

Hangzhou Hikrobot Technology Co.,Ltd.

# Photoelectric Sensor

Quick Start Guide

**HIKROBOT**

# Legal Information

© Hangzhou Hikrobot Co., Ltd. All rights reserved.

## About this Document

This Document includes instructions for using and managing the Product. Pictures, charts, images and all other information hereinafter are for description and explanation only. The information contained in the Document is subject to change, without notice, due to firmware updates or other reasons. Please find the latest version in the company website (<https://en.hikrobotics.com/>). Unless otherwise agreed, Hangzhou Hikrobot Co., Ltd. or its affiliates (hereinafter referred to as "Hikrobot") makes no warranties, express or implied. Please use the Document with the guidance and assistance of professionals trained in supporting the Product.

## Acknowledgment of Intellectual Property Rights

- Hikrobot owns the copyrights and/or patents related to the technology embodied in the Products described in this Document, which may include licenses obtained from third parties. Any part of the Document, including text, pictures, graphics, etc., belongs to Hikrobot. No part of this Document may be excerpted, copied, translated, or modified in whole or in part by any means without written permission.
- **HIKROBOT** and other Hikrobot's trademarks and logos are the properties of Hikrobot in various jurisdictions. Other trademarks and logos mentioned are the properties of their respective owners.

## LEGAL DISCLAIMER

TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THIS MANUAL AND THE PRODUCT DESCRIBED, WITH ITS HARDWARE, SOFTWARE AND FIRMWARE, ARE PROVIDED "AS IS" AND "WITH ALL FAULTS AND ERRORS". HIKROBOT MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY, SATISFACTORY QUALITY, OR FITNESS FOR A PARTICULAR PURPOSE. THE USE OF THE PRODUCT BY YOU IS AT YOUR OWN RISK. IN NO EVENT WILL HIKROBOT BE LIABLE TO YOU FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR INDIRECT DAMAGES, INCLUDING, AMONG OTHERS, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, OR LOSS OF DATA, CORRUPTION OF SYSTEMS, OR LOSS OF DOCUMENTATION, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE), PRODUCT LIABILITY, OR OTHERWISE, IN CONNECTION WITH THE USE OF THE PRODUCT, EVEN IF HIKROBOT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR LOSS.

YOU ACKNOWLEDGE THAT THE NATURE OF INTERNET PROVIDES FOR INHERENT SECURITY RISKS, AND HIKROBOT SHALL NOT TAKE ANY RESPONSIBILITIES FOR ABNORMAL OPERATION, PRIVACY LEAKAGE OR OTHER DAMAGES RESULTING FROM CYBER-ATTACK, HACKER ATTACK, VIRUS INFECTION, OR OTHER INTERNET SECURITY RISKS; HOWEVER, HIKROBOT WILL PROVIDE TIMELY TECHNICAL SUPPORT IF REQUIRED.

YOU AGREE TO USE THIS PRODUCT IN COMPLIANCE WITH ALL APPLICABLE LAWS, AND

YOU ARE SOLELY RESPONSIBLE FOR ENSURING THAT YOUR USE CONFORMS TO THE APPLICABLE LAW. ESPECIALLY, YOU ARE RESPONSIBLE, FOR USING THIS PRODUCT IN A MANNER THAT DOES NOT INFRINGE ON THE RIGHTS OF THIRD PARTIES, INCLUDING WITHOUT LIMITATION, RIGHTS OF PUBLICITY, INTELLECTUAL PROPERTY RIGHTS, OR DATA PROTECTION AND OTHER PRIVACY RIGHTS. YOU SHALL NOT USE THIS PRODUCT FOR ANY PROHIBITED END-USES, INCLUDING THE DEVELOPMENT OR PRODUCTION OF WEAPONS OF MASS DESTRUCTION, THE DEVELOPMENT OR PRODUCTION OF CHEMICAL OR BIOLOGICAL WEAPONS, ANY ACTIVITIES IN THE CONTEXT RELATED TO ANY NUCLEAR EXPLOSIVE OR UNSAFE NUCLEAR FUEL-CYCLE, OR IN SUPPORT OF HUMAN RIGHTS ABUSES.

THE PERFORMANCE DATA IN THIS PUBLICATION IS BASED ON HIKROBOT'S INTERNAL RESEARCH/EVALUATION. ACTUAL DATA MAY VARY DEPENDING ON SPECIFIC CONFIGURATIONS AND OPERATING CONDITIONS AND HIKROBOT SHALL NOT BEAR THE CONSEQUENCES ARISING THEREFROM.

IN THE EVENT OF ANY CONFLICTS BETWEEN THIS MANUAL AND THE APPLICABLE LAW, THE LATTER PREVAILS.

## Regulatory Information

---

### Note

- These clauses apply only to the products bearing the corresponding mark or information.
  - Due to the product shape and dimension, the name and address of the importer/manufacturer are printed on the package.
- 

### EU Conformity Statement



This product and - if applicable - the supplied accessories too are marked with "CE" and comply therefore with the applicable harmonized European standards listed under the Directive 2014/30/EU(EMCD), Directive 2001/95/EC(GPSD) and Directive 2011/65/EU(RoHS).



2012/19/EU (WEEE directive): Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points. For more information see: <http://www.recyclethis.info>






2006/66/EC (battery directive): This product contains a battery that cannot be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. The battery is marked with this symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling, return the battery to your supplier or to a designated collection point.

For more information see: <http://www.recyclethis.info>

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 <b>Danger</b>	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.
 <b>Caution</b>	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
 <b>Note</b>	Provides additional information to emphasize or supplement important points of the main text.

## Available Model

This manual is applicable to the photoelectric sensor.

## Contact Information

Hangzhou Hikrobot Co., Ltd.

E-mail: [global.support@hikrobotics.com](mailto:global.support@hikrobotics.com)

Website: <https://en.hikrobotics.com/>

# Contents

<b>Chapter 1 Safety Instruction</b> .....	<b>1</b>
<b>1.1 Safety Claim</b> .....	<b>1</b>
<b>1.2 Safety Instruction</b> .....	<b>1</b>
<b>1.3 Electromagnetic Interference Prevention</b> .....	<b>2</b>
<b>1.4 Laser Precaution</b> .....	<b>3</b>
<b>Chapter 2 Overview</b> .....	<b>5</b>
<b>2.1 Introduction</b> .....	<b>5</b>
<b>2.2 Key Features</b> .....	<b>5</b>
<b>Chapter 3 Appearance</b> .....	<b>6</b>
<b>Chapter 4 Installation and Wiring</b> .....	<b>8</b>
<b>4.1 Install Device</b> .....	<b>8</b>
<b>4.2 Wire Device</b> .....	<b>8</b>
<b>Chapter 5 Device Debugging</b> .....	<b>11</b>
<b>5.1 Set Alignment</b> .....	<b>11</b>
<b>5.2 Adjust Sensitivity</b> .....	<b>11</b>
<b>5.3 Set Distance and Other Functions</b> .....	<b>11</b>

# Chapter 1 Safety Instruction

The safety instructions are intended to ensure that the user can use the device correctly to avoid danger or property loss. Read and follow these safety instructions before installing, operating and maintaining the device.

## 1.1 Safety Claim

- To ensure personal and device safety, when installing, operating, and maintaining the device, follow the signs on the device and all safety instructions described in the manual.
- The note, caution and danger items in the manual do not represent all the safety instructions that should be observed, but only serve as a supplement to all the safety instructions.
- The device should be used in an environment that meets the design specifications, otherwise it may cause malfunctions, and malfunctions or component damage caused by non-compliance with relevant regulations are not within the scope of the device's quality assurance.
- Our company will not bear any legal responsibility for personal safety accidents and property losses caused by abnormal operation of the device.

## 1.2 Safety Instruction

### Caution

- Do not install the device if it is found that the device and accessories are damaged, rusted, water ingress, model mismatch, missing parts, etc., when unpacking.
- Avoid storage and transportation in places such as water splashing and rain, direct sunlight, strong electric fields, strong magnetic fields, and strong vibrations.
- Avoid dropping, smashing or vigorously vibrating the device and its components.
- It is forbidden to install the indoor device in an environment where it may be exposed to water or other liquids. If the device is damp, it may cause fire and electric shock hazard.
- Place the device in a place out of direct sunlight and ventilation, away from heat sources such as heaters and radiators.
- In the use of the device, you must be in strict compliance with the electrical safety regulations of the nation and region.
- Use the power adapter provided by the official manufacturer. The power adapter must meet the Limited Power Source (LPS) requirements. For specific requirements, please refer to the device's technical specifications.
- Do not cover the device's plug or outlet for disconnecting power supply.
- It is strictly forbidden to wire, maintain, and disassemble the device that is powered on. Otherwise there is a danger of electric shock and a damage to device.
- Make sure that the device is installed in good condition, the wiring is firm, and the power

supply meets the requirements before powering on the device.

- For a device with a power switch, please use the switch to power on and off. It is strictly forbidden to plug and unplug the power cord.
- If the device emits smoke, odor or noise, please turn off the power and unplug the power cord immediately, and contact the dealer or service center in time.
- It is strictly forbidden to touch any terminal of the device when operating it. Otherwise there is a danger of electric shock.
- It is strictly forbidden for non-professional technicians to detect signals during device operation, otherwise it may cause personal injury or device damage.
- If the device does not work properly, please contact your dealer or the nearest service center. Never attempt to disassemble the device yourself. We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.
- Please dispose of the device in strict accordance with the relevant national or regional regulations and standards to avoid environmental pollution and property damage.

### **Note**

- Check whether the device's package is in good condition, whether there is damage, intrusion, moisture, deformation, etc. before unpacking.
- Check the surface of the device and accessories for damage, rust, bumps, etc. when unpacking.
- Check whether the quantity and information of the device and accessories are complete after unpacking.
- Store and transport the device according to the storage and transport conditions of the device, and the storage temperature and humidity should meet the requirements.
- It is strictly prohibited to transport the device in combination with items that may affect or damage the device.
- Quality requirements for installation and maintenance personnel:
  - Qualification certificate or working experience in weak current system installation and maintenance, and relevant working experience and qualifications. Besides, the personnel must possess the following knowledge and operation skills.
  - The basic knowledge and operation skills of low voltage wiring and low voltage electronic circuit connection.
  - The ability to comprehend the contents of this manual.
- Please read the manual and safety instructions carefully before installing the device.
- Please install the device strictly according to the installation method in this manual.
- Do not contact the device with strong acids, alkalis, oils, greases or organic solutions such as thinners.
- Do not expose the device directly to flashlights, high-frequency switch lighting devices, or to sunlight, which may affect the performance.

## 1.3 Electromagnetic Interference Prevention

- Make sure that the shielding layer of cables is intact and 360° connected to the metal connector when using shielded cables.
- Do not route the device together with other equipment (especially servo motors, high-

power devices, etc.), and control the distance between cables to more than 10 cm. Make sure to shield the cables if unavoidable.

- The control cable of the device and the power cable of the industrial light source must be wired separately to avoid bundled wiring.
- The power cable, data cable, signal cable, etc. of the device must be wired separately. Make sure to ground them if the wiring groove is used to separate the wiring and the wiring groove is metal.
- During the wiring process, evaluate the wiring space reasonably, and do not pull the cables hard, so as not to damage the electrical performance of the cables.
- If the device is powered on and off frequently, it is necessary to strengthen the voltage isolation, and consider adding a DC/DC isolation power supply module between the device and the adapter.
- Use the power adapter to supply power to the device separately. If centralized power supply is necessary, make sure to use a DC filter to filter the power supply of the device separately before use.
- The unused cables of the device must be insulated.
- When installing the device, if you cannot ensure that the device itself and all equipment connected to the device are well grounded, you should isolate the device with an insulating bracket.
- To avoid the accumulation of static electricity, ensure that other equipment (such as machines, internal components, etc.) and metal brackets on site are properly grounded.
- During the installation and use of the device, high voltage leakage must be avoided.
- Use a figure-eight bundle method if the device cable is too long.
- When connecting the device and metal accessories, they must be connected firmly to maintain good conductivity.

### 1.4 Laser Precaution

The device complies with IEC 60825-1:2014 and GB 7247.1-2012.

#### **Caution**

- Do not look directly at the laser beam, and if necessary, adjust the direction of direct eye gaze or close your eyes for protection.
- Do not use optical instruments (such as telescopes, magnifier) to observe the laser beam.
- Do not place optical instruments (such as mirrors) within the irradiation range of the laser beam.
- Avoid shining the laser on highly reflective materials. If it is unavoidable, the angle of the reflective material should be adjusted to prevent damage caused by laser reflection.
- Turn off the laser when the device is not in use.
- Please use this device correctly and safely in accordance with the contents of this manual and the local standards and laws and regulations. Otherwise the operator may be exposed to the risk of injury, electric shock, or radiation from the laser.

The laser safety class is Class 1.



**Figure 1-1 Class 1 Laser Product**

## Chapter 2 Overview

### 2.1 Introduction

A photoelectric sensor primarily consists of a transmitter and a receiver. The former transmits visible light and infrared light, and the latter detects and converts changes of light amount reflected or interrupted by the sensing object to an electrical output.

### 2.2 Key Features

- Provides long-range detection of materials in various scenarios by using spots and lasers.
- Remains unaffected if exposed to direct sunlight, high-frequency LED light, or strong electro-magnetic wave.
- Ease to use.

---

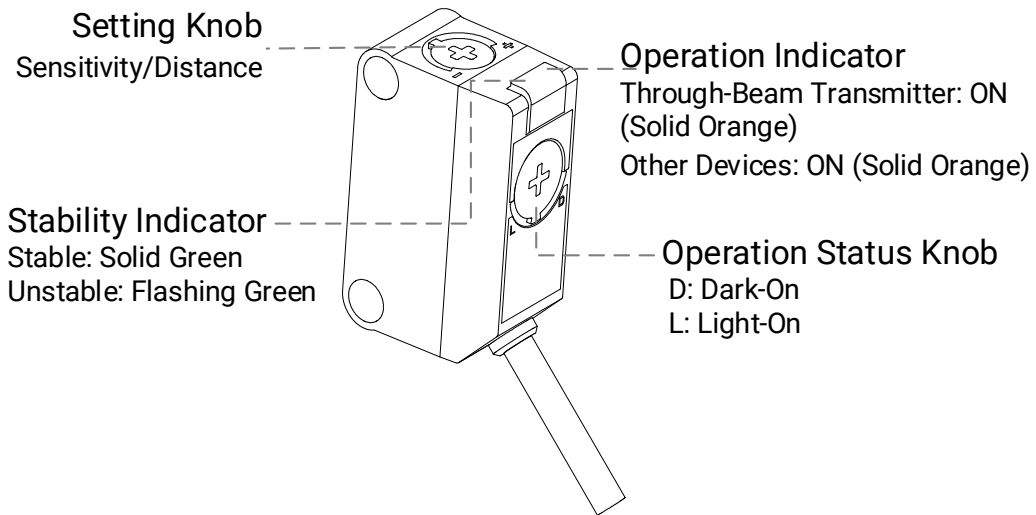
 **Note**

- The specific functions may differ by device models.
  - Refer to the device's specifications for specific parameters.
-

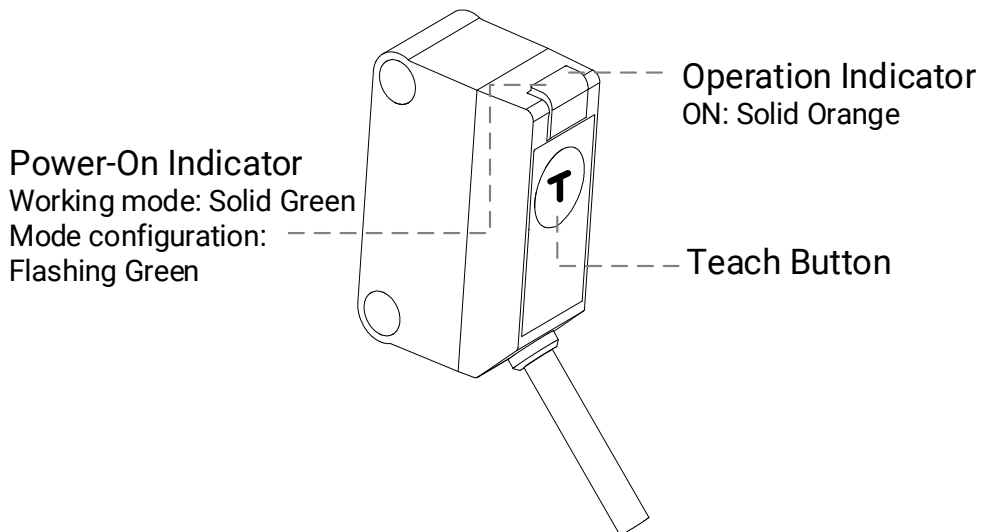
## Chapter 3 Appearance

**Note**

Appearance here is for reference only. Refer to the device's specification for detailed dimension information.



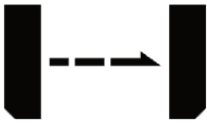

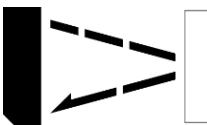


**Figure 3-1 Appearance of Type I**



**Figure 3-2 Appearance of Type II**

## Photoelectric Sensor Quick Start Guide

**Table 3-1 Device Type**

No.	Device Type	Figure	Detection Distance	Device Model		Functions
				NPN Output	PNP Output	
1	Through-Beam Sensor		15 m	MV-PE5101	MV-PE5101-P	N/A
			30 m	MV-PE5112	MV-PE5112-P	Infrared
2	Retro-Reflective Sensor		0.1 m to 3 m	MV-PE5301	MV-PE5301-P	Polarizing filter
			0.1 m to 1 m	MV-PE5313	MV-PE5313-P	Transparent object detection
3	Diffuse-Reflective Sensor		300 mm	MV-PE5602	MV-PE5602-P	N/A
			1000 mm	MV-PE5603	MV-PE5603-P	N/A
			5 mm to 50 mm	MV-PE5801	MV-PE5801-P	Definite reflective
4	Time-of-Flight Sensor		50 mm to 5000 mm	MV-PE5715		ToF
5	Diffuse-Reflective Sensor (With Settable Distance)		5 mm to 100 mm	MV-PE5501	MV-PE5501-P	Spot
			10 mm to 350 mm	MV-PE5502	MV-PE5502-P	Long-range detection

## Chapter 4 Installation and Wiring

### 4.1 Install Device

#### Before You Start

- Make sure the device in the package is in good condition and all assembly parts are included.
- Make sure all the related equipment is power-off during the installation.

Use M3 screws to fix the device. The tightening torque should be no greater than 0.6 N·m.

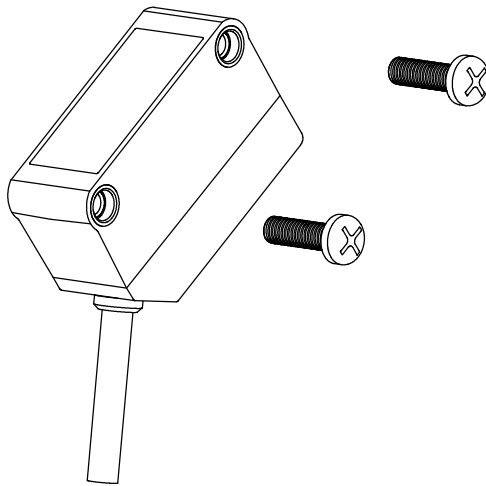


Figure 4-1 Install Device

### 4.2 Wire Device

The table below shows the cable of different devices.

Table 4-1 Cable Description

Cable Color / Device Type	Brown	Blue	Black	Pink
Through-Beam Sensor	Power Positive	Power Negative	Receiver: Output Transmitter: N/A	N/A
Retro-Reflective	Power Positive	Power Negative	Output	N/A

## Photoelectric Sensor Quick Start Guide

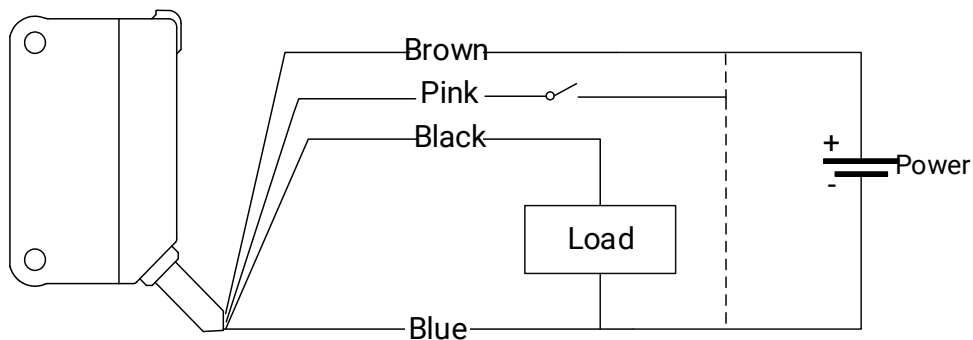
Cable Color Device Type	Brown	Blue	Black	Pink
Sensor				
Diffuse-Reflective Sensor	Power Positive	Power Negative	Output	N/A
Time-of-Flight Sensor	Power Positive	Power Negative	Output	N/A
Diffuse-Reflective Sensor (With Settable Distance)	Power Positive	Power Negative	Output	Power Negative: BGS Power Positive: FGS

### Note

- BGS function: It refers to background suppression, and applicable to detect the object without background.
- FGS function: It refers to foreground suppression, and applicable to the scene that the object and the background are close together or the object is glossy.

The figures below show the wiring method of different devices.

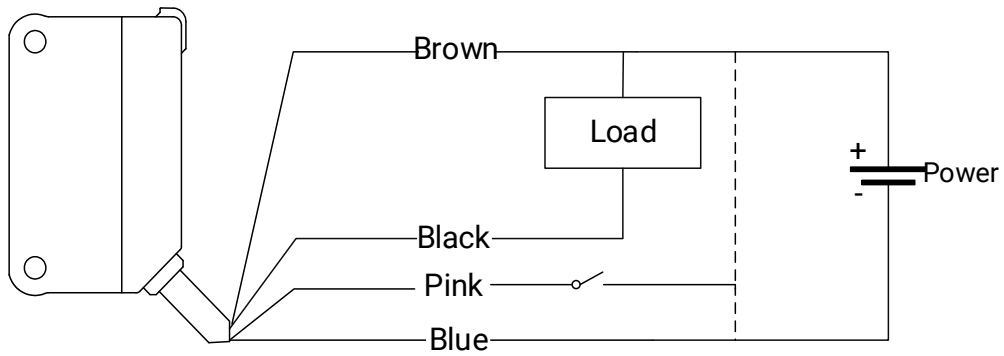
### Diffuse-reflective sensor (with settable distance)



**Figure 4-2 Wiring of PNP Device**

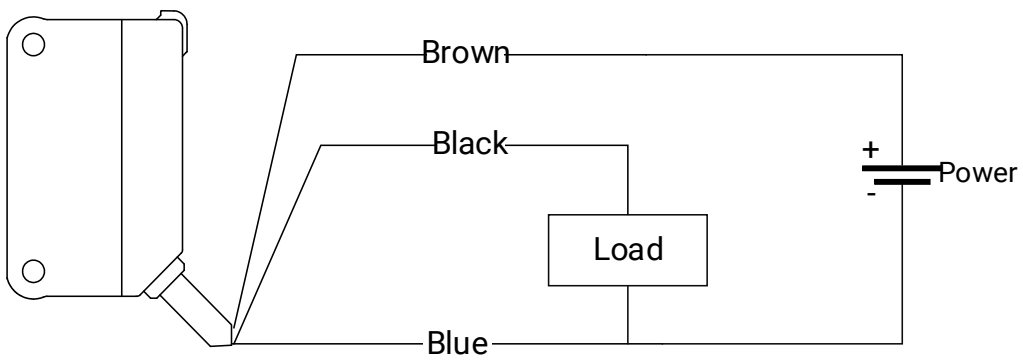
# Photoelectric Sensor Quick Start Guide

---

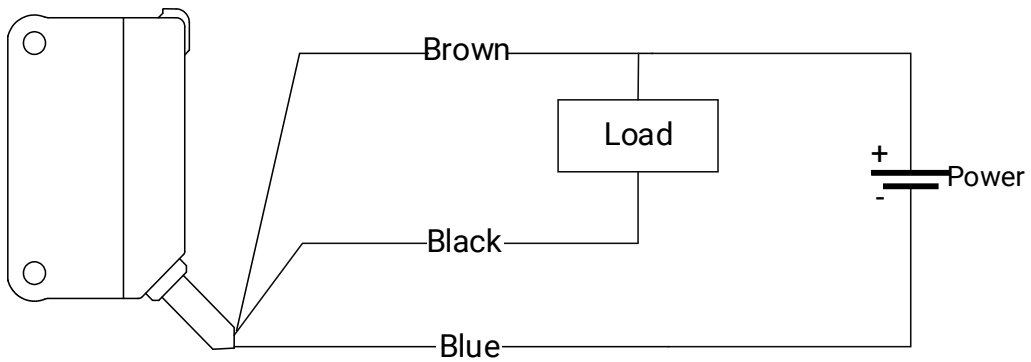


**Figure 4-3 Wiring of NPN Device**

## Other sensors



**Figure 4-4 Wiring of PNP Device**



**Figure 4-5 Wiring of NPN Device**

## Chapter 5 Device Debugging

Device debugging is required before operation. This section introduces how to debug the device, including setting alignment, sensitivity, distance, and other functions.

### 5.1 Set Alignment

The alignment method may differ by device types.

- **Through-beam sensor:** Align the transmitter to the receiver, and select a suitable position where the light beam from the transmitter can be received by the receiver and the stable indicator of the receiver is solid green.
- **Retro-reflective sensor:** Align the sensor to the reflective plate, and make sure the stable indicator is solid green.
- **Diffuse-reflective sensor:** Align the sensor to the object, and make sure the stable indicator is solid green.
- **Time-of-flight sensor:** When the sensor is aligned to the object, if infrared light spot occurs, it is necessary to align by the structural part or by the infrared camera.

### 5.2 Adjust Sensitivity

- Turn the setting knob (sensitivity) counterclockwise to decrease the detection distance. When turned to the "-" position, the detection distance is the shortest.
- Turn the setting knob (sensitivity) clockwise to increase the detection distance. When turned to the "+" position, the detection distance is the longest.

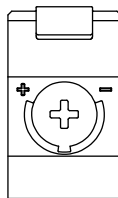


Figure 5-1 Adjust Sensitivity

### 5.3 Set Distance and Other Functions

---

 **Note**

- Setting distance is only available for the diffuse-reflective sensor (with settable distance) and the time-of-flight sensor.
  - Setting other functions is only available for the time-of-flight sensor.
-

## Setting Distance of Diffuse-Reflective Sensor (With Settable Distance)

- **BGS function:** Turn the setting knob (distance) fully counterclockwise. After the object is placed, turn the knob clockwise until the orange LED indicator lights up and the green LED indicator is always on. The position is the setting position.
- **FGS function:** Turn the setting knob (distance) fully clockwise. After the object is removed and the background is detected, turn the knob counterclockwise until the orange LED indicator lights up and the green LED indicator is always on. The position is the setting position.

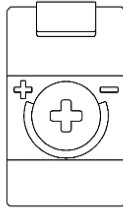


Figure 5-2 Set Distance of Diffuse-Reflective Sensor (With Settable Distance)

## Setting Distance of Time-of-Flight Sensor

- One-point teach:

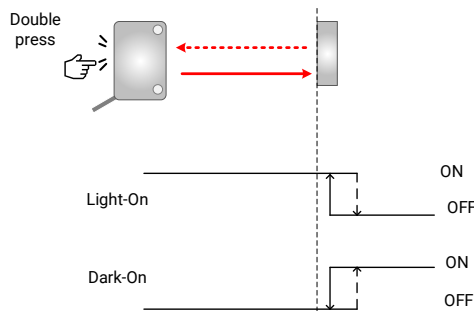


Figure 5-3 One-Point Teach

- Two-point teach:

### Note

After the first point teach is finished, the second point teach should be executed within 30 seconds.

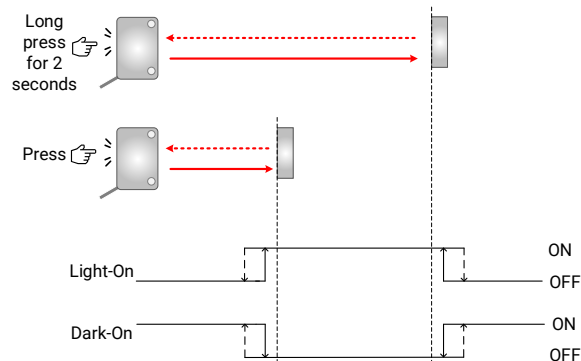


Figure 5-4 Two-Point Teach

# Photoelectric Sensor Quick Start Guide

## Setting Distance and Other Functions of Time-of-Flight Sensor

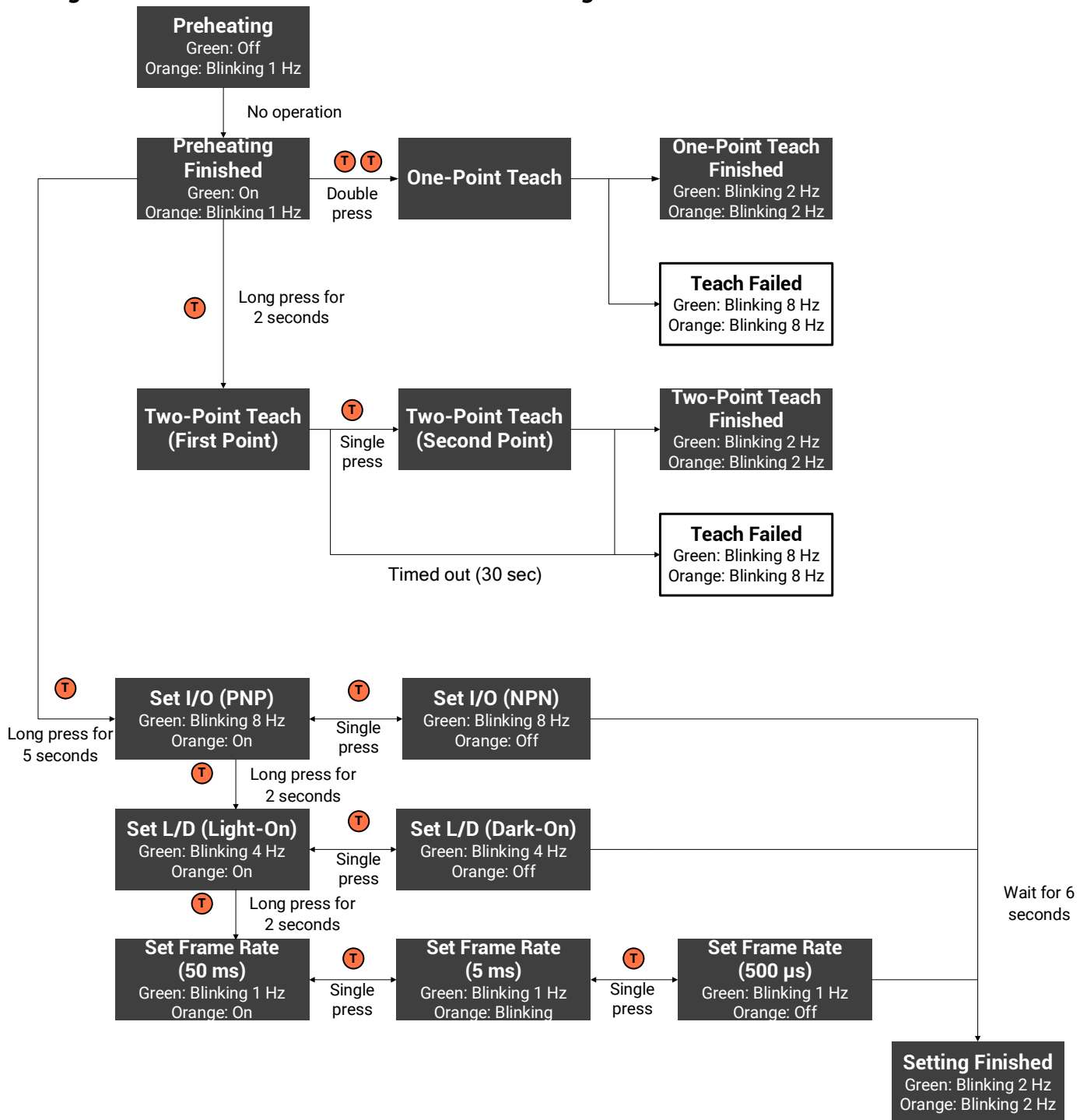


Figure 5-5 Setting Distance and Other Functions of Time-of-Flight Sensor



***HIKROBOT***

SHAPE OUR FUTURE INTELLIGENTLY

**Hangzhou Hikrobot Technology Co.,Ltd.**

E-mail: [global.support@hikrobotics.com](mailto:global.support@hikrobotics.com)

Website: <https://en.hikrobotics.com/>

**UD38465B**