### One-touch Calibration Separate Amplifier Photoelectric Sensor

**PS-T1(P)/T2(P)/T0**

**Instruction Manual**

![Image](https://via.placeholder.com/150)

A "P" following the model number indicates PNP-output type.

### Specifications

<table>
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<th>Model</th>
<th>NPN output</th>
<th>PS-T1</th>
<th>PS-T2</th>
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<td>PNP output</td>
<td>PS-T1P</td>
<td>PS-T2P</td>
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</table>

- **Response time**: 500 μs
- **Operation mode**: LIGHT ON/DARK ON (switch-selectable)
- **Indicators**: Output indicator: Red LED, Stable operation indicator: Green LED, Calibration indicator: Yellow LED
- **Timer function**: ON-delay: 40 ms, OFF-delay: 40 ms, Timer OFF (switch-selectable)
- **External calibration input signal**: Non-voltage input (contact, solid-state)
- **Control output**: NPN or PNP open-collector 100 mA max. (40 V max.)
- **Stability output**: NPN or PNP open-collector 50 mA max. (40 V max.)
- **Protection circuit**: Reverse polarity protection. Over-current protection. Surge absorption
- **Power supply voltage**: 12 to 24 VDC ±10%, Ripple (P-P) 10% max.
- **Current consumption**: 35 mA max.
- **Ambient temperature**: -10 to +55°C
- **Relative humidity**: 35 to 85%RH
- **Vibration**: 10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions, 2 hours respectively
- **Shock immunity**: 500 m/s² (Approx. 50 G) in X, Y and Z directions, 3 times respectively
- **Housing material**: Body/Cover: Polycarbonate
- **Weight (including 2 m cable)**: Approx. 75 g

### Major Features and Functions

1. **Fully-automatic calibration**
   - **Easy calibration**
     You can complete calibration simply by pressing a button as you pass a target through the optical axis.

2. **Ultra-long detecting distance**
   - **When the selector switch is set to TURBO, the PS series provides approximately double the detecting distance.**
   
   **Note**: Available only with a TURBO-ready sensor head. (See page 2.)

3. **Simple wiring**
   - The expansion unit needs no power supply cable.
   - Up to 16 expansion units can be connected to a single main unit.

**WARNING**

- The PS-T1(P)/T2(P)/T0 are intended for target detection. Do not use these products in a safety circuit for protecting the human body.
- The PS-T1(P)/T2(P)/T0 are not explosion-proof. Do not use these products in an atmosphere where inflammable gas, liquid or powder is present.

### Part Names and Functions

- **PS-T1(P) (Main unit)**
  - Operation indicator (Red LED): Lights when the control output is activated.
  - Stable operation indicator (Green LED): Lights when a sufficient light quantity is received or the light beam is stably interrupted.
  - Calibration indicator (Yellow LED): Lights during sensitivity adjustment.
  - SET button: Sensitivity calibration button
  - Key-protection switch:
    - When this switch is set to the LOCK position, key operation is disabled, and the sensitivity setting will not change, even if the SET button is pressed. The LOCK condition enables external calibration input.
  - Output timer selector switch
    - Output OFF: delay: 40 ms
    - Output ON: delay: 40 ms
    - Output timer OFF
  - Output selector switch
    - DARK ON
    - LIGHT ON
  - FINE/TURBO selector switch
    - FINE: Ultra-high accuracy
    - TURBO: Ultra-long detecting distance
  - 5-conductor cable

- **PS-T2(P)**
  - Expansion unit for one-line connection system
    - Every control/indicator functions the same as a main unit.
    - NPN or PNP open-collector 100 mA max. (40 V max.)
    - Stability output: -10 to +45°C
    - Residual voltage: 1 V max.
    - Ripple (P-P) 10% max.
    - To connect the PS-T2P to a voltage input device, provide a 4.7 kΩ resistor between the brown and black cables.

- **PS-T0**
  - Expansion unit for zero-line connection system
    - Every control/indicator functions the same as a main unit.

### Connections [PS-T1(P)/T2(P)]

#### NPN

- **Brown**: 100 mA max. 12 to 24 VDC
- **Orange**: 50 mA max. 12 to 24 VDC
- **Blue**: 12 to 24 VDC
- **Sticker**: [ included in the PS-T2(P) only ]
- **Mounting bracket**
- **End unit (x 2)**

#### PNP

- **Brown**: 100 mA max. 12 to 24 VDC
- **Orange**: 50 mA max. 12 to 24 VDC
- **Blue**: 12 to 24 VDC
- **Sticker**: [ included in the PS-T2(P) only ]

**Accessories (Provided)**

- Instruction Manual (X 1)
- Sensor head connector (x 1)
- Connector hookup sheet (x 1)

**Connections [PS-T1(P)/T2(P)]**

- To connect the PS-T1 to a voltage input device, provide a 4.7 kΩ resistor between the brown and black cables.
- When the external calibration input is not used, the pink cable at the root, or connect this cable to the positive terminal of the power supply.
- When the stability output is not used, cut the orange cable at the root, or connect this cable to the 0 V terminal of the power supply.
- The stability output also serves as a disconnection alarm output for the sensor cable.
- 1. PS-T2 has the black cable only.

**Connections [PS-T0]**

- 1. PS-T2 has the black cable only.
Select the sensitivity setting procedure according to the target condition.

### For sensitivity adjustment using a moving target

- **Fully-automatic Calibration**
  1. Pass a target through the optical axis while pressing the SET button. (At least 3 seconds)
  2. Confirm that the calibration indicator (yellow LED) flashes.
  3. Release the SET button. The calibration indicator (yellow LED) goes off.

- **Two-point Calibration**
  1. With a target in place, press the SET button and release it. The calibration indicator (yellow LED) lights.
  2. With the target removed, press the SET button and release it. The calibration indicator (yellow LED) goes off.

### To detect a minute difference

- **Positioning Calibration**
  1. With no target, press the SET button and release it. The calibration indicator (yellow LED) lights.
  2. Place a target in the position where it is to be stopped.
  3. Press the SET button and wait for the calibration indicator to flash.
  4. Release the SET button.

### For target positioning

- **Positioning Calibration**
  1. With no target, press the SET button and release it. The calibration indicator (yellow LED) lights.
  2. Place a target in the position where it is to be stopped.
  3. Press the SET button and wait for the calibration indicator to flash.
  4. Release the SET button.

### For stable detection unaffected by dust

- **Maximum Sensitivity Setting**
  1. Under the following conditions press the SET button until the calibration indicator (yellow LED) flashes.
  2. With no target
  3. With target
  4. Release the SET button. The calibration indicator (yellow LED) goes off.

- **Self-diagnostic Function**
  When the received light quantity exceeds the detection level but does not exceed the stable operation level "31 times continuously" or "for 8 seconds continuously", the stability output is activated.
  
  * **Reset:** When the stability output is activated, clean the front surface of the fiber unit or re-align the optical axis so that the stable operation indicator (green LED) lights again. The stability output is reset when detection is done while the stable operation indicator (green LED) is turned on.
  
  * The stability output is also activated if there is a break in the sensor cable.

### Using an external signal for sensitivity adjustment

- **External Calibration Function [For PS-T1(P)/T2(P) only]**
  The PS-T0 does not provide the external calibration function.
  1. Set the key-protection switch to LOCK. [Setting this switch to LOCK disables sensitivity adjustment with the SET button. (Key-protection)]
  2. Connect the pink cable to a switch or PLC.

- **CUE: Calibration input during detection**
  You can re-adjust sensitivity during detection without stopping the line operation.
  The sensor continues operation with the previous sensitivity setting until sensitivity readjustment is completed.

- **CUE: External calibration with several units**
  When several expansion units are connected, the sensitivity of all the PS-T2(P) expansion units can be simultaneously set using the external calibration input through the PS-T1(P) main unit.
  You can select a unit to be externally calibrated by setting its key-protection switch to the LOCK position.

### Selecting FINE/TURBO Mode

- **FINE mode:** Use FINE mode for normal detection.
  For detection of a minute difference, or highly accurate positioning

- **TURBO mode:** Available with sensor heads in the list below.
  For detection at a long distance, or detection of a target with low reflectivity

  **Used when the detecting distance provided in the FINE mode is insufficient.**

  **Note:** After switching the FINE/TURBO mode, be sure to readjust the sensitivity.

  **TURBO-ready sensor heads:**
  PS-55, PS-05, PS-52, PS-201, PS-202, PS-45, PS-205

  Only FINE mode is available for sensor heads other than those listed above.

- **CUE: When the sensitivity difference is insufficient:**
  After calibration is completed, the stable operation indicator (green LED) flashes if the sensitivity difference is insufficient. (When the external calibration function is used, the stability output remains on for another 3 seconds after the calibration input is turned off.)

  **Note:** Sensitivity is set and registered even when the sensitivity difference is insufficient. Be sure to confirm that detection is properly performed.
MOUNTING AMPLIFIER

Mounting/Detaching the amplifier to/from a DIN rail or the mounting bracket.
Hook the claw located at the amplifier cable side onto the DIN rail, and then hook the front side claw to the rail while pressing the amplifier forward. To detach the amplifier, unhook the front claw by lifting the amplifier front side while pressing it forward.

Side mounting
Using the side holes of the supplied mounting bracket, fix the amplifier with the screws. [For PS-T1(P) only]

MOUNTING SEVERAL AMPLIFIERS

Mounting several units
1. Remove the protective cover.
2. Mount amplifiers to a DIN rail one by one.
3. Slide one expansion unit toward another. Align the front claws of the amplifiers and push the amplifiers together until they click.
4. Fix the amplifiers together by pushing an end unit onto each end. [The end units are included in the PS-T2(P)].

Detaching amplifiers from DIN rail
1. Remove the end units.
2. Slide the expansion units apart, and detach them individually. (Do not detach multiple amplifiers connected together with end units.)

Note 1: When several units are connected, confirm the ambient temperature. (See "Specifications" on p. 1.)
Note 2: To connect several units, be sure to use a DIN rail and end units.
Note 3: To mount or detach several units, be sure to turn the power off.

CONNECTING SENSOR HEAD

1. Modify the end of the sensor cable as illustrated below.

2. Tilt the top of the connector in the direction of the arrow on the left side, and open the connector.

3. With the shield wire facing upward, insert the sensor cable as far in as possible. Bend the shield wire along the groove as illustrated.

4. Close the connector to crimp the cable. Put the connector top back and lock the connector.

5. Cut the cables sticking out from the connector.

6. Insert the connector into the amplifier, and then secure it with the lever. Run the cable under the lever and close the dust cover.

CAUTION
You can only crimp the cable up to 3 times. Crimping it more than 3 times may cause contact failure.

- Mutual Interference Suppression Function
(Available with sensors listed below)
A main sensor can be connected with up to 3 expansion sensors without being affected by the beams from the adjacent sensors.

When expansion units are connected, the PS-T series alternates the light emission timing up to four sensors. This prevents the adjacent sensor head beams from affecting detection.

Note: The interference suppression function is available when expansion units are connected to a main unit. In the case of multiple main units or a single unit, this function is not available.

Sensor heads ready for mutual interference suppression function

The mutual interference suppression function is only available with the sensor heads listed above.
**HINTS ON CORRECT USE**

- To extend the cable length, use a cable with at least a 0.3 mm² cross-section area. Limit the length of cable extension to no more than 100 m. (When connecting several units, contact Keyence for further information.)
- If the amplifier cable is placed together with power lines or high-voltage lines in the same conduit, detection error may occur due to noise interference, or the sensor may be damaged. Isolate the amplifier cable from these lines.
- When using a commercially available switching regulator, ground the F.G. terminal and ground terminal.
- Do not use the PS-T series outdoors, or in a place where extraneous light can enter the light receiving surface directly.
- During maximum sensitivity setting, the detecting distance may vary due to the difference in characteristics of each unit.
- If the wiring is incorrect, the unit may heat up, or the sensitivity setting may fluctuate. (See "Connections" on p. 1.)
- Use only the special single-core shield wire as the sensor head cable for the PS series. The cable can be extended up to 10 m. Do not connect to the terminals.

**I/O CIRCUIT**

**NPN**

<table>
<thead>
<tr>
<th>PS-T1</th>
<th>PS-T1P</th>
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<tbody>
<tr>
<td>Brown</td>
<td>Black</td>
</tr>
<tr>
<td>Pink</td>
<td>Black</td>
</tr>
<tr>
<td>Blue</td>
<td>Brown</td>
</tr>
<tr>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>Orange</td>
<td>Pink</td>
</tr>
</tbody>
</table>

1. When the external calibration input is not used, cut the pink cable at the root, or connect this cable to the positive terminal of the power supply.

**PS-T2**

![Diagram of PS-T2](image)

Power to the PS-T2 is supplied through the PS-T1, FS-T1 or FS-M1.

*(External calibration input circuit)*

2. When using expansion units, be sure to use the end unit [accessory to the PS-R0(P), T1(P), T2(P)].

**PS-T2P**

![Diagram of PS-T2P](image)

Power to the PS-T2P is supplied through the PS-T1P, FS-T1P or FS-M1P.

**DIMENSIONS**

**PS-T1(P)**

![Dimensions of PS-T1(P)](image)

- DIN-rail mounting
- Cable length: 2 m
- (Maximum when the cover is opened) 87.5

**PS-T2(P)**

![Dimensions of PS-T2(P)](image)

- DIN-rail mounting
- Cable length: 2 m
- (Maximum when the cover is opened) 87.5

**PS-T0**

![Dimensions of PS-T0](image)

- DIN-rail mounting
- (Maximum when the cover is opened) 87.5

**When the mounting bracket [included in the PS-T1(P)] is attached:**

End unit

![End unit diagram](image)

- End unit
- No. of units
- L
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16

1. The PS-T1(P), FS-T1(P), FS-M1(P), or FS-R0 is mounted in PS-T2(P).
2. When using expansion units, be sure to use the end unit [accessory to the PS-R0(P), T1(P), T2(P)].

**When several units are connected:**

![Diagram of several units connected](image)

Specifications are subject to change without notice.