# **PZ1 Series**

### Mini photo sensor

- Built in the protecting circuit for reverse power connection and for output break.
- Flexible installation due to the compact size
- 1 ms response time
- Time function (OFF Delay, 0.1 2 sec)



#### Suffix code

Model Code			Э	Description				
PZ1-				Small size photo sensor				
		1		1 m				
	Т	5		5 m	Through-beam			
		7		7 m				
		1		0.1 – 1 m	Potro-reflective			
		2		0.1 - 2 m	Retro-reflective			
Sensing method and sensing distance		10		100 mm				
		30		30 - 300 mm	Diffuse-reflective			
		40		40 - 400 mm				
		3		10 - 30 mm	Limited-reflective			
	Z	4		10 - 40 mm	Limited—reflective			
		ТЗ		10 - 30 mm	Limited reflective X OFF Delay 0.1 - 2 and			
		Т4		10 - 40 mm	Limited-reflective * OFF Delay, 0.1 - 2 sec.			
Output N			Ν	NPN open collector output				
			Р	PNP open collector output				
Protective structure (cautious 1)				IP 65 : Standard type				
				IP 67 : Optional (No volume, setting switch)				



### Specification

Model	NPN	PZ1-T1N	PZ1-T5N	PZ1-T7N	PZ1-M1N	PZ1-M2N		
Model	PNP	PZ1-T1P	PZ1-T5P	PZ1-T7P	PZ1-M1P	PZ1-M2P		
Sensing	g method	Through beam type			Retro reflection type			
Sensing	distance	1 m	5 m	7 m	0.1 – 1 m	0.1 - 2 m		
Sensin	ig object	ор	opaque above Ø6 mm opaque above Ø48			ove Ø48 mm		
Power su	pply voltage		12 - 24 V DC, ±10 %					
Current	Emitter		20 mA max.			30 mA max.		
consumpti	ion Receiver		18 mA max.	JO IIA IIIAX.				
Contro	ol output	I	NPN/PNP open co	ollector output max	x 100 mA (30 V DC)			
Output	operation		L.ON /	D.ON * switch o	peration			
Respo	nse time			1 ms max				
Hyst	teresis							
Light source	e (wave length)	infrared lightening LED (880 nm)						
LED		Control output indicator: Red LED						
		Red LED for(through beam type emitter is the power indicator)						
Sensitivity	adjustment	b	built in the sensitivity control V/R (rotation angle : 220°)					
Protecti	ive circuit	Built in the reversed power supply connection protective circuit and output short protective						
Ambient	illumination	Sunlight: 11,000 Lux max, Incandescent lamp: max 3,000 Lux						
Ambient	temperature	-25 $\sim$ 55 °C (surrounding storage temperature : -25 $\sim$ 70 °C)						
Ambien	t humidity		35 ~ 85 9	% RH (with no cor	ndensation)			
Protectiv	e structure	IP 65 (IP 67 is optional)						
Insulation	resistance	min 20 M $\Omega$ (500 V DC between the code and case)						
Dielectri	c strength	1,000 V AC for 1 min						
Vibration	resistance	10 - 55 Hz double amplitude 1.5 mm, for 2 hours each in X, Y and Z directions						
Shock r	resistance	500 %, 3 times each in X, Y and Z directions						
Connecti	ion method	Number of wires: 3P, thickness: Ø3.8 mm, length: 2 m (but, the emitter: 2P)						
Ма	terial	Case and lens: polycarbonate						
We	eight	Tms an	d Rcvr each Abo	ut 50 g	Approx	x. 60 g		

- (Note 1) IP67 protection structure is optional and there are no V/R and setting switch
- (Note 2) The sensing distance can be varied depending on the size, surface condition, glossy, non-glossy of the sensing object
- (Note 3) In case of the through beam type, emitter (PZ1-TL $\square$ ) and receiver (PZ1-TR $\square$ ) are one set of item



PNP   PZ1-R10P   PZ1-R30P   PZ1-R40P		NPN	PZ1-R10N	PZ1-R30N	PZ1-R40N			
Sensing method  Sensing distance  Sensing object  200 × 200 mm non-glossy and white paper  200 × 200 v DC)  201 × 200 × 200 v DC)  202 × 200 × 200 v DC)  203 × 200 × 200 v DC)  204 × 200 × 200 v DC)  205 × 200 × 200 v DC)  206 × 200 × 200 v DC)  207 × 200 × 200 v DC)  208 × 200 × 200 v DC)  208 × 200 × 200 v DC)  209 × 200 × 200 v DC)  209 × 200 × 200 v DC)  20	Model							
Sensing distance  Sensing object  200 × 200 mm non-glossy and white paper  12 - 24 V DC ±10 %  Current consumption  NPN / PNP open collector output 100 mA (30 V DC) max  Output operation  Response time  Hysteresis  Within 20 % of the sensing distance.  Light source (wave length)  LED  Sensitivity adjustment  Protective circuit  Ambient illumination  Sunlight: max 11,000 Lux, Incandescent lamp: max 3,000 Lux  Ambient humidity  Protective structure  Insulation resistance  Mind (500 V DC)  Dielectric strength  10-55 Hz double amplitude  Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m			121 (100)					
Sensing object 200 × 200 mm non-glossy and white paper  Power supply voltage 12 - 24 V DC ±10 %  Current consumption max 30 mA  Control output NPN / PNP open collector output 100 mA (30 V DC) max  Output operation L.ON / D.ON ** switch operation  Response time max 1 ms  Hysteresis Within 20 % of the sensing distance.  Light source (wave length) Infrared lightening LED (880 nm)  LED Control output : red LED  Sensitivity adjustment built in the sensitivity control V/R (rotation angle : 220°)  Protective circuit Built in the reversed power supply connection protective circuit and output short protective circuit Ambient illumination Sunlight : max 11,000 Lux, Incandescent lamp : max 3,000 Lux  Ambient temperature -25 ~ 55 °C (surrounding storage temperature : -25 ~ 70 °C)  Ambient humidity 35 ~ 85 % RH (with no condensation)  Protective structure IP 65 (IP 67 is optional)  Insulation resistance min 20 MQ (500 V DC)  Dielectric strength 1,000 V AC, for 1 min  Vibration resistance 500 %, 3 times each in X, Y and Z directions  Shock resistance Number of wires : 3P, Thickness : Ø3.8 mm, Length : 2 m								
Power supply voltage $12-24 \text{ V DC} \pm 10 \%$ Current consumption $\max 30 \text{ mA}$ Control output $NPN / PNP \text{ open collector output } 100 \text{ mA } (30 \text{ V DC}) \text{ max}$ Output operation $L.ON / D.ON \text{ % switch operation}$ Response time $\max 1 \text{ ms}$ $Hysteresis$ $Within 20 \% \text{ of the sensing distance.}$ $Light source (wave length)$ $LED$ $Control output : red LED$ $Sensitivity adjustment$ $Duilt in the sensitivity control V/R (rotation angle : 220°)$ $Protective circuit$ $Ambient illumination$ $Sunlight : max 11,000 Lux, Incandescent lamp : max 3,000 Lux$ $Ambient temperature$ $-25 \sim 55 \text{ °C (surrounding storage temperature : } -25 \sim 70 \text{ °C})$ $Ambient humidity$ $35 \sim 85 \text{ % RH (with no condensation)}$ $Protective structure$ $IP 65 (IP 67 \text{ is optional})$ $Insulation resistance$ $min 20 \text{ MQ } (500 \text{ V DC})$ $Dielectric strength$ $10-55 \text{ Hz double amplitude } 1.5 \text{mm, for 2 hours each in X, Y and Z directions}$ $Shock resistance$ $Onnection method$ $Number of wires : 3P, Thickness : \emptyset 3.8 \text{ mm, Length} : 2 \text{ m}$			700 11111					
Current consumption  Control output  NPN / PNP open collector output 100 mA (30 V DC) max  L.ON / D.ON ** switch operation  Response time  max 1 ms  Hysteresis  Within 20 % of the sensing distance.  Light source (wave length)  LED  Control output : red LED  Sensitivity adjustment  Built in the sensitivity control V/R (rotation angle : 220°)  Protective circuit  Ambient illumination  Sunlight : max 11,000 Lux, Incandescent lamp : max 3,000 Lux  Ambient humidity  35 ~ 85 % RH (with no condensation)  Protective structure  Insulation resistance  Min 20 MQ (500 V DC)  Dielectric strength  Vibration resistance  10–55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions  Shock resistance  Number of wires : 3P, Thickness : Ø3.8 mm, Length : 2 m								
Control output       NPN / PNP open collector output 100 mA (30 V DC) max         Output operation       L.ON / D.ON ** switch operation         Response time       max 1 ms         Hysteresis       Within 20 % of the sensing distance.         Light source (wave length)       Infrared lightening LED (880 nm)         LED       Control output : red LED         Sensitivity adjustment       built in the sensitivity control V/R (rotation angle : 220°)         Protective circuit       Built in the reversed power supply connection protective circuit and output short protective circuit and in the illumination         Ambient illumination       Sunlight : max 11,000 Lux, Incandescent lamp : max 3,000 Lux         Ambient temperature       -25 ~ 55 °C (surrounding storage temperature : -25 ~ 70 °C)         Ambient humidity       35 ~ 85 % RH (with no condensation)         Protective structure       IP 65 (IP 67 is optional)         Insulation resistance       min 20 MΩ (500 V DC)         Dielectric strength       1,000 V AC, for 1 min         Vibration resistance       10-55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions         Shock resistance       500 %, 3 times each in X, Y and Z directions         Connection method       Number of wires : 3P, Thickness : Ø3.8 mm, Length : 2 m		117						
Output operation         Response time       max 1 ms         Hysteresis       Within 20 % of the sensing distance.         Light source (wave length)       Infrared lightening LED (880 nm)         LED       Control output : red LED         Sensitivity adjustment       built in the sensitivity control V/R (rotation angle : 220°)         Protective circuit         Built in the reversed power supply connection protective circuit and output short protective circ         Ambient illumination       Sunlight : max 11,000 Lux, Incandescent lamp : max 3,000 Lux         Ambient temperature       −25 ~ 55 °C (surrounding storage temperature : −25 ~ 70 °C)         Ambient humidity       35 ~ 85 % RH (with no condensation)         Protective structure       IP 65 (IP 67 is optional)         Insulation resistance       min 20 MΩ (500 V DC)         Dielectric strength       1,000 V AC, for 1 min         Vibration resistance       10–55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions         Shock resistance       500 %, 3 times each in X, Y and Z directions         Connection method       Number of wires : 3P, Thickness : Ø3.8 mm, Length : 2 m								
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Hysteresis  Light source (wave length)  LED  Control output: red LED  Sensitivity adjustment  Built in the sensitivity control V/R (rotation angle: 220°)  Protective circuit  Ambient illumination  Sunlight: max 11,000 Lux, Incandescent lamp: max 3,000 Lux  Ambient temperature  -25 ~ 55 °C (surrounding storage temperature: -25 ~ 70 °C)  Ambient humidity  35 ~ 85 % RH (with no condensation)  Protective structure  IP 65 (IP 67 is optional)  Insulation resistance  min 20 MΩ (500 V DC)  Dielectric strength  Vibration resistance  10-55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions  Shock resistance  Connection method  Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m	Output	operation	L.	ON / D.ON * switch operation	n			
Light source (wave length)  LED  Control output: red LED  Sensitivity adjustment  Built in the sensitivity control V/R (rotation angle: 220°)  Protective circuit  Ambient illumination  Sunlight: max 11,000 Lux, Incandescent lamp: max 3,000 Lux  Ambient temperature  -25 ~ 55 °C (surrounding storage temperature: -25 ~ 70 °C)  Ambient humidity  35 ~ 85 % RH (with no condensation)  Protective structure  IP 65 (IP 67 is optional)  Insulation resistance  min 20 MΩ (500 V DC)  Dielectric strength  1,000 V AC, for 1 min  Vibration resistance  500 %, 3 times each in X, Y and Z directions  Connection method  Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m	Respo	onse time		max 1 ms				
LED  Sensitivity adjustment  built in the sensitivity control V/R (rotation angle: 220°)  Protective circuit  Ambient illumination  Sunlight: max 11,000 Lux, Incandescent lamp: max 3,000 Lux  Ambient temperature  -25 ~ 55 °C (surrounding storage temperature: −25 ~ 70 °C)  Ambient humidity  35 ~ 85 % RH (with no condensation)  Protective structure  IP 65 (IP 67 is optional)  Insulation resistance  min 20 MΩ (500 ∨ DC)  Dielectric strength  1,000 ∨ AC, for 1 min  Vibration resistance  500 %, 3 times each in X, Y and Z directions  Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m	Hys	teresis	Within 20 % of the sensing distance,					
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Protective circuit  Ambient illumination  Sunlight: max 11,000 Lux, Incandescent lamp: max 3,000 Lux  Ambient temperature $-25 \sim 55$ °C (surrounding storage temperature: $-25 \sim 70$ °C)  Ambient humidity $35 \sim 85$ % RH (with no condensation)  Protective structure  IP 65 (IP 67 is optional)  Insulation resistance $min \ 20 \ M\Omega \ (500 \ V \ DC)$ Dielectric strength $1,000 \ V \ AC$ , for 1 min  Vibration resistance $10-55 \ Hz \ double \ amplitude \ 1.5mm$ , for 2 hours each in X, Y and Z directions  Shock resistance $500 \ \%$ , 3 times each in X, Y and Z directions  Number of wires: 3P, Thickness: $\emptyset 3.8 \ mm$ , Length: 2 m	ا	LED	Control output: red LED					
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Protective structure  IP 65 (IP 67 is optional)  Insulation resistance  min 20 MΩ (500 V DC)  Dielectric strength  1,000 V AC, for 1 min  Vibration resistance  10−55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions  Shock resistance  500 %, 3 times each in X, Y and Z directions  Connection method  Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m	Ambient	temperature	−25 ~ 55 °C (su	-25 $\sim$ 55 °C (surrounding storage temperature : -25 $\sim$ 70 °C)				
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Dielectric strength       1,000 V AC, for 1 min         Vibration resistance       10−55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions         Shock resistance       500 %, 3 times each in X, Y and Z directions         Connection method       Number of wires : 3P, Thickness : Ø3.8 mm, Length : 2 m	Protecti	ve structure	IP 65 (IP 67 is optional)					
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Shock resistance       500 %, 3 times each in X, Y and Z directions         Connection method       Number of wires : 3P, Thickness : Ø3.8 mm, Length : 2 m	Dielectr	ric strength	1,000 V AC, for 1 min					
Connection method Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m	Vibration	n resistance	10-55 Hz double amplitude 1.5mm, for 2 hours each in X, Y and Z directions					
	Shock	resistance	500 %, 3 times each in X, Y and Z directions					
Material Case and lens : nolycarhonate	Connec	tion method	Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m					
Case and lens : polycarbonate	Ma	aterial	Case and lens : polycarbonate					
Weight Approx. 60 g	W	eight	Approx. 60 g					

### PZ1 Series

	NPN	PZ1-Z3N	PZ1-Z4N	PZ1-ZT3N	PZ1-ZT4N		
Model	PNP	PZ1-Z3P	PZ1-Z4P	PZ1-ZT3P	PZ1-ZT4P		
Sensir	ng method	Limited-refl	ective type	Limited-reflective type (Timer function)			
Sensin	g distance	10-30 mm	10-40 mm	10-30 mm	10-40 mm		
Sensi	ing object		$50 \times 50$ mm non-glossy and white paper				
Power s	supply voltage	12 - 24 V DC ±10 %					
Current	consumption		max 3	0 mA DC			
Conti	rol output	NPN	/PNP open collector o	utput 100 mA (30 V DC)	max		
0	l anavation	L.ON /	D.ON				
Outpu	t operation	* switch	operation	L.ON, D.ON (optional)			
		max 1 ms		When operating: 3 ms, when returning: 100 ms			
Resp	onse time	IIIdA	T IIIS	when timer setting is in the minimum value			
Hys	steresis	Within 20 % of the sensing distance.					
Light sour	rce (wave length)	Infrared lightening LED (880 nm)					
	ED Control output : red LED						
Sensitiv	ity adjustment	built in the sensitivity control V/R (rotation angle: 220°)					
Protec	tive circuit	Built in the reversed power supply connection protective circuit and output short protective					
Ambien	t illumination	Sunlight: max 11,000 Lux, Incandescent lamp: max 3,000 Lux					
Ambient temperature $-25 \sim 55$ °C (surrounding storage temperature)					~ 70 °C)		
Ambie	nt humidity	35 $\sim$ 85 % RH (with no condensation)					
Protect	ive structure	IP 65 (IP 67 is optional)					
Insulation	on resistance	min 20 MΩ(500 V DC)					
Dielect	ric strength	1,000 V AC, for 1 min					
Vibratio	n resistance	10 - 55 Hz double amplitude 1.5 mm, for 2 hours each in X, Y and Z directions					
Shock	resistance	500 %, 3 times each in X, Y and Z directions					
Connec	ction method	Number of wires: 3P, Thickness: Ø3.8 mm, Length: 2 m					
М	aterial	Case and lens : Polycarbonate					
V	Veight		Appro	x. 60 g			

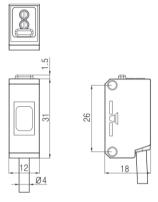
(Note1) Setting range of convergent beam type : 0.1  $\sim$  0.2 sec(OFF Delay time)

(Note2) In case of the convergent beam's time function built-in, Dark ON(DO) is optional

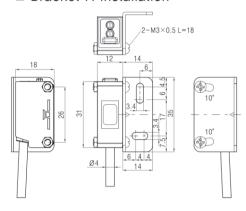
Photo Sensor

# Dimension (unit : mm)

### ■ Body

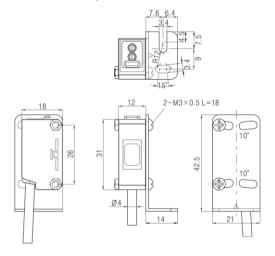


#### ■ Bracket A installation

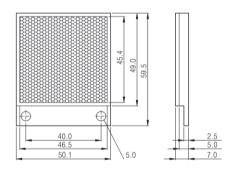


#### ■ Bracket B installation

#### \* Bracket B is optional



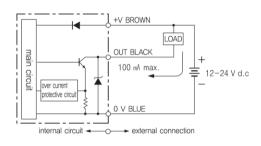
#### ■ Mirror(HY-M50)



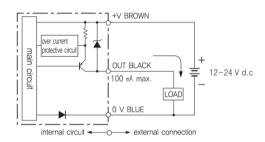
### Output circuit

\*\* For Diffuse reflection, convergent reflection, retro reflection and receiver of through beam type.
(Note that emitter of through beam type only has the power supply (12 - 24V DC)

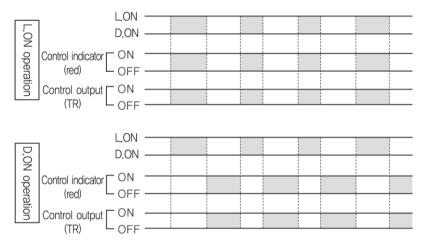
#### ■ NPN output circuit



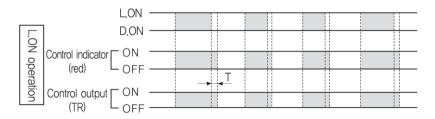
#### ■ PNP output circuit



### Operation chart



\* Through beam type is for Dark on operation



\* For convergent beam type (Time function) - Off delay

 $\mathsf{T}:\mathsf{Set}$  the time by time controlling  $\mathsf{VR}$ 



# How to install

### ■ Through-beam type/retro reflection type

Order	Installation method	Operation	Operation mode	Sensitivity volume	Indicator
1	Supply in the power after placing the emitter and receiver face to face. (Retro reflection	Receiver Emitter	D LIGHT ON	no	*
	type uses the mirror and sensor instead of using emitter and receiver)	mirror Sensor	D DARK ON	yes	•
2	Fix either the emitter or receiver and check for the range where operation indicator becomes turned ON or turned OFF by	Receiver	D LIGHT ON	no	•
	controlling the other in the direction of up, down, left and right.  After finishing the confirmation, place it in the middle and fix it.	Sensor	D LIGHT ON	yes	*
3	Place the sensing object within the	— ☐ ☐ Emitter	D DARK ON	no	•
	setting range and confirm the condition of proper operation	mirror Sensor	D DARK ON	yes	*

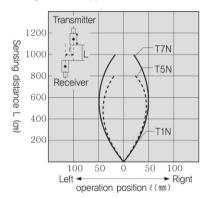


### ■ Diffusion reflection type

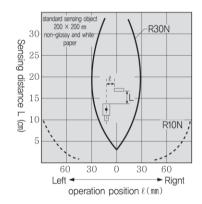
Order	Installation method	Operation	Operation mode	Sensitivity volume	Indicator
1	After removing the sensing object, turn sensitivity volume gradually to		D LIGHT ON L DARK ON L		
	the max direction and once indicator lights up, (light on) that position	Sensor sensing object		( ) v	
	will be referred as 'A' from now on, (If indicator does not get turned	<u> </u>		Min. Max.	1
	ON (OFF) even in the position of maximum then it is max)			max sensitivity volume	7
2	Place the sensing object in the desirable setting position			ID.	*
	and gradually turn the sensitivity volume from 'A' to the	sensing object	D LIGHT ON		7
2	'min' direction and once the indicator gets to turned ON			Min. Max.	
	(OFF) than that position will be referred as 'B'		D L DARK ON		
	Place the sensitivity volume in the middle of			'B'	
3	max sensitivity and 'A' and 'B' and confirm	sensing object		O X	
	the operation condition of sensing object that			Min. Max.	1
	occurs within the setting range.		D DARK ON		7

### Graphic characteristic

- Parallel movement characteristic
- Through beam type

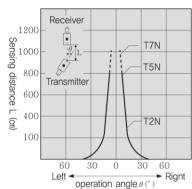


- Detecting range characteristic
- Diffuse reflection type

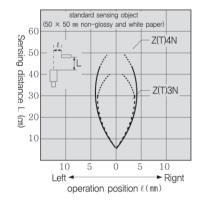


#### ■ Pointing angle characteristic

Through beam type



#### Diffuse reflection type





### Operation mode and sensitivity setting

#### Sensitivity setting



To the min direction (counter clockwise) - minimum light volume



To the max direction (clockwise) maximum light volume

#### operation mode



To the D direction (counter clockwise)

-Dark ON



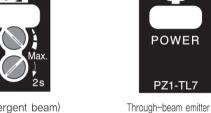
To the L direction (clockwise)

-Light ON





(Convergent beam)





Through-beam receiver

(Diffuse-reflective)

\* In case of convergent beam type (PZ1-ZT), there is a time adjusting switch (OFF Delay Time) instead of having an operation mode switch.

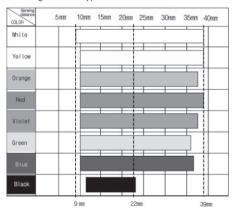
\* In case of through beam type, emitter has no operation mode switch and sensitivity adjusting switch. Receiver only has the mode switch.

Ex) Example of setting (diffuse reflection type): Sensitivity - max operation mode-Dark ON

## Characteristic of sensing distance according to the colors

#### ■ Convergent beam type Z3N

Characteristic of sensing distance according to the colors (Convergent beam type Z3N)



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