Autonics

Color Mark Sensor
BC 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.

※Safety considerations are categorized as follows.

⚠**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.

※The symbols used on the product and instruction manual represent the following
⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ 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, fire, or economic loss.
2. **Do not disassemble or modify the unit. Please contact us if necessary.**
   Failure to follow this instruction may result in product damage or fire.

⚠ Caution

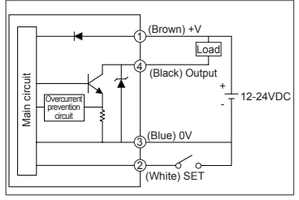
1. **Do not use the unit outdoors.**
   Failure to follow this instruction may result in shortening the life cycle of the unit or product malfunction. Use the unit indoors only. Do not use the unit outdoors, where it may be affected by external environmental factors. (e.g. rain, dust, frost, sunlight, condensation, etc.)
2. **Do not use the unit where flammable or explosive gas may be present.**
   Failure to follow this instruction may result in fire or explosion.
3. **Use the unit within the rated specifications.**
   Failure to follow this instruction may shortening the life cycle of the unit.
4. **Do not use loads beyond the rated voltage range. Do not supply AC power.**
   Failure to follow these instructions may result in product damage.
5. **Check the polarity of the power before wiring the unit.**
   Failure to follow this instruction may result in product damage.
6. **Do not use the unit where heavy vibration or impact may be present.**
   Failure to follow this instruction may result in product damage.
7. **Do not use water or oil-based detergent when cleaning the unit.**
   Failure to follow this instruction may result in fire.

▣ Model

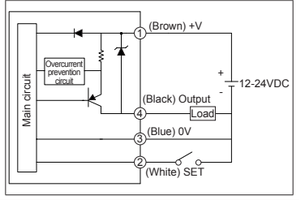
Model	Item	Sensing distance	Sensing method	Power supply	Output type	Connection	Control output
BC15-LDT-C	Color mark sensor	15mm	Convergent reflective type	12-24VDC	Solid state output (transistor)	Connector type	NPN open collector output
BC15-LDT-C-P							PNP open collector output

▣ Control Output Circuit Diagram

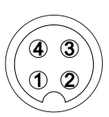
NPN open collector output



PNP open collector output



▣ M12 Connector Pinout (sold separately)



Pin number	Color code	Application
1	Brown	+V
2	White	SET
3	Blue	GND (0V)
4	Black	OUT

※Please use Autonics M12 connectors.
For more information, please refer to our catalogue or website.

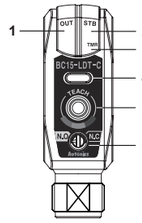
※The above specifications are subject to change and some models may be discontinued without notice.

▣ Specifications

Model		BC15-LDT-C	BC15-LDT-C-P
Sensing method		Convergent reflective type	
Sensing distance		15mm ±2mm	
Sensing target		Opaque, Translucent	
Hysteresis		Max. 20% of sensing distance (may vary by sensing mode or sensitivity)	
Spot size		1.24×6.7mm (rectangular)	
Response time		500μs	
Power supply		12-24VDC ±10% (ripple P-P: max. 10%)	
Current consumption		Max. 30mA	
Light source		Full Color LED (red, green, blue)	
Sensing mode		C (color only) mode, C+I (color + intensity) mode	
Output mode		Color match output, color mismatch output	
Output timer		40ms OFF delay timer function	
Control output		NPN or PNP open collector output · Load voltage: max. 30V · Load current: max. 100mA · Residual voltage - NPN: max. 1V, PNP: max. 2.5V	
Protection circuit		Reverse polarity protection, output short-circuit protection	
Indicator		Operation indicator: Red LED, Stability indicator: Green LED, Teaching indicator: Full Color LED	
Connection method		Connector type	
External input		External SET cable input	
Insulation resistance		Min. 20MΩ (at 500VDC megger)	
Noise strength		±240V of square wave noise (pulse width:1 μs) from the noise simulator	
Dielectric strength		1,000VAC at 50/60Hz for 1minute	
Vibration		1.5mm amplitude at 10 to 55Hz frequency in each X, Y, Z direction for 2 hours	
Shock		500m/s² (approx. 50G) in each X, Y, Z direction for 3 times	
Environment	Ambient illumination	Incandescent lamp: Max. 3,000lx (receiver illumination)	
	Ambient temp.	-10 to 55℃, storage: -25 to 75℃	
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH	
Protection structure		IP67 (IEC standard)	
Material		Case: Polycarbonate, Sensing part: Acrylic, Bracket: SUS304 (steel use stainless 304) , Bolt: Carbon steel	
Accessories		Bracket, Fixing bolts: 2, Adjustment screwdriver: 1	
Approval		CE	
Weight※1		Approx. 80g (approx. 14g)	

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※The temperature and humidity of environment resistance is rated at non-freezing or condensation.

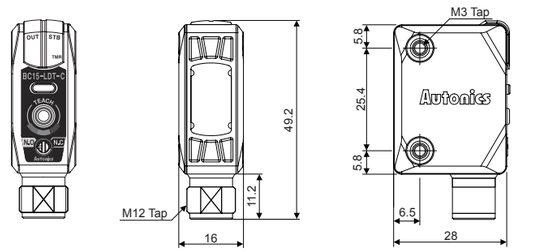
▣ Unit Description



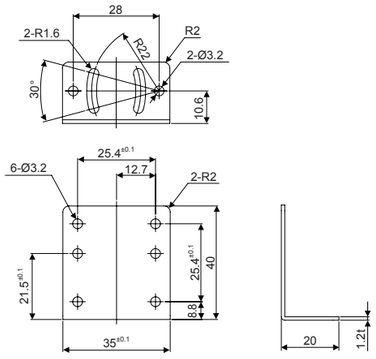
1. Operation indicator (OUT): ON (red) indicates operation.
2. Stability indicator (STB): ON (green) indicates stable status.
3. Timer indicator (TMR): ON (orange) when timer is set.
4. Teaching indicator
   : Displays the reference color after successfully "teaching" the color.
   ※The teaching color and the color displayed on the teaching indicator may differ depending on environment conditions (ambient light, reflection angle, material, etc.) .
5. SET key: Used for function settings.
6. Color match/mismatch switch
   - N.O.: Output ON when target color matches reference color.
   - N.C.: Output ON when target color does not match reference color.

▣ Dimensions

(unit: mm)



●Mounting Bracket



▣ Functions

◎ **Color teaching**
Set the reference color with the teaching function. Press the SET key in RUN mode to enter teaching standby status. Place the desired color at the sensing position (spot) and hold the SET key for over 3 seconds.
When teaching is complete, the teaching color indicator will turn ON.
When there is an error, the operation indicator will flash (red).

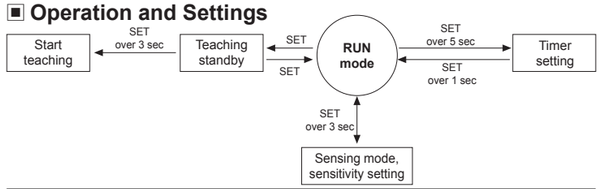
◎ **Display teaching**
The set reference color can be displayed on the teaching indicator.
With the ability to check the set reference color there is no need to re-set the teaching color every time.
It may difficult to check the similar colors when installing multiple sensors.
Teaching indicator color is available only for reference.
※The teaching color and the color displayed on the teaching indicator may differ depending on environment conditions (ambient light, reflection angle, material, etc.)

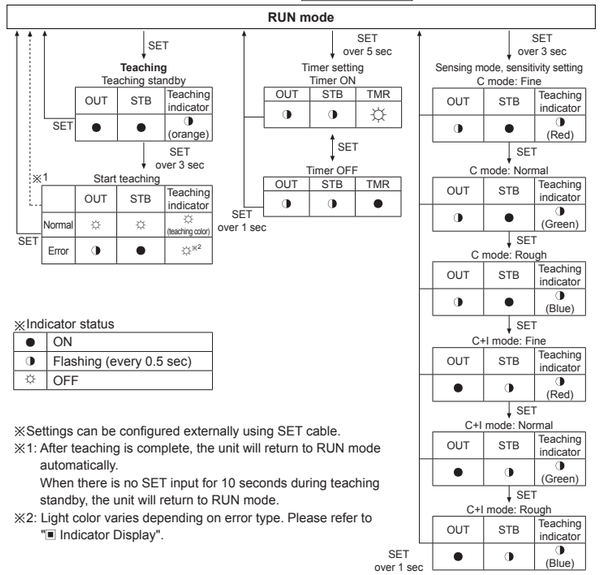
◎ **Sensing mode, sensitivity setting (color tolerance)**
Two sensing modes; C (color only) mode discriminates by color rate and C+I (color +intensity) mode discriminates by color rate and contrast.
Set the sensing sensitivity (fine, normal, rough) at each sensing mode.

◎ **Color match/mismatch mode**
- Color match mode (N.O.): Output ON when target color matches reference color.
  Turn the color match/mismatch switch towards N.O.
- Color mismatch mode (N.C.): Output ON when target color does not match reference color.
  Turn the color match/mismatch switch towards N.C.

◎ **OFF delay timer**
Timer (40ms OFF delay) functions helps prevent output malfunction from target objects moving too rapidly. The timer indicator turns ON (orange) when the timer function is set.

▣ Operation and Settings





※Indicator status

●	ON
◑	Flashing (every 0.5 sec)
☼	OFF

※Settings can be configured externally using SET cable.
※1: After teaching is complete, the unit will return to RUN mode automatically.
When there is no SET input for 10 seconds during teaching standby, the unit will return to RUN mode.
※2: Light color varies depending on error type. Please refer to "▣ Indicator Display".

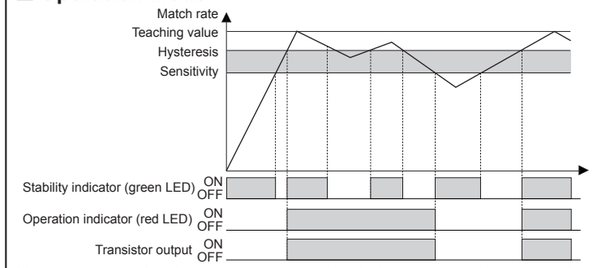
▣ Indicator Display

Status			Operation indicator (Red LED)	Stability indicator (Green LED)	Teaching indicator (Full color LED)	Timer indicator (Orange LED) Timer ON	Timer indicator (Orange LED) Timer OFF
Normal operation	Stable match		☼	☼	☼ (Teaching color)		
	Unstable match		☼	●			
	Unstable mismatch		●	●			
	Stable mismatch		●	☼			
Sensitivity setting (C mode)	Fine		◑	●	◑ (Red)	☼	●
	Normal				◑ (Green)		
	Rough				◑ (Blue)		
Sensitivity setting (C+I mode)	Fine		●	◑	◑ (Red)		
	Normal				◑ (Green)		
	Rough				◑ (Blue)		
Teaching setting	Teaching standby		●	●	◑ (Orange)		
	Normal teaching		☼	☼	☼ (Teaching color)		
	Teaching error	Excess light intensity	◑	●	☼ (Green)		
		Insufficient light intensity	◑	●	☼ (Red)		
		Fluctuating light intensity	◑	●	☼ (Blue)		
Timer setting	ON		◑	◑	☼ (Teaching color)	☼	
	OFF		◑	◑	☼ (Teaching color)	●	
Overcurrent input			⊳	⊲	●	●	

※Indicator status

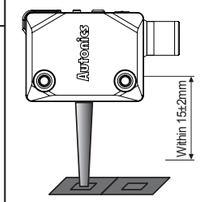
☼	ON	●	OFF
◑	Flashing (every 0.5 sec)	⊳⊲	Flashing alternately (every 0.5 sec)

▣ Operation Mode



※The waveforms of "Operation indicator" and "Transistor output" are for color match mode operation. They are opposite operation for color mismatch mode operation.

▣ Installation & Adjustment



①Installation
: Place the color mark sensor and the target object facing each other then affix the unit. The installation distance should be within ±2mm of 15mm .
②Press the SET key to enter teaching standby status. Place the desired color at the sensing position (spot) and hold the SET key for 3 seconds to set the reference color. When it is complete, the teaching indicator will display the set color
③Hold the SET key for 3 seconds change sensing mode and sensitivity settings.
④Hold the SET key for 5 seconds to set the timer. The timer is a 40ms OFF delay timer.

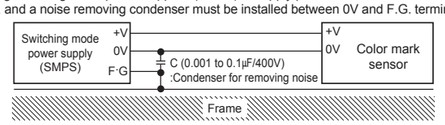
※In case of teaching error, the output indicator and teaching indicator will flash depending on the intensity of received light.
※When detecting metal or glossy objects tilt install the sensor at about 10 to 20 degree angle.

▣ Troubleshooting

Problem	Cause	Troubleshooting
Will not operate	Power supply	Supply power within rated specifications
	Connection error	Check the cable connections.
Will not operate occasionally	Excess light intensity alarm during teaching, output chattering	Install the sensor at a 10 to 20 degree angle. (when sensing metal or glossy objects)
	Converter external light interference	Install a visor on the sensor or install the unit away from the external light source.
	Contamination of sensor cover	Remove the substance using a soft brush and reset the sensitivity.
	Connector error	Check connector assembly.
Other error	—	Check the display status of the indicators.

▣ Cautions During Use

1. The color mark sensor will be able to detect objects after 500ms of supplying power. If the color mark sensor and the load are using separate power sources, power must be supplied to the color mark sensor first.
2. Use a visor or a hood so that excessive light (e.g. sunlight, spotlight) does not directly enter into the inclination angle of the color mark sensor.
3. The color mark sensor may malfunction under fluorescent lighting. Please use a visor if necessary.
4. If the color mark sensor is installed directly on a flat surface, the reflection off the surface may cause malfunction. Make sure there is enough space between the color mark sensor and the surface.
5. If the color mark sensor is wired with a high voltage line or power line, it may cause product damage or malfunction. Use separate wiring or a dedicated conduit.
6. Avoid installation in places where dust or corrosion may be present, as it may cause product malfunction.
7. When connecting a DC relay or other inductive load to the output, remove power surge by using diodes or varistors.
8. Please use short cables for wiring the color mark sensors. Power surge from extended wiring may cause product malfunction.
9. When the lens is stained by foreign substances, clean the lens lightly with dry cloth. Do not use chemical or organic solvents.
10. When using switching mode power supplies (SMPS) to supply power, the F.G. terminal must be grounded, and a noise removing condenser must be installed between 0V and F.G. terminals.



11. This unit may be used in the following environments.
①Indoors ②Altitude: Under 2,000m
③Pollution degree 2 ④Installation category II

※Failure to follow these instructions may result in product damage.

▣ 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
- Tachometers/Pulse (Rate)Meters
- Display Units
- Sensor Controllers

Autonics Corporation
http://www.autonics.com

HEADQUARTERS:
18, Bansong-ro 513beon-gil, Haeundae-gu, Busan, South Korea, 48002
OVERSEAS SALES:
#402-303, Bucheon Techno Park, 655, Pyeongcheon-ro, Wonmi-gu, Bucheon, Gyeonggi-do, South Korea, 14502
TEL: 82-32-610-2730 / FAX: 82-32-329-0728
E-mail: sales@autonics.com