This switch is designed for general industrial use, not for use as a safety device.
Do not connect this device to AC power. Doing so may cause rupture or burnout.

**Handling Precautions**
- This device is a precision instrument. Do not hit it or bump it against any object.
- The diameter of the mounting bracket holes must be 4 mm or less. Tighten the mounting screws to a maximum torque of 0.8 N·m.
- Up to 100 m is required for stabilization after the power is turned on.
- Do not use in an environment exposed to direct sunlight or rainwater.
- Do not splash water, cutting oil, etc., on the device or its cables.
- Do not expose the device to chemicals (organic solvents, acids, alkalis).
- If the lens is dirty, wipe it with a soft, damp, clean cloth. Do not use organic solvents or alcohol.
- Switches cannot be connected in series (AND circuit). Parallel connection (OR circuit) is supported.

**Wiring Precautions**
- Bends in the cable should have a radius of at least 15 mm (30 mm min. for the section immediately next to the device).
- Avoid use in which the cable receives repeated bending stress.
- Do not pull the cable with excessive force (50 N). Doing so might cause disconnection, resulting in a short circuit and burnout.
- Tighten connectors firmly by hand.
- If extension of the cable is necessary, use at least 0.5 mm² wire, no more than 100 m long.
- Special care is required at low temperatures (below 0 °C), because cables become stiff and flexibility is much lower.
- When using an inverter or servo motor, be sure to ground the frame ground terminal and ground terminal.
- Do not put the wires of the photoelectric switch and motor power lines or other power wires in the same conduit. Doing so may cause malfunction or damage due to induction noise. Route the wires separately or put them in different conduits.

**Installation Precautions**
- Install the device so that the target object moves in the direction shown in Fig. 1. If the switch is installed horizontally, false detection of an object that is situated away from the set distance may result. In this case, the use of a shielding plate is recommended. If it is not possible to install a shielding plate, thoroughly check device operation before use.
- If a reflective or reflective object is located near the device, unreliable detection may occur. In this case, increase the distance between the devices and the reflective object, or incline the angle as shown in Fig. 2.
- Depending on the shape or pattern of the object, unreliable detection may occur. Before use, thoroughly check device operation.
- If the background or the target object is reflective, incline the optical axis so that the device does not receive the reflected light directly.

**Disposal Precautions**
- When discarding the product, dispose of it as industrial waste, following local regulations.

---

*Please read "Terms and Conditions" from the following URL before ordering and use.
https://www.azbil.com/products/factory/order.html

Other product names, model numbers and company names may be trademarks of the respective company.

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Advanced Automation Company

†Toshiba Corporation changed its name to Azbil Corporation on April 1, 2012.

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Reliable detection of any object under any conditions!
Compact size with super long-distance detection

Thanks to the triangulation method, objects of any color made from any material can be reliably detected. With long-distance detection of up to 750 mm, switch is suitable for use on conveyor lines.

Achieves formerly impossible performance

Compact & super range

Background Suppression type: 750 mm
Foreground Suppression type: 500 mm

Designed for ease of use

Regular installation

Industrial standard installation: mounting hole pitch of 25.4 mm (1 inch)

Metal threads

Metal screw threads improve workability by preventing stripping. Higher tightening strength (×1.6") prevents cracking of housing. *Compared to our resin threads (0.5 N-m)

Easier to use

Orange indicator
Green indicator
[Far] button (r)
[Center] button (C)
[Near] button (L)

Better display visibility

Models HP7-G___ / HP7-F___
Easy and reliable adjustment using the [Center] button for tuning and [Far] and [Near] buttons for adjustment.

Model HP7-S___
No adjustment required.

Excellent basic characteristics

Detection performance

The use of triangulation and an infrared light source reduces detection distance variation resulting from differences in object color and material. Capable of detecting small differences.

Resistance to LED lighting and ambient light

Uses a new algorithm and a filter that cuts light from ambient illumination.

Temperature characteristics

Variation in sensing distance over full operating temperature range (-20 to +55 °C) is ±4 % max. (reference value when HP7-G81 is set to 500 mm).

Angle characteristics

Variation in sensing distance in the horizontal direction with a 45° incline: ±2 % max. (reference value when HP7-G81 is set to 500 mm).

Three available models optimized for different purposes

High-performance model HP7-G___ Background Suppression

Super-long 750-mm sensing distance
Ability to tune and adjust allows detection of various types of objects

High-resolution, high-precision model HP7-F___ Foreground Suppression

Excellent step difference detection
Two types, with sensing distances of 500 and 250 mm

Zone detection model HP7-S___ Background suppression (fixed distance)

Sensing distance is adjusted at the factory
Background suppression function is easier to use

Long-distance detection
Reliable detection
Adjustment is not required
Background suppression high-performance model
Moleo HP-D-

Compact, but capable of long-distance detection (to 750 mm). The automatic tuning and adjustment functions allow detection of various types of objects under various installation conditions.

>>> Can reliably detect multiple objects of various colors made from various materials.

Variations of corrugated cardboard cartons
Reliably detects corrugated cardboard cartons of various colors with various types of marking.

Reused pallets
Reliably detects dirty pallets of various colors.

Useful for locations where reflectors cannot be installed.

L-shape conveyors (direction converters and loaders)
The 750-mm sensing distance covers the width of the conveyor belt, simplifying switch layout.

Inspection and carry lines
Reliable detection of the target only, not the worker.

Long-distance models can be located away from the target.

Between conveyor belts
Simplifies switch layout.

Objects of various heights
Detects objects of various thicknesses.

Approaching objects can be stopped at the desired position.

Can decelerate and stop moving racks
Large sensors are not required. Automatic tuning reduces setup time.

L-shape conveyors (direction converters and loaders)
Since detection does not rely on color or material, it is possible to stop objects at the same position.

Background suppression high-resolution, high-precision model
Moleo HP-F-

In addition to detecting small step differences, this model can reliably detect reflective objects.

>>> Detects thin objects

Detects reflective objects

Note: For use only with a stable background (conveyor belt, etc.).

Background suppression (fixed-distance) zone detection model
Moleo HP-Z-

Background suppression function is easier to use. Sensing distance is adjusted at the factory. Onsite adjustment is not required.

>>> Circuit board transport

Detection at the bottom layer only of multi-layer conveyor belts
**Background Suppression (Normally Open operation)**

Detection function is based on the distance to the target object.
Background objects beyond the set distance are not detected.

In the figure on the left, the background and other (potentially interfering) object are not detected.

**Note**
Detection may not be reliable for objects with very low reflectivity or for reflective objects.

**Foreground suppression function (Normally Open operation)**

Detection function is based on the distance to the background object.
Effective when there is a conveyor belt or other stable background.

Enables detection of objects that cannot be detected reliably by background suppression (i.e., reflective or low reflectivity objects)
Suitable for detecting small step differences.

**Table of models**

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Detection method</th>
<th>Max. sensing distance</th>
<th>Light source</th>
<th>Output</th>
<th>Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Background Suppression</td>
<td>750 mm</td>
<td>Infrared</td>
<td>NPN/NO</td>
<td>HP7-G81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreground Suppression</td>
<td>250 mm</td>
<td>NPN/NO</td>
<td>PNP/NO</td>
<td>HP7-G82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zone detection</td>
<td>100 mm</td>
<td>NPN/NO</td>
<td>PNP/NO</td>
<td>HP7-F41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>300 mm</td>
<td>NPN/NO</td>
<td>PNP/NO</td>
<td>HP7-F42</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500 mm</td>
<td>NPN/NO</td>
<td>PNP/NO</td>
<td>HP7-F31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NPN/NO</td>
<td>PNP/NO</td>
<td>HP7-F32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Appearance</th>
<th>Description</th>
<th>Compatible models</th>
<th>Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Bottom-mount L-bracket</td>
<td></td>
<td>HP7-G__</td>
<td>HP-B83</td>
</tr>
<tr>
<td>Wraparound</td>
<td>Wraparound vertical mounting</td>
<td></td>
<td>HP7-F__</td>
<td>HP-B81</td>
</tr>
<tr>
<td></td>
<td>bracket</td>
<td></td>
<td>HP7-S__</td>
<td>HP-B82</td>
</tr>
</tbody>
</table>

**External dimensions**

- **HP7-G__** / **HP7-F__**
  - Preassembled type
  - M3 connector type

- **HP7-S__**
  - Preassembled type
  - M5 connector type

**Brackets**

- Bottom-mount L-bracket (HP-B83)
- Wraparound vertical mounting bracket (HP-B81)
- Wraparound horizontal mounting bracket (HP-B82)

---

**Behavior**
The switch determines that a target object is present when the background object cannot be detected.

**Reference**

- Set distance positive
- Set distance negative
- Background object
- Background object detected = OFF

**Note**
Can be used only when there is a background object.
**Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>Distance measurement diffuse scan</th>
<th>Zone detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical model No.</td>
<td>HPT-GB1</td>
<td>Background</td>
</tr>
<tr>
<td>PNP</td>
<td>HPT-F21</td>
<td>Suppression</td>
</tr>
<tr>
<td></td>
<td>HPT-F42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPT-S1/S1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPT-S1/S2</td>
<td></td>
</tr>
<tr>
<td>Detection method</td>
<td>Background Suppression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foreground Suppression</td>
<td></td>
</tr>
<tr>
<td>Distance setting method</td>
<td>Turning (Center) button, Adjustment (Far) and (Near) buttons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Distance setting range</td>
<td>100 to 750 mm</td>
<td></td>
</tr>
<tr>
<td>(target: white paper)</td>
<td>180 to 250 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300 to 500 mm</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>20 mA max.</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>DC 10.2 to 28.4 V (neglect 10 % max.)</td>
<td></td>
</tr>
</tbody>
</table>
| Spot size and distance characteristic

**Operation range characteristics**

<table>
<thead>
<tr>
<th>Distance measurement diffuse scan</th>
<th>Zone detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPT-GB1</td>
<td>Background suppression</td>
</tr>
<tr>
<td>HPT-F21</td>
<td></td>
</tr>
<tr>
<td>HPT-F42</td>
<td></td>
</tr>
<tr>
<td>HPT-S1/S1</td>
<td></td>
</tr>
<tr>
<td>HPT-S1/S2</td>
<td></td>
</tr>
<tr>
<td>Detection method</td>
<td>Background suppression</td>
</tr>
<tr>
<td>Foreground Suppression</td>
<td></td>
</tr>
<tr>
<td>Distance setting method</td>
<td>Turning (Center) button, Adjustment (Far) and (Near) buttons</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>300 to 500 mm</td>
</tr>
<tr>
<td>Current consumption</td>
<td>20 mA max.</td>
</tr>
<tr>
<td>Power</td>
<td>DC 10.2 to 28.4 V (neglect 10 % max.)</td>
</tr>
</tbody>
</table>

**Typical characteristics**

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>N.O. and N.C. can be switched by button operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output modes</td>
<td>NPN/PNP open collector</td>
</tr>
<tr>
<td>Response time</td>
<td>1 ms: 0.7 ms</td>
</tr>
<tr>
<td>Light source</td>
<td>Infrared wavelength: approx. 900 nm</td>
</tr>
<tr>
<td>Indicators</td>
<td>Operation indicator (orange)</td>
</tr>
<tr>
<td></td>
<td>Power indicator (green)</td>
</tr>
<tr>
<td>Ambient light intensity</td>
<td>Infrared: 10000 lux, Sunlight: 40000 lux</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MO. min. (at DC 650 V)</td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>AC 1.000 V / 50Hz (for one minute between electrical or metal case)</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>500 mA / 10 times each in X, Y, and Z directions</td>
</tr>
<tr>
<td>Protective structure</td>
<td>PNP (IEC standard)</td>
</tr>
<tr>
<td>Wiring method</td>
<td>HPT-GB1 prewired 2 m, HPT-F21 prewired 3 m</td>
</tr>
<tr>
<td></td>
<td>HPT-S1/S2 prewired connector, 36 cm, HPT-F42</td>
</tr>
<tr>
<td></td>
<td>M8 connector, 72 cm, HPT-F21 prewired 3 m,</td>
</tr>
<tr>
<td></td>
<td>HPT-S1/S2 prewired connector, 36 cm, HPT-F42</td>
</tr>
<tr>
<td></td>
<td>M8 connector, 72 cm</td>
</tr>
<tr>
<td>Circuit protection</td>
<td>Error prevention circuit at power on 100 ms max., power failure protection, output short-circuit protection</td>
</tr>
</tbody>
</table>

**Output stage circuit**

- NPN output type
  - Control output
  - Black: 100/50 mA max.
  - Blue: DC 10.2 to 28.4 V

- PNP output type
  - Control output
  - Black: 100/50 mA max.
  - Blue: DC 10.2 to 28.4 V

**Output operation**

- Background Suppression
- Foreground Suppression

**Sensing range**

- Sensing range (target: white paper)
- Hysteresis (target: white paper)
- Spot size and distance characteristic

**Hysteresis and distance characteristic**

- Induction characteristics

**Graphs of sensing distance by object type**

The above characteristics are typical examples only, not guaranteed values. Always test first under actual conditions and allow a margin for error.
Operation procedures (Model HP7G-___/F___)

**Names of parts**

- Orange indicator
  - [Far] button (+)
  - [Center] button (C)
  - [Near] button (-)

**Indicator status**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>During normal operation</th>
<th>During tuning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green indicator</td>
<td>Always on</td>
<td>Blink to indicate guidance</td>
</tr>
</tbody>
</table>

**Operation procedures**

**STEP 1** Disabling and setting the key lock

Disabling the key lock

Turn the key lock off.

Enabling the key lock

To enable the key lock, turn the power off and back on, or do the following.

**STEP 2** Tuning (Model HP7G-___)

After adjusting the optical axis, tune the device. The set distance (OP) is automatically adjusted based on the state of the target object and background. If desired, change the set distance by doing **STEP 3**.

**STEP 3** Adjustment

After adjusting the device in **STEP 2**, adjust the set distance if desired. After adjustment and before use, check device operation by executing trial runs.

**Operation process flow: Relevant operation procedures**

**STEP 1** ️ Disable key lock ➔ **STEP 2** Adjust optical axis, tune device ➔ **STEP 3** Adjust set distance

**STEP 2** Tuning (Model HP7G-___)

- The device goes into tuning mode
- With no target object present, quickly press and release the [Center] button. The orange LED blinks rapidly (at approx. 10 Hz).
- With a target object in position, quickly press and release the [Center] button. Blinking stops and normal operation begins.
- Setup is complete

**STEP 3** Adjustment

- Press the [Far] button to set a longer distance and the [Near] button to set a shorter one.
- The orange LED blinks rapidly at approx. 10 Hz. The orange LED indicates output status.

**Output operation (N.O./N.C.)**

The relationship between N.O./N.C. setting and output operation is shown below.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Target object</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.O.</td>
<td>Yes</td>
<td>ON</td>
</tr>
<tr>
<td>N.C.</td>
<td>No</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**Restoring default settings**

Factory default settings for set distance and N.O./N.C. can be restored.

- Holding the [Center] button until the green LED starts to blink rapidly (approx. 5 seconds at approx. 10 Hz), Green LED blinks rapidly at approx. 10 Hz.

**Checking the N.O./N.C. setting**

- For N.O.: Press [Center] button 3 times consecutively
  - Orange LED blinks rapidly (at approx. 10 Hz)
- For N.C.: Press [Center] button 2 times consecutively
  - Green LED blinks rapidly (at approx. 10 Hz)

**Switching between N.O. and N.C.**

- Press [Center] button 5 times consecutively
  - Orange LED blinks rapidly (at approx. 10 Hz)
  - Green LED blinks rapidly (at approx. 10 Hz)

**Helpful Hint**

- Do not press and hold the button down. Doing so will lock the keys.

**Graphical representation**

- The graph cannot depict exact numbers. Please use it as an approximate reference.
- The guide light is hard to see, draw the surroundings and use a target object like a white paper.