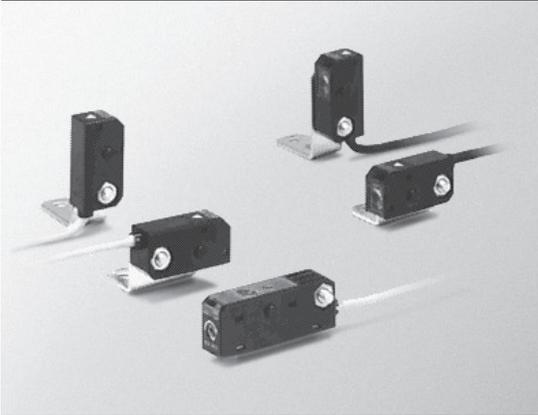


Ultraminiature Photoelectric Switches with Self-contained Amplifier



HPJ Series

Fingertip-size, Provided with a various slit attachments. (six types)



- Fingertip-size 22 x 11 x 8 mm (thru scan model)
30 x 12 x 8 mm (limited diffuse scan model)
- Long distance scanning 1.5 m (thru scan model)
30±5 mm (limited diffuse scan model)
- Various slit attachments (six types)

ORDER GUIDE

Shape	Scanning method		Scanning distance	Supply voltage	Output mode	Operation mode		Sensitivity adjustment	Catalog listing			
						Light ON	Dark ON					
Horizontal type 	Thru scan		1.5 m	10.8 to 26.4 Vdc	NPN open collector		○		HPJ-T11			
Vertical type 							○		HPJ-T21			
					PNP open collector		○		HPJ-T22			
						NPN open collector	○		HPJ-T23			
						Limited diffuse scan	Red LED	3 ± 0.5 cm	NPN open collector	○		○
PNP open collector									○			HPJ-D22
Infrared LED	NPN open collector	○		○			HPJ-A21					

SPECIFICATIONS

Detection method	Thru-scan			Limited diffuse scan		
Catalog listing	HPJ-T□1	HPJ-T22	HPJ-T23	HPJ-D21	HPJ-D22	HPJ-A21
Supply voltage	10.8 to 26.4 Vdc (ripple 10% max.)					
Current consumption	Emitter 20 mA max. Receiver 20 mA max.			20 mA max.		
Scanning distance	1.5 m			30 ± 5 mm		
Directional angle	Opaque object 4 mm dia. max.			—		
Standard target object	—			10 x 10 cm KODAK 90% white paper used		10 x 10 cm KODAK 18% white paper used
Scanning angle	3 to 30°			—		
Differential travel	—			25% max.		
Operation mode	Dark ON		Light ON	Light ON		
Output mode	NPN	PNP	NPN	NPN	PNP	NPN
Control output	Output switching circuit: 100 mA max. (resistive load) Voltage drop: 1V max. (at 100 mA switching circuit) Output dielectric strength: 26.4V			Output switching circuit: 80 mA max. (resistive load) Voltage drop: 1V max. (at 80 mA switching circuit) Output dielectric strength: 26.4V		
Response time	1ms max. for operation and recovery					
Sensitivity adjustment	—			1-turn control		
Light emitter	Infrared LED			Red LED	Infrared LED	
Indicator lamps	Operation indicator (other than thru scan emitter): red (lit at output ON)					
Ambient light immunity	Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.					
Operating temperature range	-20 to +50°C					
Storage temperature range	-40 to +70°C					
Humidity range	35 to 85%RH (condensation not allowed)					
Insulation resistance	20 MΩ min (by 500 Vdc megger)					
Dielectric strength	1,000 Vac (50/60 Hz) for 1 minute between case and electrically live metals			Non-controlled sections: 1,000 Vac (50/60 Hz) for 1 minute Controlled sections: 500 Vac (50/60 Hz) for 1 minute between case and electrically live metals		
Vibration resistance	10 to 55, 1.5 mm peak-to-peak amplitude, 2 hrs in X, Y, and Z directions					
Shock resistance	500 m/s ² 3 times in X, Y and Z directions					
Protection	IP40 (IEC standard)					
Wiring method	Pre-leaded					
Weight	Approx. 20 g for both emitter and receiver (with 2 m cable)			Approx. 20 g (with 2 m cable)		
Circuit protection	Reverse connection protection circuit					

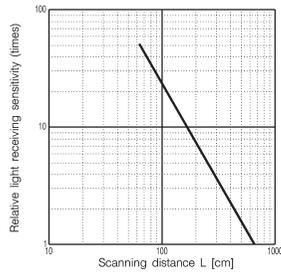
ATTACHMENTS (sold separately)

Name	Shape	Description	Catalog listing	Applicable model
Slits for thru scan model		Single set includes 1.5 mm dia., 3 dia., vertical 1 mm width, vertical 2 mm width, horizontal 1 mm width, horizontal 2 mm width (for emitter and receiver) slits	HPJ-U01	HPJ-T11, T21 T22, T23
Bracket for thru scan model		Q'ty: 1 (supplied with HPJ-T11)	HPJ-B01	
		Q'ty: 1 (supplied with HPJ-T21, T22, T23)	HPJ-B02	

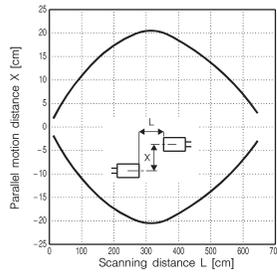
CHARACTERISTICS DIAGRAMS

● Thru scan HPJ-T11, T21

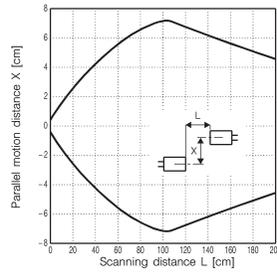
● Excess gain (Light receiving level margin) (typical example) ● Parallel motion characteristics (typical examples)



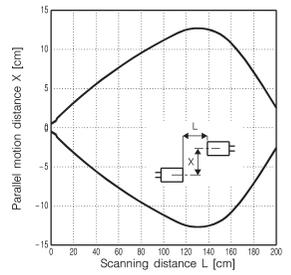
● Normal



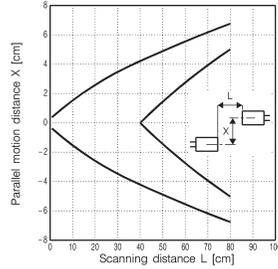
● 1.5 mm dia. slit mounted at emitter



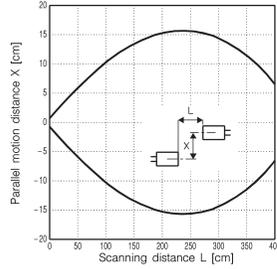
● 1.5 mm dia. slit mounted at receiver



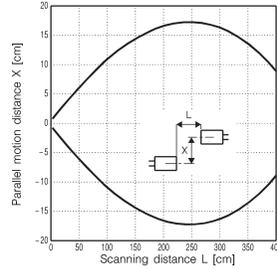
● 1.5 mm dia. slit mounted at both emitter and receiver



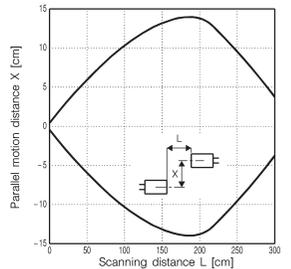
● 3 mm dia. slit mounted at emitter



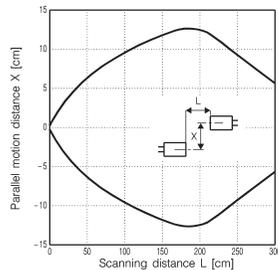
● 3 mm dia. slit mounted at receiver



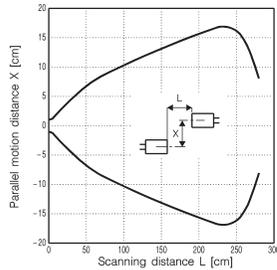
● 3 mm dia. slit mounted at both emitter and receiver



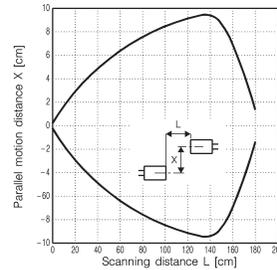
● 1 mm wide vertical slit mounted at emitter



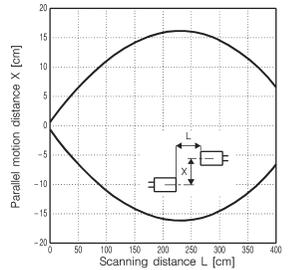
● 1 mm wide vertical slit mounted at receiver



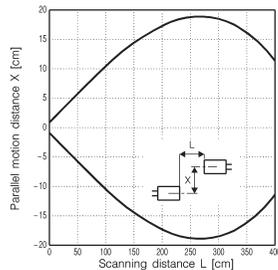
● 1 mm wide vertical slit mounted at both emitter and receiver



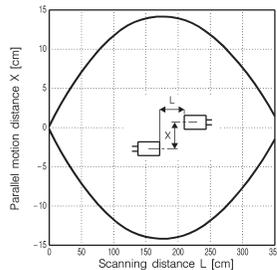
● 2 mm wide vertical slit mounted at both emitter and receiver



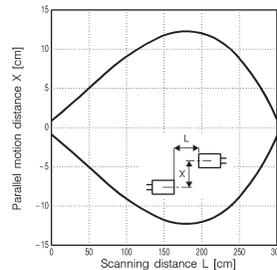
● 2 mm wide vertical slit mounted at receiver



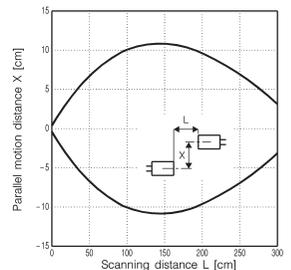
● 2 mm wide vertical slit mounted at both emitter and receiver



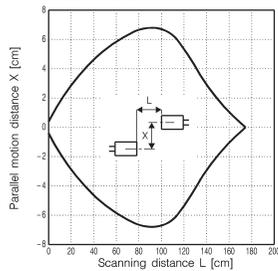
● 1 mm wide horizontal slit mounted at both emitter and receiver



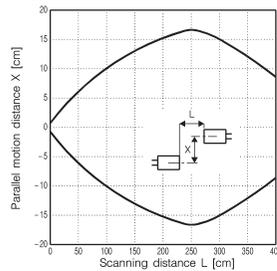
● 1 mm wide horizontal slit mounted at receiver



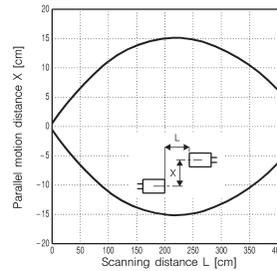
● 1 mm wide horizontal slit mounted at both emitter and receiver



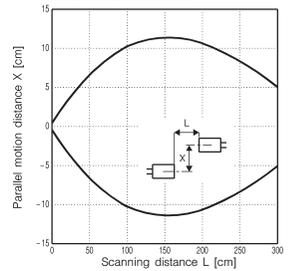
● 2 mm wide horizontal slit mounted at emitter



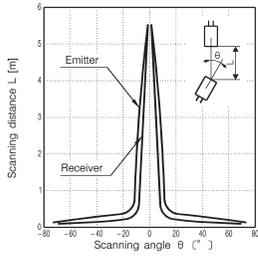
● 2 mm wide horizontal slit mounted at receiver



● 2 mm wide horizontal slit mounted at both emitter and receiver



● Angular characteristics (typical example)

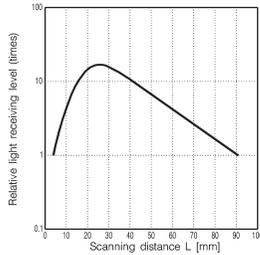


● Scanning distance characteristics (typical values) when slit HPJ-U01 is attached (comparison with slit not attached)

	Used on emitter	Used on emitter or receiver
No slit	100%	100%
1.5mm dia.	5%	30%
3mm dia.	40%	60%
1mm wide horizontal	20%	40%
2mm wide horizontal	40%	60%
1mm wide vertical	20%	40%
2mm wide vertical	40%	60%

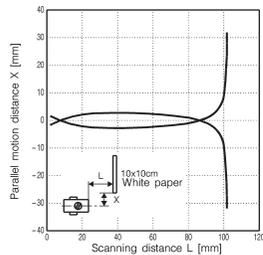
● Limited diffuse scan model HPJ-D21, HPJ-D22

● Excess gain (Light receiving level margin) (typical example)

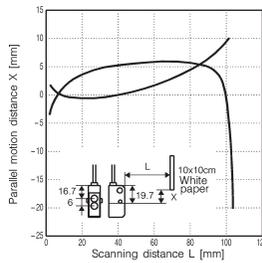


● Detection area characteristics

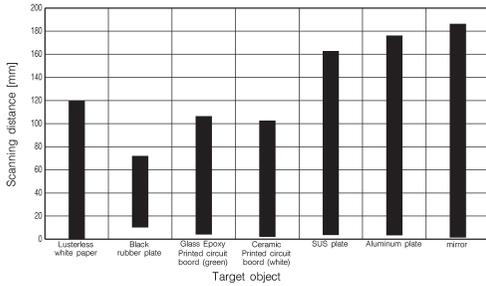
● Horizontal movement



● Vertical movement

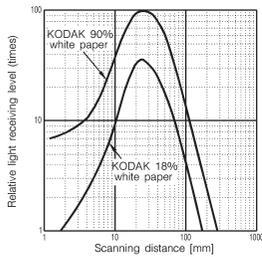


● Object characteristics



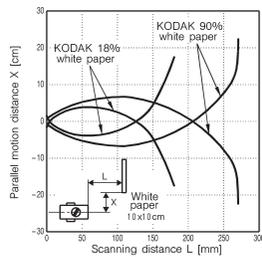
● Limited diffuse scan model HPJ-A21

● Excess gain (Light receiving level margin) (typical example)

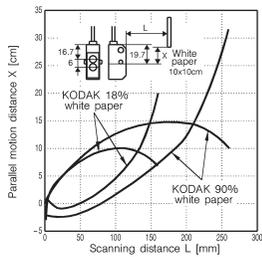


● Detection area characteristics

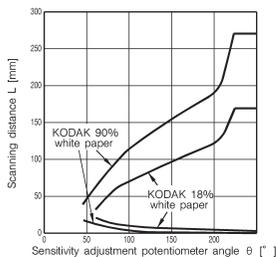
● Horizontal movement



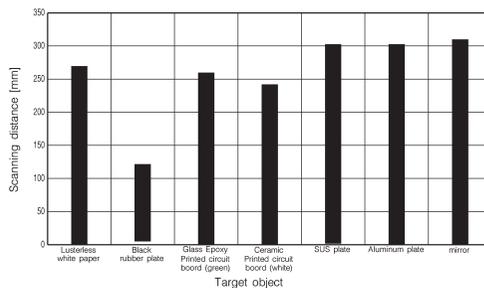
● Vertical movement



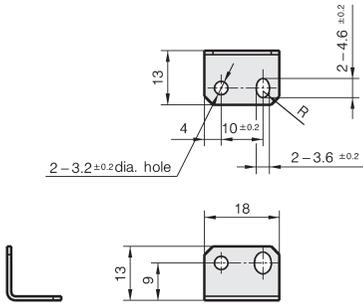
● Sensitivity adjustment potentiometer rotation angle characteristics



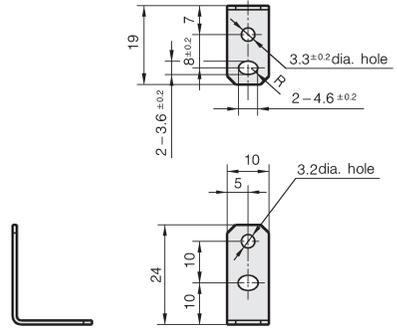
● Object characteristics



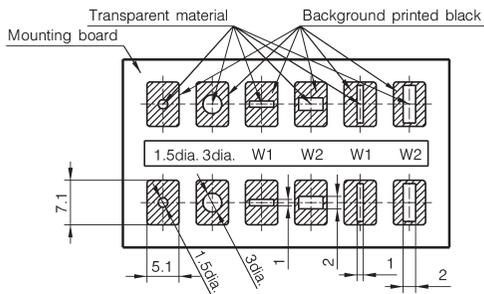
- Bracket (Sold separately)
- Bracket for thru scan model: **HPJ-B01**



- Bracket for thru scan model: **HPJ-B02**

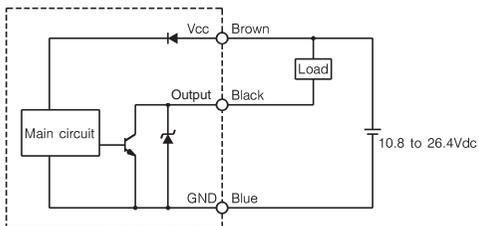


- Slit (attachable on thru scan model)
- **HPJ-U01**

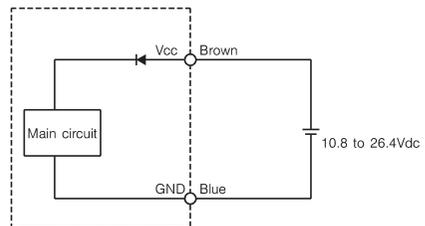


OUTPUT STAGE CIRCUIT DIAGRAM

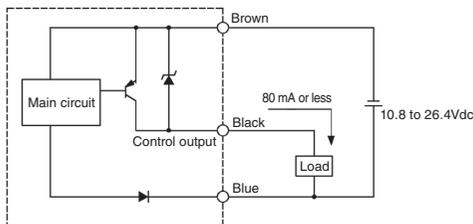
- Thru-scan receiver / Limited diffuse scan
NPN open collector type



- Thru-scan emitter



- Thru-scan receiver / Limited diffuse scan
PNP open collector type



SENSITIVITY ADJUSTMENT

When there are many types of target objects or the sensing position changes, we recommend that operation be checked during trial operation adjustments.

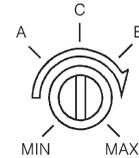
During this operation, make sure that adjustments are not influenced by light reflected from surrounding objects.

● Thru scan model

- Temporarily install the emitter and receiver in a straight line so that they face each other.
- Move the emitter vertically and horizontally, and fix it at the center of the area where the receiver's operating indicator turns OFF.
- Move the receiver vertically and horizontally, and fix it at the center of the area where its operating indicator turns OFF.
- Place a target between the emitter and receiver. Make sure that the indicator turns ON.

● Limited diffuse scan model

- Mount the photoelectric switch facing the sensing position.
- Next, with no target object placed, gradually rotate the sensitivity adjustment control from MAX towards MIN until the indicator turns OFF. Take this position as B.
- If the indicator turns OFF even if the sensitivity adjustment control is at MAX, take the MAX position as A.
- Place the target object at the predetermined position, and gradually rotate the sensitivity adjustment control from MIN towards MAX until the operation indicator turns ON. Take this position as B.
- Set the sensitivity adjustment control at position C between A and B.



BASIC PRECAUTIONS

● Wiring Precautions

- Route the cord separately from electric or power lines or through an exclusive conduit. Otherwise, electrical noise or power surge may cause incorrect operation or damage.
- When extending cords, use 0.3mm² min. cable. Keep the cable length to within 100m.
- When using a commercially available switching regulator, ground the FG (frame ground) terminal. Otherwise, switching noise may cause incorrect operation.
- When using a load that generates rush current (e.g. capacitive load, ramp load), connect a current-limiting resistor between the load and the output. Otherwise, the output may become damaged.
- Do not connect the output terminal without a load. Doing so might damage the output transistor.

● Handling Precautions

- Do not swing the photoelectric switch by its cord.
- Do not tug the cord with excessive force (30N or more). Doing so might break the cord.
- The photoelectric switch is precision assembled. Do not allow objects to hit the switch, in particular, its lens. Scratches or cracks in the lens might impair its characteristics.
- If dirty, wipe with a soft, clean cloth. Do not use benzene, acetone, paint thinner or other organic solvents.

- Do not bend the part of the cord nearest to the photoelectric switch with a minimum radius of 20mm. Also, avoid applying continuous bending stress.
- Do not turn the sensitivity adjustment control at a torque greater than 0.02N-m.
- It takes about 1ms for operation to stabilize after the power is turned ON.
- Be careful of mutual interference when two or more photoelectric switches are used in close proximity.
- Tighten the mounting screws to a torque of 0.5 N-m or less. If a bracket or screws other than those supplied with the switch are used, the allowable tightening torque may differ depending on the bracket, the material of the screws, and the condition of the surface.
- For outdoor use, put inside a case, etc., To prevent direct exposure to sunlight and rain water.
- 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.

Before use, thoroughly read the "Precautions for use" and "Precautions for handling" in the Technical Guide on pages A-141 to A-156 as well as the instruction manual and product specification for this switch.