



Smart Photo Sensor SPS02 Specifications

TOSHIBA TELI CORPORATION

Information contained in this document is subject to change without prior notice.

D4213898D



Smart Photo Sensor

Contents

RESTRICTION FOR USE.....	1
CASES FOR INDEMNITY (LIMITED WARRANTY).....	2
Notes on using this product	3
1 Overview	5
2 Product Configuration.....	5
3 Option.....	6
4 Name of all parts.....	7
5 Wiring	8
6 Input and Output Circuit	9
7 Application Example	10
8 Specifications.....	10
9 Related Materials	11
10 Dimensions.....	12
11 Spectral Response Example.....	14
12 Warranty Rules.....	15
13 Repair	16

D4213898D



RESTRICTION FOR USE

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:
 1. Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
 2. Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.
- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.
- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.
 - (*1) : Equipment directly concerned with human life refers to.
 - Medical equipment such as life-support systems, equipment for operating theaters.
 - Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
 - Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law.
 - Equipment related to the above.
 - (*2) : Equipment relating to maintenance of public services/functions involving factors of safety refers to.
 - Traffic control systems for air transportation, railways, roads, or marine transportation.
 - Equipment for nuclear power generation.
 - Equipment related to the above.



CASES FOR INDEMNITY (LIMITED WARRANTY)

We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user in the following cases.

- In the case damage or losses are caused by natural disasters, such as an earthquake and thunder, fire, or other acts of God, acts by a third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.
- In the case of indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.
Also, in the case damage or losses are caused by an SPS application using with this product.
- In the case damage or losses are caused by failure to observe the information contained in the instructions in this instruction manual and specifications.
- In the case damage or losses are caused by use contrary to the instructions in this instruction manual and specifications.
- In the case damage or losses are caused by malfunction or other problems resulting from unintended use of equipment or software etc. that are not specified.
- Expenses we bear on this product shall be limited to the individual price of the product.
- The item that is not described in specifications of this product is out of the guarantee.
- The case of damages or losses which are caused by incorrect connection of the cable is out of the guarantee.



Notes on using this product

- Handle carefully

Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage the connection cable, since this may cause wire breakage.

- Environmental operating conditions

Do not use the product in locations where the ambient temperature or humidity exceeds the specifications. Otherwise, internal components may be adversely affected. In particular, do not use the product in areas exposed to direct sunlight. Moreover, during shooting under high temperatures, white spots (noise) may be produced, depending on the subject or product conditions (such as increased gain). However, such phenomena are not malfunctions.

- This product can be used under various conditions, please be sure to test operation under the condition and the environment you use.

- Check a combination with the lens

Depending on the lens and lighting you use, an image is reflected as a ghost in the imaging area. However, this is not because of a fault of the product. In addition, depending on the lens you use, the performance of the product may not be brought out fully due to deterioration in resolution and brightness in the peripheral area, aberration and others. Be sure to check a combination with the product by using the lens and lightning you actually use. When installing a lens in the product, make sure carefully that it is not tilted. In addition, use a mounting screw free from defects and dirt. Otherwise, the lens etc. may be unable to be removed.

- Do not expose the product's image-pickup-plane to sunlight or other intense light directly
Its inner CMOS (Complementary Metal-Oxide Semiconductor) sensor might be damaged.

- Occurrence of noise on the screen

If an intense magnetic or electromagnetic field is generated near the product or connection cable, noise may be generated on the screen. If this occurs, move the product or the cable.

- Handling of the protective tape

If the product is not in use, affix the protective tape to the product to protect the CMOS sensor.

- If the equipment is not to be used for a long duration

Turn off power to the product for safety.



Smart Photo Sensor

- Maintenance

Turn off power to the equipment and wipe it with a dry cloth.

If it becomes severely contaminated, gently wipe the affected areas with a soft cloth dampened with diluted neutral detergent. Never use alcohol, benzene, thinner, or other chemicals because such chemicals may damage or discolor the paint and indications.

If the image pickup surface becomes dusty, contaminated, or scratched, consult your sales representative.

- Disposal

When disposing of the product, it may be necessary to disassemble it into separate parts, in accordance with the laws and regulations of your country and/or municipality concerning environmental contamination.

Following information is only for EU-member states:

The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product.





Smart Photo Sensor

1 Overview

A Smart Photo Sensor is ultra-compact and contains high-speed image processing system. A device that can construct an image system by one chip is used in this sensor. It is capable to high-speed process the image because of preprocessing in the device, and it is also capable to determine a result that a former photoelectric sensor was incapable to.

An interface supplies GPIO, USB and RS-232, and it is possible to embed them in various uses. GPIO is used for determining the permission for the result of preprocessing, and USB is used for changing the parameters and the image transfer. RS-232 is prepared for recognition of the object position and PLC transmission.

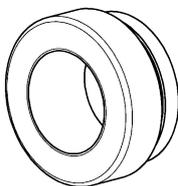
It is possible to choose a suitable application and embed it according to conditions of use such as the environment, the object and the result of preprocessing. As for application development, Visual Architect (optional) with user-friendly and graphical programming environment is prepared and the customers can arrange it.

The Smart Photo Sensor is the most ideal for a customer who requests a scene that the former photoelectric sensor was incapable to determine or simple preprocess that does not require high-quality image processing system.

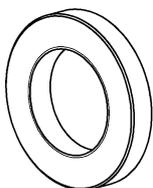
The Smart Photo Sensor supports RoHS restricting of the use of certain Hazardous Substances in electrical and electronic equipment.

2 Product Configuration

- SPS02 bodyx1
- Manualx1
- S-Mount Adapterx1



- Lens Locking Ringx1

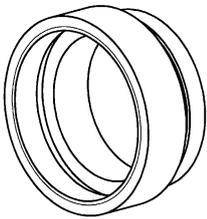




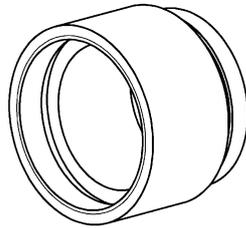
Smart Photo Sensor

3 Option

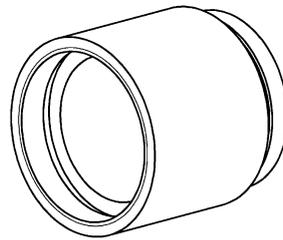
- Development Environment Visual Architect
- USB cable (TypeA - microB)
- Various of S-Mount Lens
Contact your dealer / distributor for details.
- Extension Tube for S-Mount Lens



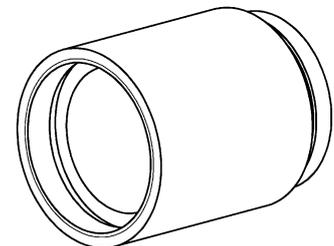
L=5mmx1



L=10mmx1

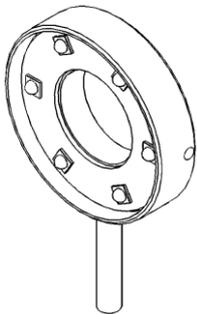


L=15mmx1



L=20mmx1

- LED Lamp

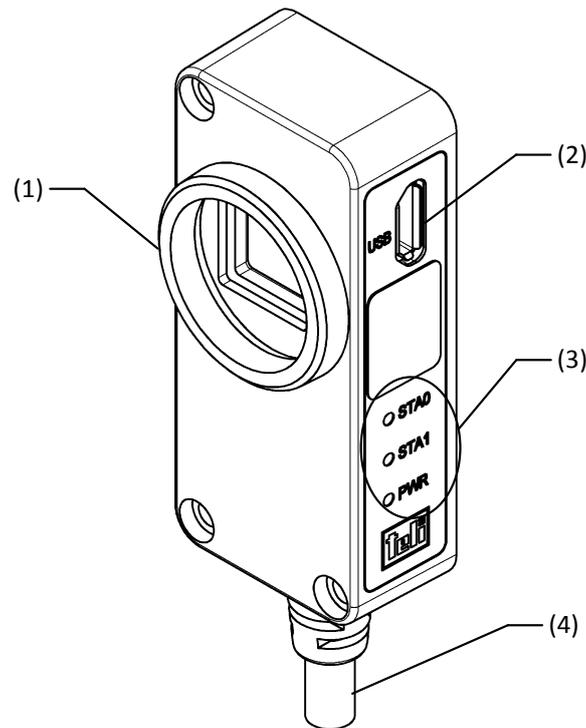


- Power Supply for LED Lamp



Smart Photo Sensor

4 Name of all parts



(1) Lens Mount

Attach the lens or the lens adapter according to the purpose of use.

(2) Micro-USB Type B Receptacle

Connector receptacle to connect with USB cable.

This port operates at USB2.0 high speed.

You can also transfer the image or set up parameter in real time via USB.

(3) LED Signal Light

- STA0 (Red) When setting "RED LED" block in Visual Architect, you can link LED display to any event.
- STA1 (Green) When setting "Green LED" block in Visual Architect, you can link LED display to any event.
- PWR (Orange) When you turn on power, it lights up.

(4) Power and I/O cable

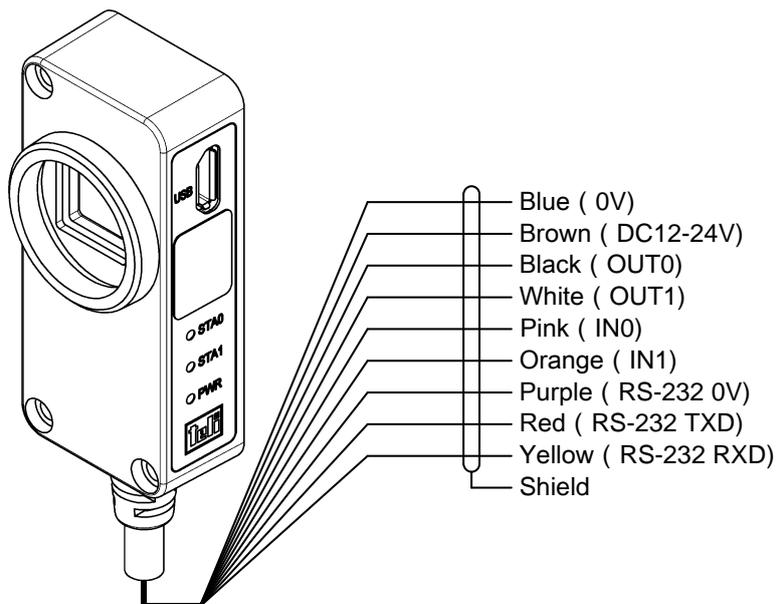
Direct cable for power and input / output signal, when stand-alone is operating, use this cable only.



Smart Photo Sensor

5 Wiring

The tip of power and I/O cable is scattering. Please wire it with a terminal block or a connector.

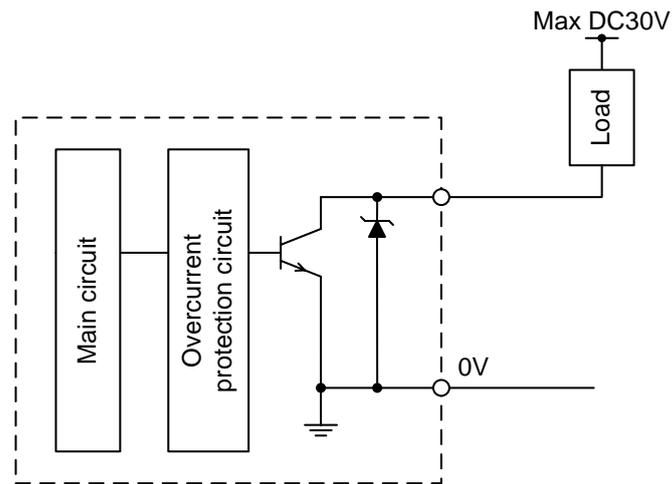


Color	Signal Name	Function	Size	Cable length	Bend Radius [Minimum]
Blue	0V	GND of the external power supply GND of the I/O Signal	AWG26	1[m]	44[mm]
Brown	DC12-24V	External Power Supply DC12~24V			
Black	OUT0	Signal Output			
White	OUT1	Signal Output			
Pink	IN0	Signal Input			
Orange	IN1	Signal Input			
Purple	RS-232 0V	GND of the RS-232			
Red	RS-232 TXD	TXD of the RS-232			
Yellow	RS-232 RXD	RXD of the RS-232			
—	Shield	Shield of the cable			

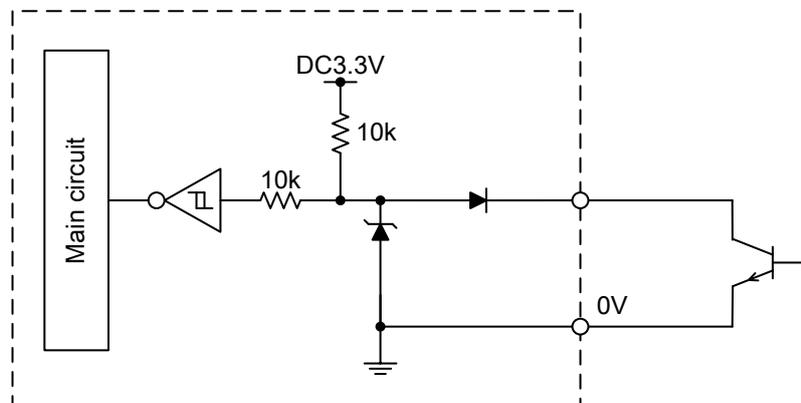


6 Input and Output Circuit

6-1 Output Circuit



6-2 Input Circuit





Smart Photo Sensor

7 Application Example

- Checking if all the parts are ready.
- Counting the number of the part.
- Positioning of the circuit board.
- Deciding the amount of liquid in the bottle.
- Checking the label.

8 Specifications

Imager	
Image Sensor	Type 1/2 CMOS sensor
Number of Effective Pixels	144 x 176
Cell Size	33.6 x 33.6[μm]
Sensing Area	4.8 x 5.9[mm]
Exposure Time	1 μ ~20ms
I/O Specification	
Output	2 Line NPN Open Collector Power Supply Voltage : 30V (maximum) Residual Voltage : 1V (maximum) Load Current : 100mA (maximum)
Input	2 Line ON Voltage : 0.5V (maximum) ON Current : 30 μ A (short-circuit) OFF Current : 50 μ A (maximum)
USB	USB2.0 High speed USB-Micro Type-B Receptacle
RS-232	TXD / RXD
Protection Circuit for GPIO	Output : Over Current Protection Input : Over Voltage Protection
LED Signal Light	STA0 : Red STA1 : Green PWR : Orange
Power Supply	Power and I/O cable for the power supply : DC12~24V \pm 10% (ripple 10% or less) USB cable : DC5V \pm 5% (ripple 10% or less) If both an I/O cable for the power supply and a USB cable are connected, power is supplied from an I/O cable for the power supply.
Power Consumption	2.4W
Ambient Conditions	
Operation Temperature	0~40 $^{\circ}$ C However, the temperature of this product housing is 60 $^{\circ}$ C or less.
Storage Temperature	-10~60 $^{\circ}$ C
Operation / Storage Humidity	35~85%RH (no condensation)

D4213898D



Smart Photo Sensor

EMC condition	EMI : EN61000-6-4, FCC Part 15 Subpart B Class A EMS : EN61000-6-2
Vibration Resistance	10~55Hz Double Amplitude 1.5mm Two hours for each XYZ direction
Shock Resistance	500m/s ² 6direction For each three times
Dimensions	22(W) x 50(H) x 12(D)[mm] (not including protrusion)
Mass (including 1meter cable)	About 56g
Lend Mount	M17 P=0.75

Notes on Heat Radiation:

The temperature of this product housing must be kept less than 60 °C.
Please provide sufficient heat radiation depending on your installation.

Notes on Heat Radiation:

The power consumption differs from an SPS Application you write on in this product. When using the SPS Application you arranged, please be sure about the influence of the heat under the condition and the environment you use.

Notes on Conformity of the EMC:

The adaptability of the safety standard of this product is assured in the condition of combination with the following parts:

- USB Cable U2C-MF20BK (ELECOM Co., Ltd)
- USB Connector Adaptor USA-MMC (Miyoshi Co., Ltd)

Please confirm the EMC compatibility of equipment and device.

9 Related Materials

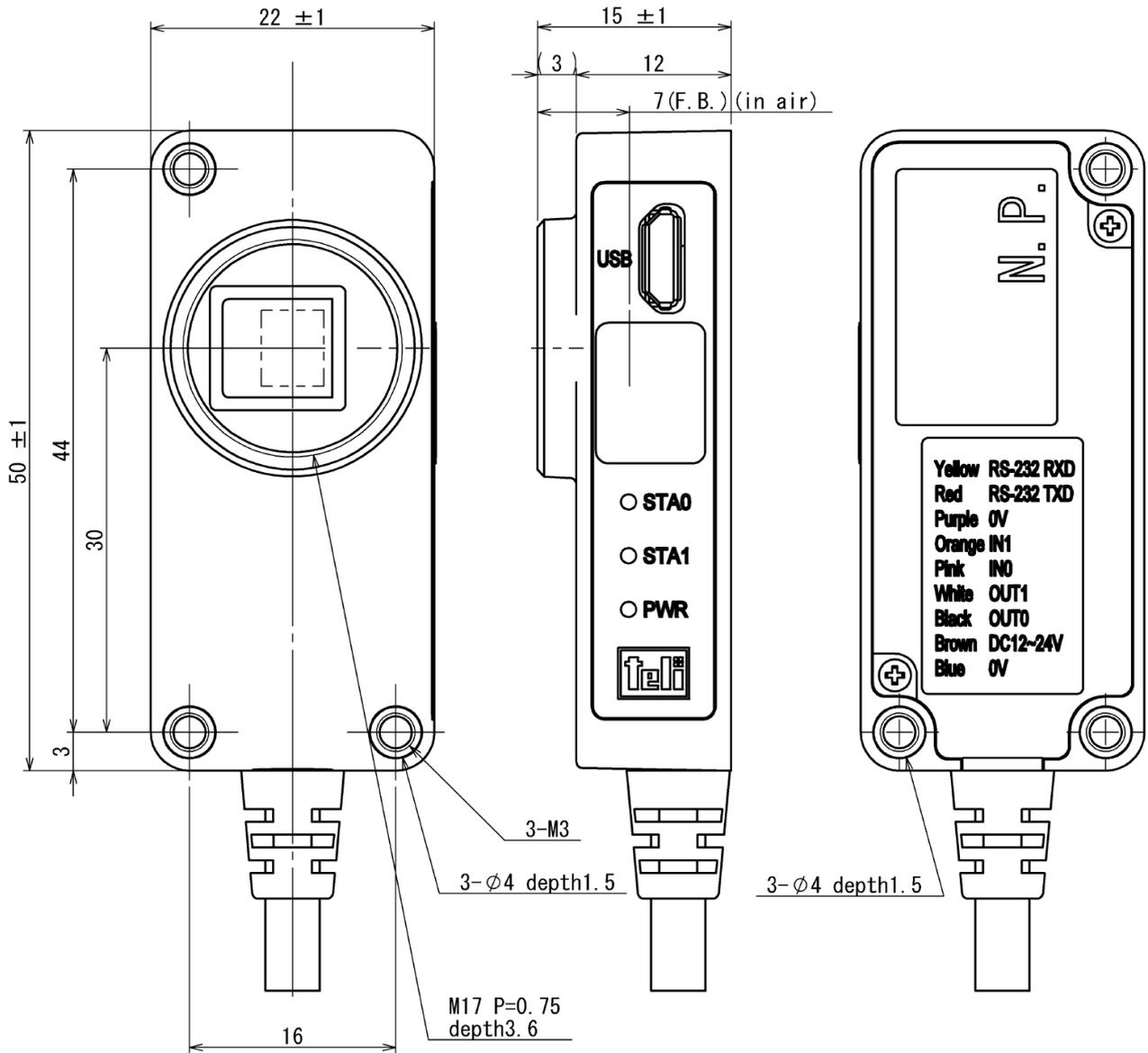
- SPS & Visual Architect Quick Start Guide
- SPS Visual Architect User Guide
- SPS Block Library Reference
- SPS Communication Manager Reference
- SPS Custom C/C++ Block API Reference
- SPS Custom CFPP API Block Reference
- SPS CFPP Code Reference



Smart Photo Sensor

10 Dimensions

● SPS02 body

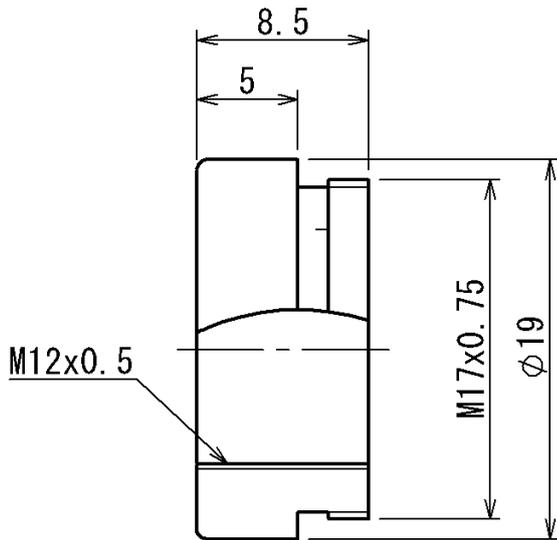


[mm]

D4213898D

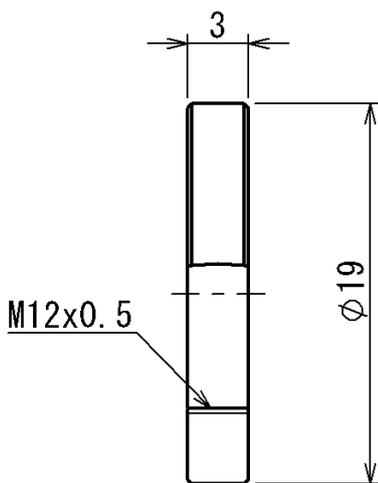


● S-Mount Adapter



[mm]

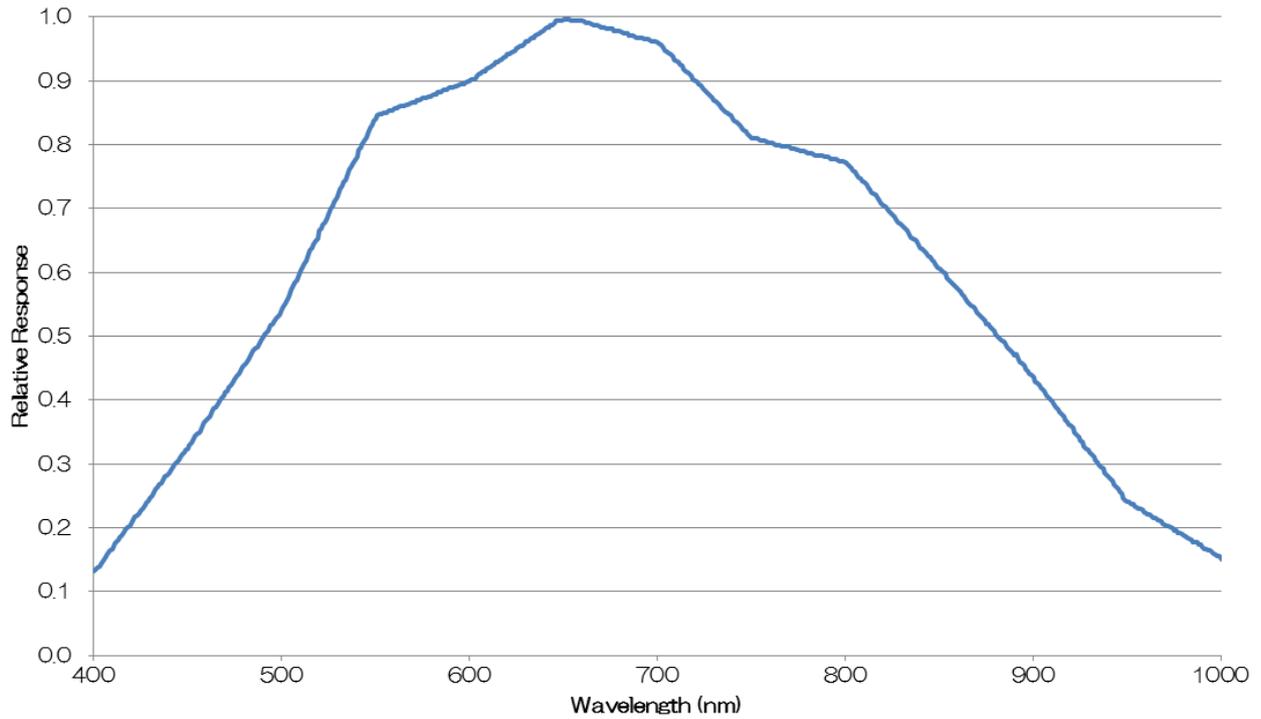
● Lens Locking Ring



[mm]



11 Spectral Response Example





12 Warranty Rules

12-1 Warranty term

Warranty term is 12 months after your purchase. We may assume the date of the purchase from our shipping date when the date is unidentified.

12-2 Limited Warranty

Free warranty is not applicable for the troubles, damages or losses caused by the cases of the followings, even if it is during the warranty term.

- (1) Natural exhaust, wear or degradation of a component parts.
- (2) Handling against the instructions and conditions described in the instruction manual.
- (3) Remodeling, adjustment and the part exchange. (including the opening of the enclosure box and the alteration)
- (4) Using the accessories not included with the product or our non-designated optional articles.
- (5) Damages caused during the transportation or deficiency of the handling such as drop or fall of the products after the products having been transferred to customers, leaving the products to corrosive environment such as sunlight, fire, sand, soil, heat, moisture, or an inappropriate storing method.
- (6) A fire, an earthquake, a flood, a lightning, or other natural disasters, pollution and a short circuit, abnormal voltage, excessive physical pressure, theft, other accident.
- (7) When connected to a product which is not recommended.
- (8) When connected to the power supply which is not suitable.
- (9) Forgery product, products which does not have proper serial number, products of which serial number is forged, damaged or deleted.
- (10) The fault caused by a malfunction combining other interface device or software that our company is not involved in.
- (11) All defects that happened after the expiration for a warranty term.



13 Repair

13-1 Repair methods

Exchange to a replacement or an equal function product.

13-2 Repair request methods

On the occasion of a repair request, please return the defective product with the failure situation report sheet to be filled out.

Please read the following instructions carefully.

- (1) Please return our product alone, taking out of your equipment in case that our product is installed to an equipment.
- (2) We are unable to return the information such as your own serial numbers, control number, the identification seal, if it is attached to the returned products. Please keep record before you return the product.
- (3) As the data saved in the product will not be kept after the repair, please take out data before return.
- (4) We are unable to accept the cancellation after the repair request by the customer's reason.
- (5) About the repair product shipping expenses, please bear the charges when you return the product to us. We bear the charges to you from us only for a warranty period.
- (6) We are unable to accept your request of a delivery date and time of the product return, or the delivery method.
- (7) We are unable to accept a trouble factor investigation, the request of the repair report.
- (8) We accept a repair of out of warranty product, if it is repairable.
- (9) The proprietary rights of the repair request products after the exchange repair belong to us.
- (10) The immunity from responsibility of the product is applied in the repair completion products.

In order to grasp the details of failure, please fill out the following information, and send us the defective product with this report sheet enclosed.

(1) Customer information

Company Name		Department	Your Name
Telephone number	E-Mail address		FAX number
Postal code number	Address		

(2) Return address Please fill out this information, if the return address is different from above address (1).

The offered personal information is not used for any purposes other than after-sale service, such as repair of a product and an inquiry, and the questionnaire of the improvement in customer satisfaction.
 Moreover, except for the case where it commissions "The offered personal information is not used for any purposes other than after-sale service, such as repair of a product and an inquiry, and the questionnaire of the improvement in customer satisfaction."
 Moreover, except for the case where it commissions within limits required for the above-mentioned purpose achievement, it does not indicate to a third party without a visitor's consent.
 We pay careful attention and manage a visitor's information."

(3) Before submitting your request to repair, please refer the following solutions to fix common problems.

***In any case of the following items, please perform in an environment that permits the maximal amount of safety.**
***When turning on/off power, follow the procedure as provided by the device and make sure that it is safe and does not interfere with operation.**

1) LED (Orange) light on the side of the product does not turn on. Check → <input type="checkbox"/> Solid light <input type="checkbox"/> No light <input type="checkbox"/> Other
• Make sure that power and I/O cable and a USB cable are connected to the product correctly and power is supplied. *If both power and I/O cable and a USB cable are connected, power is supplied from an I/O cable for the power supply.
2) GPIO and RS-232 does not operate. Check → <input type="checkbox"/> Correct <input type="checkbox"/> Incorrect <input type="checkbox"/> Other
• Make sure that there is power and I/O cable breakage, and it is connected to your device correctly. • Please turn off this product once, switch on a power supply again after passing for a while, and confirm operation. • If you wrote on application to the product, re-write again and check operation.
3) A image is not output. Check → <input type="checkbox"/> Correct <input type="checkbox"/> Incorrect <input type="checkbox"/> Other
• Make sure that a USB cable are connected to the product correctly and power is supplied. • Please turn off this product once, switch on a power supply again after passing for a while, and confirm operation. • If you wrote on application to the product, re-write again and check operation.

(4) Failure situation

■ Accrual date Month: Day: Year:

Model name	Serial No.	Your dealer
		Purchase date
		Month: Year:
Condition of failure (Please specify symptoms of trouble.)		

As for the SPS application or the setting information that a customer saved, all data, the setting information and SPS application will be deleted in order for us to install our own test application when confirming the phenomenon.
 Also we doesn't do back-up of the data. Please understand and accept that we assumes no responsibility for the data in advance.

(5) From when

Unknown From the beginning After a while After environment was changed.

(Others : _____)

(6) Occurrence frequency

Unknown It certainly occurs. It sometimes occurs. It occurs, after time passes.

(Others : _____)

<For dealer use>

Reception date : Receipt No. : JOB No: Check :