General-Purpose Self-Contained
Photoelectric Switches
Model HP7-A_/C_/D_/P_/T_ _

Nothing escapes his notice, no matter what the conditions.

Suitable for a variety of applications and conditions.

- Wide range of configurations and specifications
- Improved resistance to interference (e.g., fluorescent lights)
- Threaded metal mounting holes for more reliable installation
- Different frequency thru-scan model for stress-free installation
- Inexpensive, to meet current market needs
- Auto Adjust button for situations where detection is difficult

Warning
- Designed for general industrial use, not for safety equipment.
- Do not connect this device to AC power. Doing so might cause rupture or burnout.

Handling precautions
- Tighten the mounting screws to a maximum torque of 0.8 N·m.
- Holes for mounting brackets should be 3.5 mm in diameter or less.
- After the power is turned on, the switch starts to operate in 60 ms at most (80 ms for model HP7-C).
- For outdoor use, put inside a case, etc., To prevent direct exposure to sunlight and rainwater.
- Avoid locations with strong vibration or impact. They may cause optical axis misalignment.
- Shield the lens from water and oil. Water or oil on the lens can cause faulty operation.
- Do not expose to chemicals (Organic solvents, acids, alkalis).
- Use a cover or change the mounting direction to ensure correct switch operation if there is heavy interference from ambient light.
- When used in a very dusty environment, be sure to take countermeasures to keep dust away from the lens surface by using a sealed case or air purging.
- Even when oil-resistant cable is used, do not use in a location subject to continuous splashing by water or oil, or where the unit is immersed in liquid. Ensure that the end of the cable is not subject to splashing by water or oil.
- A bend in the cable immediately after it exits the device should have a radius of a least 30 mm. Also, avoid use in which the cable receives repeated bending stress. Do not apply a force of 50 N or higher (30 N or higher for low-temperature cable types).

Wiring precautions
- If a cable extension is necessary, use wire at least 0.3 mm² in cross-sectional area and at most 100 m long.
- If the cable of the photoelectric switch are laid in the same conduit as high-voltage or power lines, isolation may cause malfunction or damage. Isolate the photoelectric switch’s cable or lay it in a separate conduit.

Adjustment method
- Thru-scan model and retroreflective model
  1. Move the emitter and receiver (Main body and reflector in case of a retroreflective model) up, down, right, and left, and then align them in the center of the area where the green stable-operation indicator lights up.
  2. Check switch operation using a target object then use the Auto Adjust button to adjust the sensitivity setting.
- Diffuse-scan model
  1. Mount the photoelectric switch pointing toward the desired detection position.
  2. Check switch operation using a target object then use the Auto Adjust button to adjust the sensitivity setting.

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1-12-2 Kawanazawa, Fujisawa
Kanagawa 251-8522 Japan
URL: http://www.azbil.com

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7th Edition: Issued in Aug, 2018-SK CP-PC-2263E
High-performance photoelectric switches suitable for a wide range of applications

**Resolves installation issues!**

- **Light axis is hard to adjust over long distances.** (Thru-scan and retroreflective models) / **Unreliable detection of dark (etc.) objects.**

- **Interference between side-by-side switches.**
  - Need to reverse the switch configuration or move switches.

- **Photoelectric switches may be tripped by inverter fluorescent lights or LEDs.**
  - Reliable in various lighting

- **Simple to operate and delivers reliable detection**

  Long-range thru-scan models have a light-operated indicator on the front, and retroreflective models send out a visible red light beam for light axis alignment over long distances. Diffuse-scan models offer the best long-distance detection standards in the industry along with consistent detection of darker colors.

  - Thru-scan switches using different frequencies can be installed side by side without mutual interference protection filter or reversed switch orientation. (The 4 m type with its short detection range reduces malfunctions caused by mutual interference between adjacent rows of switches.) Diffuse-scan and retroreflective models are fitted with automatic interference suppression that allows two units to be used side by side.

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**Designed for use in just about any environment!**

- **Cutting oil mist near metalworking lines reduces switch life.**
  - Improved resistance to oil
  - Modified polyallylate resin with excellent resistance to oil is employed (thru-scan and diffuse-scan models). Polyallylate resin lenses offer improved resistance to the effects of oils and chemicals.

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Due to high-intensity four-element LED, light spot is easy to be recognized, helping to save time during light axis adjustment.

- **The LED resists aging and can be used for a long time.**

**Stronger mounting holes**

- **Plastic threaded holes are not strong enough, so threads are stripped if screws are tightened too tightly or too quickly.**

**Low temperature use OK**

- Operation of the standard model is guaranteed down to -30 °C.

- Switches don’t operate in freezers at -35 °C.

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- Operation of the standard model is guaranteed down to -30 °C.
Applications

With its wide range of possible configurations, the HP7 meets a variety of detection needs.

**Long-distance detection**

Use to detect objects that have fallen from mobile racks or popped out of stacker cranes. The light-operated indicator on the front makes adjustment of the light axis easy.

*Model HP7-T4_ Detection range: 30 m*

**Gang-mounted switches**

Use when switches need to be closely packed to judge workpiece size, etc. The combined use of standard and different-frequency switches and the mutual interference protection filter enables serial installation of multiple switches.

*Model HP7-T_1 standard frequency + Model HP7-T different frequency + Model HP-U02 (Filter)*

Note: This combination is for the red beam models only.

**Substrate detection**

Use for detection of objects passing the inlets/outlets of furnaces, where air may be thick with dust and smoke. The 30-meter detection capability makes longer service life possible.

*Model HP7-T4_ Detection range: 30 m*

**Reduction of mutual interference**

Use to reduce mutual interference between adjacent lines of switches. The short detection range restricts the possibility of mutual interference.

*Model HP7-T5_ Detection range: 4 m*

**Reduction of erroneous detection**

Consistently detects film-wrapped workpieces that can fool retroreflective switches and transparent collapsible boxes that interfere with polarization.

*Model HP7-P5_ Detection range: 3 m*

**Detection of transparent objects**

Use to detect transparent food containers and other transparent objects.

*Model HP7-P1_ Detection range: 5 m*

**Glass detection**

Use to detect objects such as glass wafers and FPDs. Very low hysteresis ensures positive detection.

*Model HP7-C1_ Detection range: 1 m*

**External light interference countermeasure**

Use different-frequency thru-scan models to prevent false tripping of switches from image processing lighting in the printing and check processes. Different-frequency thru-scan models are especially resistant to external interference.

*Model HP7-C5_ Detection range: 1 m*

**Use of a wide-beam diffuse scan model enables stable detection of substrates.**

*Model HP7-D2_ Detection range: 100 mm*

*Model HP7-D6_ Detection range: 50 mm*

**Note:** Since the detection range is short in glass detection, be sure to check the detection range before use.

**Use different-frequency thru-scan models to prevent false tripping of switches from image processing lighting in the printing and check processes. Different-frequency thru-scan models are especially resistant to external interference.**

*Model HP7-T__*

**Detection range:** 3 m

**Use for reliable detection of PET bottles and glass bottles. Consistent detection of any type of bottle, with or without contents.**

*Model HP7-CM_ Detection range: 1 m*

*1: Installing a specially designed slit can improve consistency of detection. Model HP7-CN_ Detection range: 50 cm*

*2: Model with built-in slit*
Tuning without a workpiece

In certain applications involving thru-scan and retroreflective switches, the target may not block the switch beam properly due to unwanted reflection and/or permeation of light. In some cases, diffuse-scan switches may erroneously recognize background as the target. Tuning without a workpiece is the first step in trying to resolve the problem.

Tuning without a workpiece refers to tuning with no target object present.

Thru-scan and retroreflective switches: Automatically adjusts sensitivity to trigger the switch at approximately half the intensity of the light received when there is no target object present.

Diffuse-scan switch: Automatically adjusts sensitivity to trigger the switch at approximately twice the intensity of the light received when there is no target object present.

Two-point tuning

Two-point tuning is used in situations where tuning without a workpiece does not achieve the required results, or where it is necessary to detect target objects at a specific location.

Sensitivity is automatically set to a value mid-way between the state when the target is present and when the target is absent.

Switch is triggered by background

Erroneously detects background as the target when operated at factory default settings (Maximum sensitivity).

Tune without a workpiece. Background information is suppressed.

Cardboard boxes are now detected consistently and reliably.

Light seeps through semi-transparent target object

Light passes through semi-transparent target objects, affecting detection consistency.

Tune without a target object.

Target is now detected correctly.

Note: For objects with high transparency, use the model HP7-C transparent object detection switch. Be sure to test it on the actual target objects.

Unwanted reflections affect detection consistency

Reflected light passes through gaps in the target object, causing detection errors.

Tune without a target object.

Palettes are now detected correctly.

Position tuning

The switch can be adjusted to detect an object at a specific position. The sensitivity is automatically set for detection at that position.

Detection in a specific position

The aim is to sense the target object as it reaches the designated position.

Position tuning is performed at the required position.

The switch operates around at this position. Note that the sensing distance can vary by as much as 15% from the set distance.

False detection

The switch detects background objects such as the conveyor. First, the switch is exposed to the no-target state. Next, the switch is exposed to the state with a target present. The switch is now able to distinguish between the two states.
Model HP7-C is incompatible with low-temperature cables. Model HP7 can handle cable connections.

**Connection options**

Model HP7 can handle cable connections. *Model HP7-C is incompatible with low-temperature cables.

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Model No. Suffix</th>
</tr>
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<tbody>
<tr>
<td>0.5 m Cable</td>
<td>-L005</td>
</tr>
<tr>
<td>5 m Cable</td>
<td>-L050</td>
</tr>
<tr>
<td>M12 Preloaded Connector 30 cm Cable</td>
<td>-C003</td>
</tr>
<tr>
<td>M12 Preloaded Connector 50 cm Cable</td>
<td>-C006</td>
</tr>
<tr>
<td>M12 Preloaded Connector 1 m Cable</td>
<td>-C010</td>
</tr>
<tr>
<td>Quick Lock Preloaded Connector, 30 cm Cable</td>
<td>-S003</td>
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<tr>
<td>Quick Lock Preloaded Connector, 1 m Cable</td>
<td>-S010</td>
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<tr>
<td>MB Connector</td>
<td>-T</td>
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<tr>
<td>Low-temperature Cable 2 m</td>
<td>-D</td>
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<tr>
<td>Low-temperature Cable 5 m</td>
<td>-D050</td>
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</table>

**Basic model numbers**

Connection: 2 m cable

<table>
<thead>
<tr>
<th>Detection method / Configuration</th>
<th>Detection range / Light source</th>
<th>Catalog listing</th>
<th>Different-frequency model No.</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td>Thru-scan</td>
<td>30 m / Infrared</td>
<td>HP7-T11</td>
<td>HP7-T15</td>
<td>NPN</td>
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<td></td>
<td>15 m / Red</td>
<td>HP7-T12</td>
<td>HP7-T16</td>
<td>PNP</td>
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<tr>
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<td>15 m / Infrared</td>
<td>HP7-T12</td>
<td>HP7-T16</td>
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<td></td>
<td>4 m / Red</td>
<td>HP7-T51</td>
<td>HP7-T55</td>
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<tr>
<td></td>
<td>5 m / Red</td>
<td>HP7-P11</td>
<td>HP7-P15</td>
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<tr>
<td>Retroreflective</td>
<td>3 m / Red</td>
<td>HP7-P12</td>
<td>HP7-P16</td>
<td>PNP</td>
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<td>HP7-A44</td>
<td>NPN</td>
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<td>Diffuse-scan</td>
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<td>100 mm / Infrared</td>
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<td>HP7-G24</td>
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<td>HP7-G28</td>
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<td>Wide-beam diffuse scan</td>
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<td>NPN</td>
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<tr>
<td>Retroreflective transparent object detection</td>
<td>2 m / Red</td>
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<td>HP7-C16</td>
<td>NPN</td>
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<td></td>
<td>1 m / Red</td>
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<td>HP7-CL16</td>
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<tr>
<td></td>
<td>Improved detection</td>
<td>HP7-CN15</td>
<td>HP7-CN16</td>
<td>NPN</td>
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<tr>
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<td>50 cm / Red</td>
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<td>HP7-CN26</td>
<td>NPN</td>
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<td>1 m / Infrared</td>
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<td>HP7-CM16</td>
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<td></td>
<td>Improved detection</td>
<td>HP7-CF15</td>
<td>HP7-CF16</td>
<td>NPN</td>
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<td>50 cm / Infrared</td>
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<td>HP7-CF26</td>
<td>NPN</td>
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</tbody>
</table>

**Detection range by photoelectric switch (mm) (reference value)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Configuration</th>
<th>Catalog listing</th>
<th>Description</th>
<th>Compatible model</th>
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<tbody>
<tr>
<td>Reflectors</td>
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</tr>
<tr>
<td>HP-SH05</td>
<td></td>
<td></td>
<td>Vertical slit</td>
<td>HP7-T1_</td>
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<tr>
<td>HP-SH10</td>
<td></td>
<td></td>
<td>Horizontal slit</td>
<td>HP7-T1_</td>
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<tr>
<td>Reflection sheet</td>
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<td></td>
<td>Use at up to 70 % or less of the max. detection range.</td>
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<td></td>
<td></td>
<td></td>
<td>Uses the size after cutting.</td>
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<td>Accessories</td>
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<td>HP-B08</td>
<td>Standard</td>
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<td>Bottom-mounting L-bracket</td>
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<td>HP-B09</td>
<td>Bottom-mounting L-bracket</td>
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<td>Rear-mounting L-bracket</td>
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<td>Wrapsaround</td>
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<td>Wrapsaround vertical mounting bracket</td>
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<td>Wrapsaround horizontal mounting bracket</td>
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<td>HP-SV05</td>
<td>Slit for thru-scan</td>
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<td>Vertical slit</td>
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<td>HP-SV10</td>
<td>Slit for thru-scan</td>
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<td>Horizontal slit</td>
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<td>HP-SV20</td>
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<td>HP-H05</td>
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<td>Interference protection filter for thru-scan model</td>
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<td>Silt for improving detection consistency</td>
<td>HP7-CL_S /CM_S</td>
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</tbody>
</table>

**Connection method**

Thru-scan: Emitter model number is HP7-E and receiver model number is HP7-R.

**Accessories**

Connection: 2 m cable

<table>
<thead>
<tr>
<th>Name</th>
<th>Configuration</th>
<th>Catalog listing</th>
<th>Description</th>
<th>Compatible model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP-B08</td>
<td>Standard</td>
<td></td>
<td>Bottom-mounting L-bracket</td>
<td>All models</td>
</tr>
<tr>
<td>HP-B09</td>
<td>Bottom-mounting L-bracket</td>
<td></td>
<td></td>
<td>All models</td>
</tr>
<tr>
<td>HP-B10</td>
<td>Rear-mounting L-bracket</td>
<td></td>
<td></td>
<td>All models</td>
</tr>
<tr>
<td>HP-B11</td>
<td>Wrapsaround</td>
<td></td>
<td>Wrapsaround vertical mounting bracket</td>
<td>All models</td>
</tr>
<tr>
<td>HP-B12</td>
<td>Wrapsaround</td>
<td></td>
<td>Wrapsaround horizontal mounting bracket</td>
<td>All models</td>
</tr>
<tr>
<td>HP-SV05</td>
<td>Slit for thru-scan</td>
<td></td>
<td>Vertical slit</td>
<td>HP7-T1_</td>
</tr>
<tr>
<td>HP-SV10</td>
<td>Slit for thru-scan</td>
<td></td>
<td>Horizontal slit</td>
<td>HP7-T1_</td>
</tr>
<tr>
<td>HP-SV20</td>
<td>Slit for thru-scan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP-H05</td>
<td>Horizontal</td>
<td></td>
<td>Interference protection filter for thru-scan model</td>
<td>HP7-T1_ /T5_</td>
</tr>
<tr>
<td>HP-H10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP-H20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP-SC01</td>
<td></td>
<td></td>
<td>Silt for improving detection consistency</td>
<td>HP7-CL_S /CM_S</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Connection method**

Thru-scan: Emitter model number is HP7-E and receiver model number is HP7-R.

Note: Model HP7-T: Thru-scan: Emitter model number is HP7-E and receiver model number is HP7-R. Products with operation other than those specified above are also available (for example, model HP7-P13 and HP7-C35S: NPN LED).
**Specification**

<table>
<thead>
<tr>
<th><strong>Item</strong></th>
<th><strong>Value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td>10.2 to 26.4 V DC</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>14 mA max.</td>
</tr>
<tr>
<td><strong>Scanning distance</strong></td>
<td>3 m / 5 m / 15 m / 30 m</td>
</tr>
<tr>
<td><strong>Target object</strong></td>
<td>Opaque object: 80 mm dia. min.</td>
</tr>
<tr>
<td><strong>Diffusion angle</strong></td>
<td>0.5° to 10°</td>
</tr>
<tr>
<td><strong>Parallel displacement</strong></td>
<td>10 mm in X, Y, and Z directions</td>
</tr>
<tr>
<td><strong>Operating humidity</strong></td>
<td>-40 to +70°C (without freezing or condensation)</td>
</tr>
<tr>
<td><strong>Storage temperature</strong></td>
<td>-30 to +55°C (without freezing or condensation)</td>
</tr>
</tbody>
</table>

**Characteristics diagrams (Typical examples)**

**Thru-scan models (Model HP7-T1_ / T2_ / T5_ )**

**Excess gain** (light modulated by the required amount)

**Parallel displacement**

**Output circuit diagram**

**Note:** The above summary of key characteristics should not be construed as a performance guarantee. Always test first under actual conditions and allow leeway as appropriate.
Note: The above summary of key characteristics should not be construed as a performance guarantee. Always test first under actual conditions and allow leeway, as appropriate.
### External Dimensions (Unit: mm)

<table>
<thead>
<tr>
<th>Model</th>
<th>Model Name</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP-SV15</td>
<td></td>
<td>31.9</td>
<td>15.8</td>
</tr>
<tr>
<td>HP-SV20</td>
<td></td>
<td>31.9</td>
<td>15.8</td>
</tr>
<tr>
<td>HP-SV25</td>
<td></td>
<td>31.9</td>
<td>15.8</td>
</tr>
<tr>
<td>Model HP-SC01</td>
<td></td>
<td>31.9</td>
<td>15.8</td>
</tr>
</tbody>
</table>

### Reflective Area
- **Model FE-RR26**: Acrylic resin (Transparent)
- **Model FE-RR27**: Acrylic resin (Transparent)
- **Model FE-RR28**: Acrylic resin (Transparent)

### Reflective Area (Sold separately)
- **Model HP-SC01**: Acrylic resin (Transparent)
- **Model HP-SC02**: Acrylic resin (Transparent)

### Reflector (Sold separately)
- **Model FE-RR8**: Acrylic resin (Transparent)
- **Model FE-RR15**: Acrylic resin (Transparent)
- **Model FE-RR17**: Acrylic resin (Black)

### Filter
- **Model HP-U02**: Polarizing direction: vertical, Polarizing direction: horizontal

### Bracket (Sold separately)
- **Button-mounting L-bracket (Model HP-B08)**
- **Wraparound vertical mounting bracket (Model HP-B09)**
- **Wraparound horizontal mounting bracket (Model HP-B12)**

### Other Components
- **Button-mounting L-bracket (Model HP-B10)**
- **Wraparound vertical mounting bracket (Model HP-B11)**
- **Wraparound horizontal mounting bracket (Model HP-B12)**


**The operation method**

---

### 2-point tuning

If target objects cannot be reliably detected even after tuning without a workpiece, adjust as shown below.

#### Thru-scan models and retroreflective models

As a result of tuning without a workpiece, target objects do not block enough light.

#### Diffuse-scan models

As a result of tuning without a workpiece, the switch does not receive enough light from target objects.

The switch will be set automatically so that it operates at about twice the light intensity as when there is no target object.

- *Note:* For thru-scan models, if the set scanning distance is shorter than the following amount, light intensity may be too strong, causing the switch to enter the state described in "Indicator lamp flashes repeatedly."

Model HP7-T1...HP7-T2...1 m. Model HP7-T5...3 m.

- **Model HP7-A1:** Distance between 200 mm and 500 mm
- **Model HP7-A4:** Distance between 200 mm and 1,000 mm

Hold down the button for about 2 seconds until the orange indicator lamp starts flashing rapidly (at about 10 Hz), then release.

- **Switches to sensitivity adjustment mode.**

- **Without a workpiece, hold down the button until both LEDs start blinking (about 2 seconds), and release it.**

- **Measures light intensity without a target object.**

- **With a workpiece in place, give the button a short press.**

- **Measures light intensity with target present and sets sensitivity.**

- **Setup is complete.**

- **Normal operation will be restored automatically.**

- **(In about 2 seconds).**

#### 3-point tuning

If target objects cannot be reliably detected even after tuning without a workpiece, adjust as shown below.

#### Thru-scan models and retroreflective models

As a result of tuning without a workpiece, target objects do not block enough light.

#### Diffuse-scan models

As a result of tuning without a workpiece, the switch does not receive enough light from target objects.

The switch will be set automatically so that it operates at about twice the light intensity as when there is no target object.

- *Note:* For thru-scan models, if the set scanning distance is shorter than the following amount, light intensity may be too strong, causing the switch to enter the state described in "Indicator lamp flashes repeatedly."

Model HP7-T1...HP7-T2...1 m. Model HP7-T5...3 m.

- **Model HP7-A1:** Distance between 200 mm and 500 mm
- **Model HP7-A4:** Distance between 200 mm and 1,000 mm

Hold down the button for about 2 seconds until the orange indicator lamp starts flashing rapidly (at about 10 Hz), then release.

- **Switches to sensitivity adjustment mode.**

- **Without a workpiece, hold down the button until both LEDs start blinking (about 2 seconds), and release it.**

- **Measures light intensity without a target object.**

- **With a workpiece in place, give the button a short press.**

- **Measures light intensity with target present and sets sensitivity.**

- **Setup is complete.**

- **Normal operation will be restored automatically.**

- **(In about 2 seconds).**

### Thru-scan or retroreflective models

#### Diffuse-scan models

As a result of tuning without a workpiece, the switch does not receive enough light from target objects.

The switch will be set automatically so that it operates at about twice the light intensity as when there is no target object.

- **Note:** For thru-scan models, if the set scanning distance is shorter than the following amount, light intensity may be too strong, causing the switch to enter the state described in "Indicator lamp flashes repeatedly."

Model HP7-T1...HP7-T2...1 m. Model HP7-T5...3 m.

- **Model HP7-A1:** Distance between 200 mm and 500 mm
- **Model HP7-A4:** Distance between 200 mm and 1,000 mm

Hold down the button for about 2 seconds until the orange indicator lamp starts flashing rapidly (at about 10 Hz), then release.

- **Switches to sensitivity adjustment mode.**

- **With the target in position, hold down the button for about 2 seconds until both indicator lamps start flashing rapidly (at about 10 Hz), then release.**

- **Now press the button again briefly.**

- **Both indicator lamps will flash slowly (at about 1 Hz).**

- **Press the button briefly.**

- **Setup is complete.**

- **Normal operation will be restored automatically.**

- **(In about 2 seconds).**

### Checking LO/DO

Use the procedure shown below to check the current operating mode.

- **Normal operation**

  - **Press the button once to revert to Dark-operate status.**

- **Stability indicator**

  - **Green LED only blinks rapidly (about 10 Hz).**

  - **Indicates Light-operate status.**

- **Output indicator**

  - **Green LED only blinks rapidly (about 10 Hz).**

  - **Indicates Dark-operate status.**

### Checking indicator lamp flashes repeatedly

The table below lists the various states indicated by repeated flashing together with suggested responses. If the problem is not resolved, it may be necessary to try a different model of switch.

---

### When confused, or to restore the default setting (max. sensitivity)

If you wish to restore the factory default sensitivity, or if you lose track of your progress while making adjustments, do the following to restore the factory default from any flashing status.

- **Hold down the button until the green LED starts blinking (about 7 seconds).**

- **Sensitivity is restored to the factory default setting.**

- **Setup is complete.**

- **Normal operation will be restored automatically.**

- **(In about 2 seconds).**

---
Retroreflective transparent object detection

Tips for using the model HP7-C retroreflective transparent object detection model

The extensive model HP7-C lineup can handle a variety of target objects and customer applications.

- **Model HP7-C lineup**

<table>
<thead>
<tr>
<th>Sample model</th>
<th>Detection range</th>
<th>Beam</th>
<th>Overview</th>
<th>Long-distance detection capability</th>
<th>Features</th>
<th>Recommended target</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP7-C3S</td>
<td>2 m</td>
<td>Red</td>
<td>Standard long-distance model</td>
<td>Allows flexible usage by eliminating restrictions on installation.</td>
<td></td>
<td>FPD glass substrate and transparent film.</td>
</tr>
<tr>
<td>HP7-CL1S</td>
<td>1 m</td>
<td>Red</td>
<td>Special optical system</td>
<td>Consistent detection by significantly reducing external interference</td>
<td></td>
<td>Transparent containers (FOUP and food containers) and transparent film.</td>
</tr>
<tr>
<td>HP7-CN1S</td>
<td>50 cm</td>
<td></td>
<td>Special optical system</td>
<td>Improved detection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP7-CM1S</td>
<td>1 m</td>
<td></td>
<td>For PET &amp; glass bottle detection</td>
<td>Can consistently detect any type of bottle, with or without contents</td>
<td></td>
<td>PET/glass bottles (with or without contents).</td>
</tr>
<tr>
<td>HP7-CP1S</td>
<td>50 cm</td>
<td></td>
<td>For PET/glass bottle improved detection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Recommended models for various target objects**

<table>
<thead>
<tr>
<th>Target</th>
<th>HP7-CN</th>
<th>HP7-CL</th>
<th>HP7-CM</th>
<th>HP7-CN</th>
<th>HP7-CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty PET bottle</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full PET glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empty glass bottle</td>
<td>X</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full glass bottle</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Food container</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOUP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transparent film</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FPD glass</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

- **Notes for reliable detection**

- Wait 3 minutes after power on before tuning or using the switch. This allows the internal temperature to stabilize.
- If the ambient temperature varies after tuning and detection becomes unreliable, retune the switch.
- Over the course of long-term use, variations in light intensity may be caused by factors such as dirt on the switch/reflector or light axis misalignment due to vibration. Regular maintenance and cleaning will prevent such problems.

- **New models with improved detection: Model HP7-CL/CN/CM/CP**

To detect target objects with diverse shapes and materials, HP7-C models are equipped with a special optical system and built-in slit, and users can select the optimum light source for the target object. The model HP7-C provides both top performance and ease of use.

Models for PET/glass bottle detection

A PET or glass bottle filled with liquid can act as a condenser lens. As a countermeasure, these models are equipped with an LED that emits near-infrared light, which attenuates in water at a high rate. The result is attenuation of interfering light at a rate more than twice as high as with previous models. If detection is inconsistent due to the particular shape of the target object, specially designed slits are available to improve performance. (Model No. of special slits for HP7-CL_S and HP7-CM_S: HP-SC01)

- **Smartclick** is a trademark of OMRON Corporation.

Cable with connector

Be sure to use a model PA5-___ cable with connector when connecting a preloaded connector or connector type switch.

- **Model PA5-___ cable**

<table>
<thead>
<tr>
<th>Shape</th>
<th>Power supply</th>
<th>Cable properties</th>
<th>Cable length</th>
<th>Catalog</th>
<th>Lead colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preloaded</td>
<td>DC</td>
<td>Vinyl-insulated</td>
<td>2 m</td>
<td>PA5-4ISX2SK</td>
<td>brown, white, black, blue</td>
</tr>
<tr>
<td>connector</td>
<td></td>
<td>cable with high</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>resistance to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>oil and vibration</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Tightening the connector**

Align the grooves and rotate the fastening nut on the model PA5 connector by hand until it fits tightly with the connector on the switches side.

Model PA7-___ cable

Be sure to use a model PA7-___ cable with connector when connecting Preleaded Quick Lock type switch.

- **Model PA7-___ cable**

<table>
<thead>
<tr>
<th>Shape</th>
<th>Power supply</th>
<th>Cable properties</th>
<th>Cable length</th>
<th>Catalog</th>
<th>Lead colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preloaded</td>
<td>DC</td>
<td>Vinyl-insulated</td>
<td>2 m</td>
<td>PA7-4ISX2SK</td>
<td>brown, white, black, blue</td>
</tr>
<tr>
<td>connector</td>
<td></td>
<td>cable with high</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>resistance to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>oil and vibration</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Tightening the connector**

Align the triangle main and mate the male and female connector then rotate 45° to match the keys on the rings by hand.

Model PA8-___ cable

Be sure to use a model PA8 cable with connector when connecting a M8 preleaded connector or M8 connector type switch.

- **Model PA8-___ cable**

<table>
<thead>
<tr>
<th>Shape</th>
<th>Power supply</th>
<th>Cable properties</th>
<th>Cable length</th>
<th>Catalog</th>
<th>Lead colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>DC</td>
<td>Vinyl-insulated</td>
<td>2 m</td>
<td>PA8-4ISX2MK</td>
<td>brown, white, black, blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cable with high</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>resistance to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>oil and vibration</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Tightening the connector**

Align the grooves and rotate the fastening nut on the model PA8-___ connector by hand until it fits tightly with the connector on the switches side.

- **Model PA8-___ cable with connectors.**

<table>
<thead>
<tr>
<th>Shape</th>
<th>Power supply</th>
<th>Cable properties</th>
<th>Cable length</th>
<th>Catalog</th>
<th>Lead colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>DC</td>
<td>Vinyl-insulated</td>
<td>2 m</td>
<td>PA8-4ISX2MK</td>
<td>brown, white, black, blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cable with high</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>resistance to</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>oil and vibration</td>
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</tbody>
</table>

- **Tightening the connector**

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