Be sure that it can be different by size, surface and gloss of target.

▣ Caution for using

1. Intercept a strong source of light as like sunlight, spotlight within inclination angle range of photoelectric sensor.
2. The photoelectric sensor may cause malfunction under the fluorescent lamp light, so be sure to use cut-off light with panel.
3. When more than two sensors are installed adjacently, it can be occurred malfunction by light beam from the other target. So it must be installed at an enough interval.
4. If photoelectric sensor is installed at flat part, it might cause malfunction by reflection light from flat part.
   Be sure to put space between photoelectric sensor and ground.
5. When wire the photoelectric sensor with high voltage line, power line in the same conduit, it may cause malfunction or mechanical trouble.
   Therefore please wire seperately or use different conduit.
6. Avoid installing the unit as following place.
   Corrosive gas, oil or dust, strong flux, noise, sunlight, strong alkali, acid.
7. In case of connect DC relay as inductive load to output, please remove surges by using diode or varistor.
8. The photoelectric sensor cable shall be used as short as possible, because it may cause malfunction by noise through the cable.
9. When it is stained by dirt at lens, please clean the lens with dry cloth, but don't use an organic materials such as alkali, acid, chromic acid.
10. When use switching power supply as the source of supplying power, F.G terminal shall be good earth ground and condenser for removing noise shall be installed between 0V and F.G terminal.

Switching power supply (SMPS) +V / 0V / F.G.
C(0.001 to 0.1μF/400V) : Condenser for removing noise
Photoelectric sensor +V / 0V
Frame
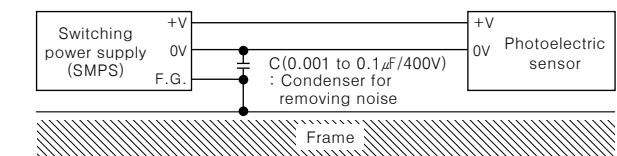
11. Installation environment
    ① It shall be used indoor.
    ② Altitude Max. 2,000m.
    ③ Pollution Degree 3.
    ④ Installation Category II

※**It may cause malfunction if above instructions are not followed.**

▣ Major products

■ Proximity sensors
■ Area sensors
■ Door/Door side sensors
■ Pressure sensors
■ Counters
■ Timers
■ Rotary encoders
■ Display units
■ Power controllers
■ Sensor controllers
■ Panel meters
■ Graphic/Logic panels
■ Temperature controllers
■ Tachometer/Pulse(Rate) meters
■ Temperature/Humidity transducers
■ Switching power supplies
■ Stepping motors/drivers/motion controllers
■ Field network devices
■ Laser marking system(CO2, Nd:YAG)
■ Laser welding/soldering system
■ Photoelectric sensors
■ Fiber optic sensors

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