

For Receipt     For Reference

Date of Issue Jul 14, 2020

Sample Corporation

OMRON Corporation  
 SENSOR Development Group, Module  
 Development Dept. Product Development  
 Division, Business Management Division HQ

Originated by 	Reviewed by 	Authorized by 
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## PRODUCT SPECIFICATIONS

Name Light Convergent Reflective Sensor

Model B5W-LB1114-1

Item —

Please make a signature, stamp or other equivalent mark indicating your receipt on one copy of this sheet and return it to Omron on or before Month Day, 20XX. If you place an order of a product described in this sheet, you will be deemed to accept this specification.

Registration Part Number by Customer
Type Name;
Type Number;

Signature, Stamp or Other Equivalent Mark (for receipt confirmation)

Release of Drawings
Sales

### Distribution

	Copy
Customer	
Sales	

### Revision Record

Mark	Date	Contents	Name
A	Jun 12, 2020	Creating	A.Tada
A1	Jul 14, 2020	Revising note	A.Tada

1. CLASSIFICATION	Photoelectric element
2. STRUCTURE	
2.1 Construction	
(1) Emitter	GaAlAs infrared light-emitting diode
(2) Receiver	Si photo integrated circuit (one chip)
2.2 Operation	NPN Open collector output
2.3 Outline Dimensions	Figure 2
2.4 Material	
(1) Emitter / Receiver	Epoxy resin
(2) Case	Polycarbonate (PC)
(3) Lens	PMMA
(4) Cover	Polycarbonate (PC)
2.5 Sensing Method	Reflective type
2.6 Operating Mode	Light-ON
2.7 Connecting Method	Connector
2.8 Terminal Type	BM03B – GHS-TBT (J.S.T. Japan Solderless Terminal)
2.9 Number of Terminals	3
2.10 Applicable connector	GHR – 03 (J.S.T. Japan Solderless Terminal)
2.11 Internal Circuit	Figure 1
2.12 Degree of protection	IP50 (not including terminals)
2.13 Operation indicator	L-Lighting

### 3. ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

ITEM	SYMBOL	VALUE	UNIT	REMARKS
Power Supply Voltage	V <sub>CC</sub>	DC 26.4	V	—
Output Voltage	V <sub>OUT</sub>	DC26.4	V	—
Output Current	I <sub>OUT</sub>	60	mA	—
Output Power Dissipation	P <sub>OUT</sub>	75	mW	Figure 3 ※1
Operating Temperature	Topr	-10 ~ +60	°C	※1
Storage Temperature	Tstg	-25 ~ +80	°C	※1
Soldering Temperature	Tsol	—	°C	—

※1 Reduce the voltage and current, if necessary, by reference to the temperature rating chart (Figure 3), even if the temperature is within the specified range. The product should be used without freezing or condensation.

4. ELECTRICAL AND OPTICAL CHARACTERISTICS

(Ta=25°C, Vcc=24V±10% Ripple (p-p) 10% max)

ITEM	SYMBOL	LIMITS			UNIT	TEST CONDITIONS
		MIN	TYP	MAX		
Sensing distance	-	2	-	10	mm	White paper (58mm×42mm)
	-	3	-	8	mm	Black paper (58mm×42mm)
Non-sensing distance	-	20	-	-	mm	White paper (58mm×42mm)
Minimum sensing object	-	-	0.05	-	mm	Copper wire
Hysteresis	-	-	-	20	%	
Consumption Current	Icc	-	-	15	mA	With incident Without incident
Consumption Current (Peak)	-	-	-	50	mA	With incident Without incident
Low Level Output Voltage	V <sub>OL1</sub>	-	-	0.8	V	I <sub>out</sub> = 50mA
	V <sub>OL2</sub>	-	-	0.32	V	I <sub>out</sub> = 10mA
Response time	t	-	-	1	ms	V <sub>out</sub> = V <sub>cc</sub>
Operating illuminance	-	-	-	3000	lx	Incandescent lamp
Operating illuminance	-	-	-	10000	lx	sunlight
Peak Emission Wavelength	λ <sub>P</sub>	-	850	-	nm	
Peak Spectral Sensitivity Wavelength	λ <sub>P</sub>	-	740	-	nm	

※Power On Reset (POR) function is built in this product and POR is performed when a power supply is turned on. Set rise time (10% ~ 90%) of power supply within 1ms.

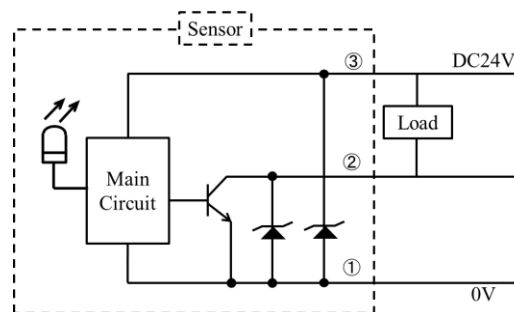


Figure 1. INTRENAL CIRCUIT

TIME CHART		Light-ON (OUT)
With incident		
Without incident		
Operation indicator ON (orange)	OFF	
Output Transistor	OFF	
Load (RL)	High Low	

## 5. MACHINERY CHARACTERISTICS

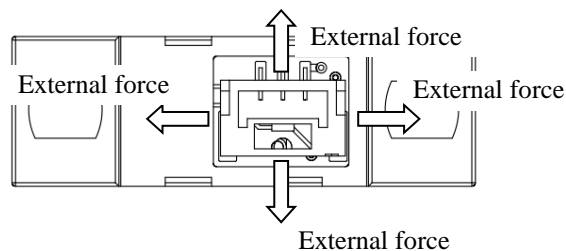
ITEM	LIMITS
Shock	500m/s <sup>2</sup> for 3 times each in X,Y,Z directions
Vibration	Vibrational frequency : 10-55Hz Half amplitude : 0.75 mm Each in X,Y,Z directions

## 6. VISUAL

ITEM	CRITERION
fracture, clack, burr, loss, flaw, dust, foreign material, dulling	A sensor having a defect which will degrade any electro-optical characteristic listed in section 4 must be rejected.

## 7. CONNECTION

- (1) Do not connect or disconnect a connector while supply voltage is applied. This may damage the products.
- (2) Make sure that a stress (external force) as shown in the figure below is not applied to the connector. This may damage the products.



## 8. MOUNTING CONDITIONS

The product shall be fitted on the flat with a M3 screw, spring washer, and 6mm dia. flat washer tightened with a maximum torque of 0.54 N · m.

## 9. STANDARD TESTING CONDITION

Unless otherwise specified, the values in this specification are tested complying with the conditions below.

- 9.1 Temperature 25°C
- 9.2 Humidity 65%RH

## 10. STORAGE AND OPERATING ENVIRONMENT

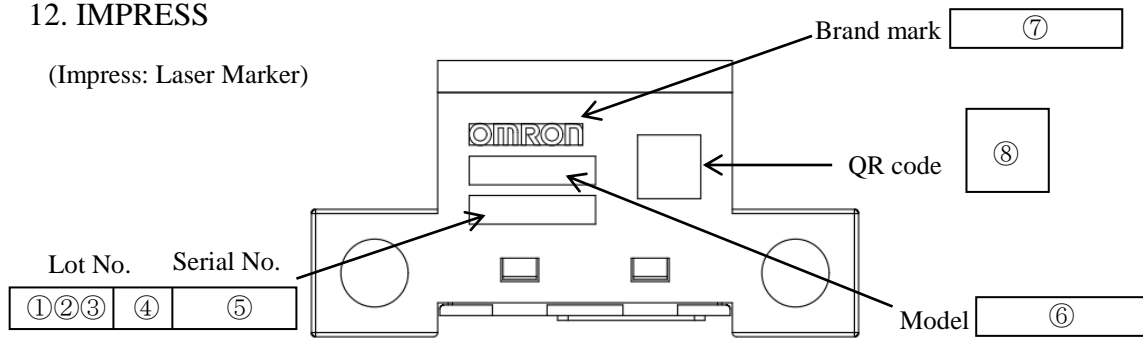
- (1) Places where the product is not exposed to corrosive gases, such as hydrogen sulfide gas, or salty wind.
- (2) Places where it is not exposed to direct sunlight.
- (3) Make sure that flux, oil, or other chemicals do not adhere to the surface of the emitter and receiver.
- (4) Do not apply a load that may deform or deteriorate the product in any circumstances.
- (5) Store the product in a normal temperature, humidity, and pressure environment.
- (6) The product should be used without freezing or condensation.
- (7) Do not use the product in atmospheres or environments that exceed product ratings.

11. ACCESORIES

None

12. IMPRESS

(Impress: Laser Marker)



- ①: Production date See Chart 1.
- ②: Production Month 1~9 represents January ~ September, and X,Y,Z represents October, November, December.
- ③: Production Year Represents The last digit of the year.
- ④: Process control number Alphanumeric 2 orders of magnitude as a process control number.
- ⑤: Serial No. 4 orders of magnitude as serial number per lot.
- ⑥: B5W-LB1114
- ⑦: **OMRON**
- ⑧: QR code For internal administration

Chart 1. Production date of Lot Number

Date	1	2	3	4	5	6	7	8	9	10
Lot No.	1	2	3	4	5	6	7	8	9	A
Date	11	12	13	14	15	16	17	18	19	20
Lot No.	C	D	E	F	G	H	J	K	L	M
Date	21	22	23	24	25	26	27	28	29	30
Lot No.	N	P	R	S	T	U	V	W	X	Y
Date	31									
Lot No.	Z									

13. DISPOSAL

This product shall be disposed of as industrial waste.

14. OTHER

For common precautions, please refer to the common precautions stated in the catalog and HP.



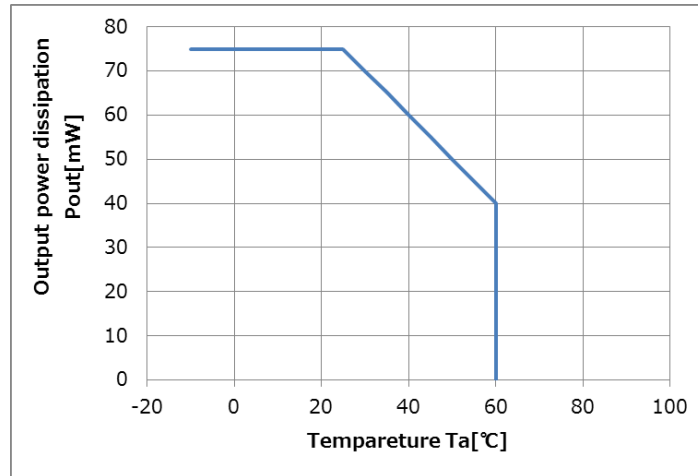


Figure3. Output power dissipation derating for temperature

## Packing

1pcs product is placed in a plastic bag. The tip of the bag is bended twice and the bag is sealed by the label.

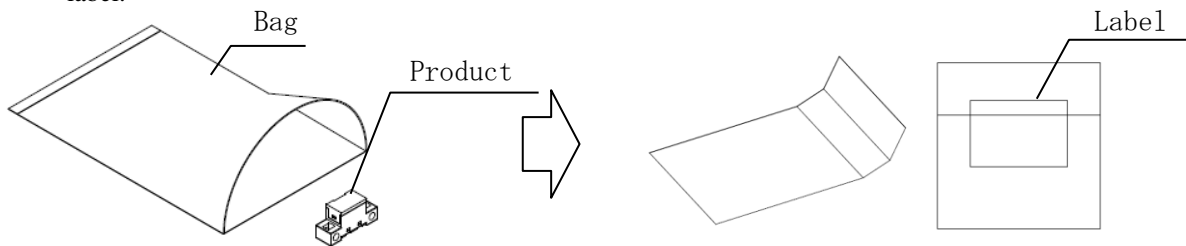


Fig.4 Packing of B5W-LB1114-1

## 15. PRECAUTIONS

### (1) Warning

These products cannot be used in safety devices for presses or other safety devices used to protect human life. This product is designed for use in applications for sensing workpieces and workers that will not affect levels of safety.

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purpose.

### (2) Precautions for Safe Use

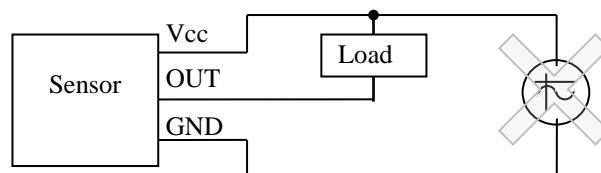
To ensure safety, observe the following precautions.

#### 2. 1) Wiring

##### 2. 2. 1) Power Supply

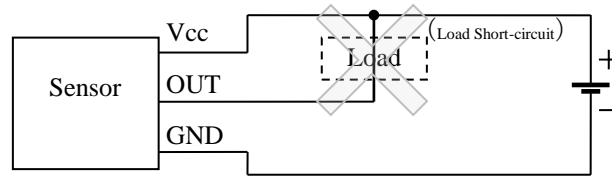
Do not apply any voltage exceeding the operating voltage range.

Applying any excessive voltage or supplying AC power to a DC-type sensor may cause the Sensor to explode or burn.



2. 2. 2) Load Short-circuit

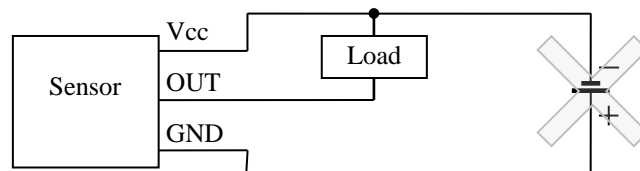
Do not short-circuit the load. Doing so may cause the Sensor to explode or burn.



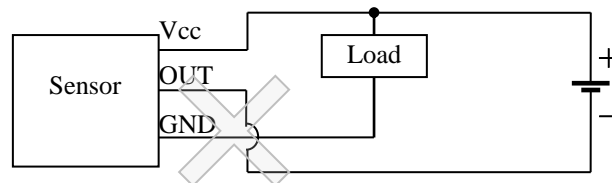
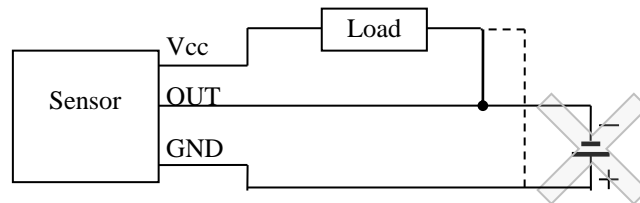
2. 2. 3) Wiring

Be sure to wire the Sensor correctly and be careful not to connect the polarities incorrectly, otherwise the Sensor may explode or burn.

Example1) Wrong polarity

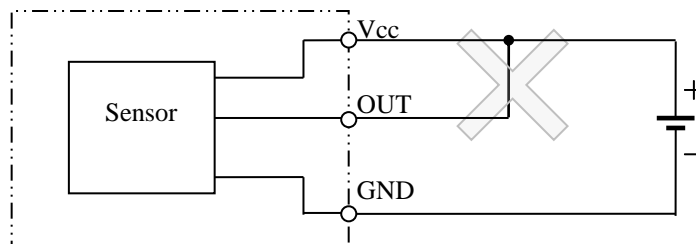


Example2) Wrong polarity or wrong wiring



2. 2. 4) Connection with No Load

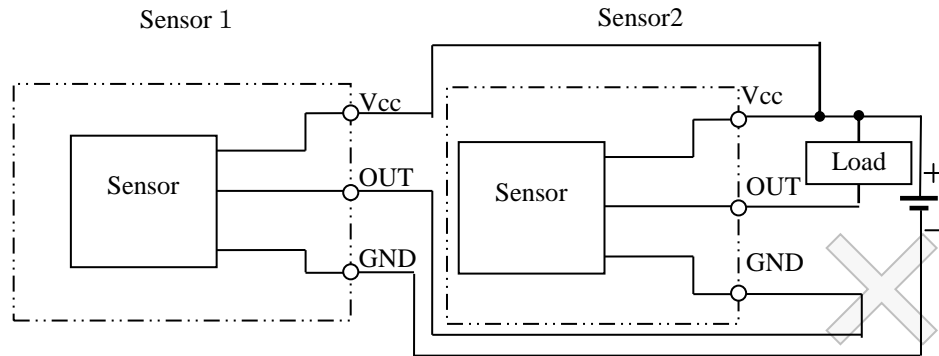
If connected to the power supply without any load, internal elements may explode or burn. Make sure that a proper load is connected to the Sensor.





## 2. 2. 5) AND Connections

Do not use AND connections such as in the example shown in the diagram here. Voltage will be applied to the Vcc terminal without the GND terminal of Sensor 2 being securely grounded, and may cause the Sensor to fail. Depending on the model used, inrush current to Sensor 2 when Sensor 1 is turned ON may cause product failure.



## 2. 2. 6) Operating Environment

This product does not have a water-proof or dust-proof structure. Therefore, do not use it in an application or environment where it will be subjected to dust or splashes from water, oil, or any other liquid.

## (3) Precautions for Correct Use

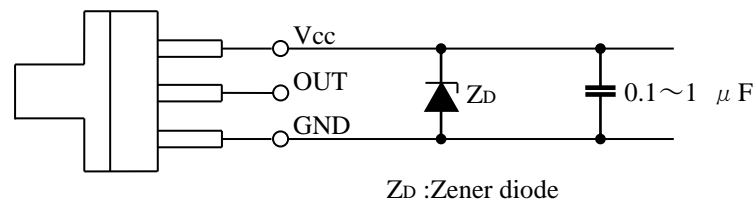
## 3. 1) Installation

- (1) The Sensors (models that begin with B5W-LB) are designed for being built into the device which is being used and are. Therefore, basically design the device structure to prevent the entrance of an incandescent light to the Sensor. When using a Sensor in an area exposed to an incandescent light or other external light interference, install so as to minimize the effects of external light sources.
- (2) Mount the Sensors securely on a flat surface
- (3) Install so that nothing can collide with the sensing section of the Sensor.  
Damage to the sensing surface will cause inferior performance.
- (4) Before using the Sensor, check to be sure that it has not become loose due to vibration or shock.

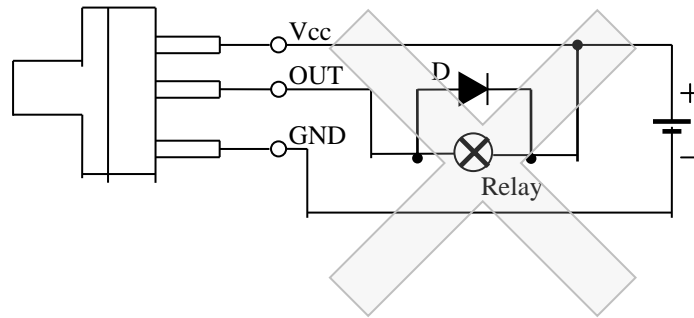
## 3. 2) Wiring

## 3. 2. 1) Surge

- (1) If there is surge in the power supply line, try connecting a capacitor (with a capacitance of 0.1 to 1  $\mu\text{F}$ ) or a Zener diode ( $Z_D$  in the diagram below, with a rated voltage of 30 to 35 V). Use the Sensor only after confirming that the surge has been removed.



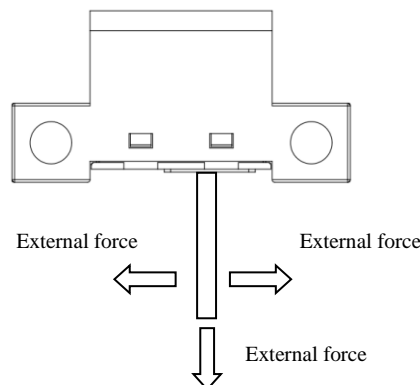
- (2) Do not use a small inductive load, such as a relay.



- (3) Separate the wiring for the Sensor from high-voltage lines or power lines. If the wiring is routed in the same conduit or duct as such lines, the Sensor may malfunction or may be damaged by inductive interference.
- (4) Make sure that the connectors (either dedicated or commercially available) are securely locked.

### 3. 2. 2) Handling Methods when Wiring

- (1) If a force is applied to the connection area between the terminal and connector by bending or pulling the cable after the wiring is completed, the connector contact part or connection area with the cable may be damaged, resulting in contact failure. Make sure that a stress (external force) as shown in the figure below is not applied to the connection area between the terminal and connector when routing and connecting cables or harnesses.
- (2) Do not wiring when power is supplied to the Sensor. Doing so may damage the Sensor.



### 3. 3) Design

#### **Precautions for Sensors with Modulated Light**

Design the application so that light will be completely interrupted.

We recommend that you use a metal object as the sensing object. (The light beam from an Infrared Sensor may pass through plastic sensing objects, which may make detection unstable.)

Terminate the terminals that you do not use (e.g., the L terminal or output line) and do not connect them to anything.

#### **Reasons for Interference from Power and Cable Length on Sensors with Modulated Light**

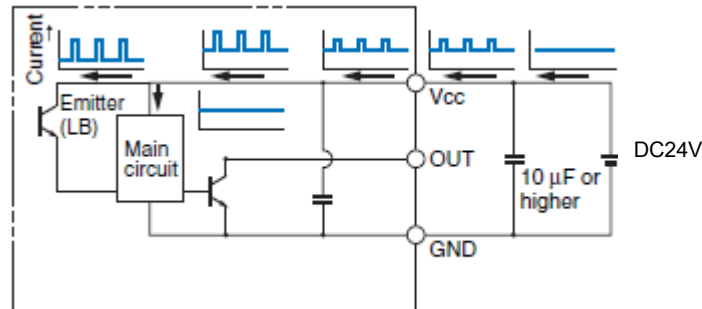
A LED emitter is pulse-lighted to produce modulated light. A large current momentarily flows to the Sensor in sync with this pulse timing. This causes a pulsating consumption current.

A photoelectric sensor incorporates a capacitor with sufficient capacity, and is virtually unaffected by the pulse of the consumption current. With a small Sensor, however, it is difficult to have a capacitor with a sufficient capacity. Accordingly, when the cable length is long or depending on the type of power source, it may become impossible to keep up with the pulse of the consumption current and operation may become unstable.

### Countermeasures

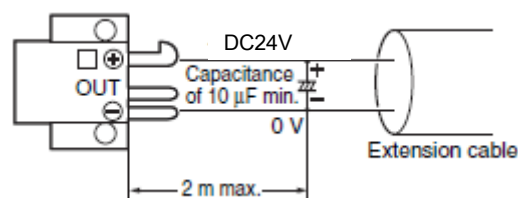
#### 〈Adding a Capacitor〉

Attach a capacitor of 10  $\mu\text{F}$  min. (e.g., a film capacitor) to the wires as close as possible to the Sensor. (Use a capacitor with a dielectric strength that is at least twice the Sensor's power supply voltage. Do not use tantalum capacitors. A short-circuit may cause the capacitor to ignite due to the large current flow.)



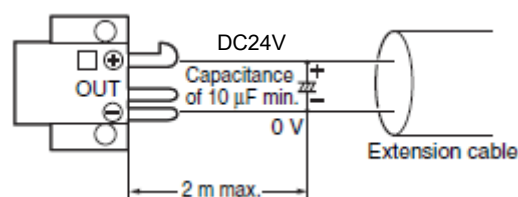
#### 〈Cable Length〉

- Design the configuration so that the maximum total cable length for the Sensor with Modulated Light is 2 m.
- When using a cable longer than 2 m, attach a capacitor (e.g., an aluminum electrolytic capacitor) with a capacity of approximately 10  $\mu\text{F}$  to the wires as shown below. The distance between the terminal and the capacitor must be within 2 m. Make sure that the total cable length is no longer than 5 m. To use a cable length longer than 5 m, use a PLC or other means to read the sensor output and then transmit the signals using a PLC's communications.
- Although cables are capable of being extended longer than 5 m, performance is likely to be affected by noise interference from adjacent cables and other devices. Voltage drops due to the resistance of the cable material itself will also influence performance. Therefore, factors, such as the difference in voltage between the end of the cable and the sensor and noise levels, must be given full consideration.

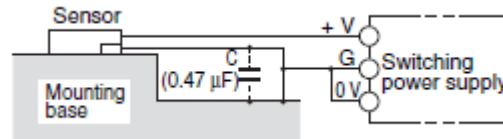


#### 〈Countermeasures for Switching Power Supplies〉

- Take either of the following countermeasures as required if connecting a Sensor with Modulated Light to a switching power supply.
  - ① Attach a capacitor of 10  $\mu\text{F}$  min. to the wires as close as possible to the Sensor. (Use a capacitor with a dielectric strength that is at least twice the Sensor's power supply voltage. Do not use tantalum capacitors. A short-circuit may cause the capacitor to ignite due to the large current flow.)



- ② Connect to the 0-V line of the power source or connect to the power source via a capacitor of approximately  $0.47 \mu\text{F}$  to reduce the impedance of the mounting base to prevent inductive noise from entering the mounting base.

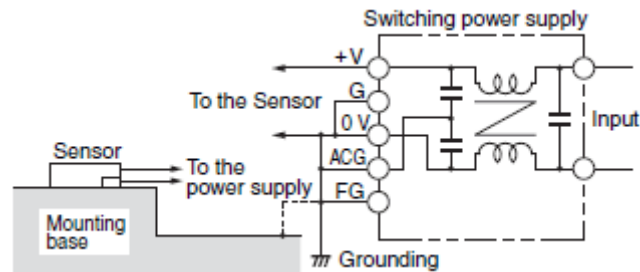


- ③ Connect the noise filter terminal (neutral terminal to ACG) of the switching power supply to the case (FG) and 0-V terminal of the power supply.

The line connected as mentioned above should be grounded or connected to the mounting base to ensure stable operation.

(Recommended by power supply manufacturers.)

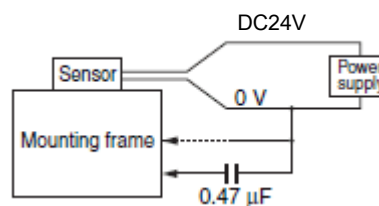
#### 〈Countermeasures to Handle Inductive Noise〉



- Insert a plastic insulator of approximately 10 mm between the Sensor and the mounting base.

#### 〈Effects of Inductive Noise〉

- When there is inductive noise in the Sensor mounting frame (metal), the output of the Sensor may be affected. In this case, ensure that there is no electrical potential difference between the Sensor 0-V terminal and the Sensor mounting frame, or put a  $0.47\text{-}\mu\text{F}$  capacitor between the 0-V terminal and the frame.



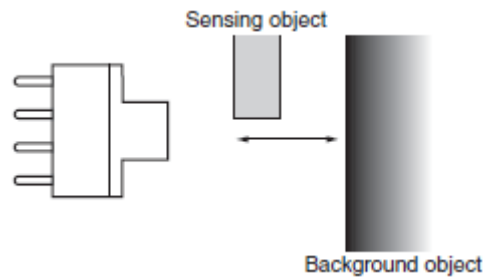
#### Precautions for Reflective Photo micro Sensors

##### 〈Sensing Distance〉

- Reflective photo micro sensor uses white paper (reflectance 90%) as standard. The sensing distance will change if you use under other conditions.

##### 〈Background Objects〉

- Use the Sensor only after carefully studying the possibility of light entering the Sensor due to light being reflected off background objects.



Decrease reflection from the background object, e.g., by providing a sufficient distance to the background or by using a black sponge as the background.

### 3. 4) Other Precautions

- (1) Do not disconnect the Connector from the Sensor when power is supplied to the Sensor. Doing so may damage the Sensor.
- (2) Avoid installing the Sensor in the following locations to prevent malfunction or product failure:
  - ① Location exposed to high concentrations of dust, oil mist, etc.
  - ② Locations exposed to corrosive gases
  - ③ Locations exposed directly or indirectly to water, oil, or chemical spray
  - ④ Outdoors or locations exposed to intensive light, such as direct sunlight
- (3) The Sensor may be dissolved by exposure to organic solvents, acids, alkali, aromatic hydrocarbons or chloride resin hydrocarbons, causing deterioration in characteristics. Do not expose the Sensor to such chemicals.
- (4) An output pulse may occur when the power supply is turned ON depending on the power supply and other conditions. Use the sensor in the stable ready-for-detection state reached in 100 ms after turning on the power supply.

## 16. Warranty and Limited Warranty

### (1) Definition

The definition of terms used in these Terms and Conditions are as follows:

- 1) *Usage conditions*: Usage conditions, rating, performance, operating environment, handling instructions, cautions, prohibited use, etc. of *Omron products* described in specifications, documentations or manuals.
- 2) *Customer application*: Application of *Omron products* by customers which include embedding and/or using *Omron products* in their parts/components, electronic substrates, devices, equipment or systems manufactured by customers.
- 3) *Fitness*: (a)Fitness, (b)performance, (c) non-infringement of third-party intellectual property, (d) compliance with laws and regulations and (e)conformity to various standards.

### (2) Caution on Descriptions

Attention is required to the following points on descriptions in specifications.

- 1) Rated values and performance values are the product of tests performed for separate single conditions, including but not limited to temperature and humidity. It is not intended to warrant rated values and performance values for multiple combined conditions.
- 2) Reference data are provided for reference only. *Omron* does NOT warrant that *Omron products* work properly at all time in the range of reference data.
- 3) Application examples are provided for reference only. *Omron* does NOT warrant the *Fitness* of *Omron products* under such application.
- 4) *Omron* may discontinue the production of *Omron products* or change the specifications of them for the purpose of improving such products or other reasons entirely at its own discretion.

### (3) Precautions

Please be aware of and accept the following when you introduce or use *Omron products*:

- 1) Please use *Omron products* in compliance with *usage conditions* including rating and performance.
- 2) Please confirm *fitness* of *Omron products* in your application and use your own judgment to determine the appropriateness of using them in such application. *Omron* shall not warrant the *fitness* of *Omron products* in customer application.
- 3) Please confirm that *Omron products* are properly wired and installed for their intended use in your overall system.
- 4) When using *Omron products*, please make sure to (i) maintain a margin of safety vis-à-vis the published rated and performance values, (ii) design to minimize risks to customer application in case of failure of *Omron products*, such as introducing redundancy, (iii) introduce system-wide safety measures to notify risks to users, and (iv) conduct regular maintenance on *Omron products* and *customer application*.
- 5) *Omron products* are designed and manufactured as general-purpose products for use in general industrial products. They are not intended to be used in the following applications. If you are using *Omron products* in the following applications, *Omron* shall not provide any warranty for such *Omron products*.
  - (a) Applications with stringent safety requirements, including but not limited to nuclear power control equipment, combustion equipment, aerospace equipment, railway equipment, elevator/lift equipment, amusement park equipment, medical equipment, safety devices and other applications that could cause danger/harm to people's body and life.
  - (b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property.
  - (c) Applications under severe condition or in severe environment, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks
  - (d) Applications under conditions and environment not described in specification
- 6) In addition to the applications listed from (a) to (d) above, *Omron products* are not intended for use in automotive applications (including two wheel vehicles). Please do NOT use *Omron products* for automotive applications. Please contact *Omron* sales staff for products for automotive use.

(4) Warranty Terms and Conditions

The terms and conditions for warranty of *Omron products* are as follows:

- 1) Warranty period: One year after the purchase.
- 2) Coverage: *Omron* will provide free replacement of the malfunctioning *Omron products* with the same number of replacement/alternative products.
- 3) Exceptions: *Omron* will not cover *Omron products* under its warranty if the cause of the malfunction falls under any of the following.
  - (a) Usage in a manner other than the original intended use for the *Omron products*.
  - (b) Usage outside of the *usage conditions*.
  - (c) Modification or repair made to the *Omron product* by other than *Omron personnel*.
  - (d) Software program embedded by other than *Omron* or usage of such software.
  - (e) Cause which could not have been foreseen with the level of science and technology at the time of shipping from *Omron*.
  - (f) Causes originating from other than *Omron* or *Omron products* (including force majeure such as but not limited to natural disasters).

(5) Limitation of Liability

The warranty set out in these Terms and Conditions is the whole and sole liability for *Omron products*. There are no other warranties, expressed or implied. *Omron* and the distributors of *Omron products* are not liable for any damages which may arise from or be related to *Omron products*.

(6) Export Controls

Customers of *Omron products* shall comply with all applicable laws and regulations of other relevant countries with regard to security export control, when exporting *Omron products* and/or technical documents or providing such products and/or documents to a non-resident. *Omron* may not provide customers with *Omron products* and/or technical documents should they fail to comply with such laws and regulations.