


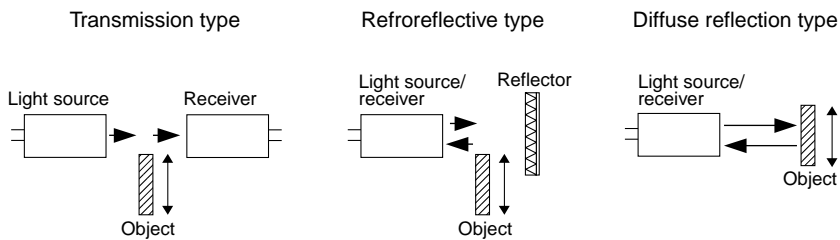
Photoelectric Switches



General information

Selection guide

Basic type	PH1C	
Photo	 <p style="text-align: center;">XX03-013A</p>	
Description	Highly compact photoelectric switch with dimensions of 10.8x31x20mm. Energy saving design with long-distance detection and a built-in amplifier. Meets CE Mark requirements.	
Detecting method	Transmission type Retroreflective type Diffuse reflection type	
Operation mode	Dark-ON/Light-ON selectable	
Special function	–	
Supply voltage	12 to 24VDC \pm 10% (ripple \pm 10% or less)	
Output configuration	Detecting: NPN transistor, open collector output	
Output (switching capacity)	100mA max.	
Detectable object (material)	Transparent, opaque	
Detecting distance	1m, 3m, 4m, 10m	
Response time	1ms	
Ambient temperature	Operation: -25 to $+55^{\circ}\text{C}$ Storage: -40 to $+70^{\circ}\text{C}$	
Degree of protection	IP67 (IEC)	
Page	05/56	

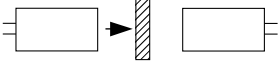
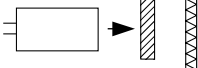
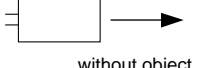
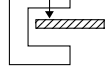
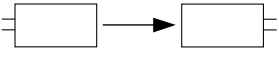
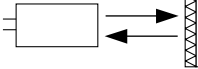
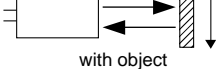
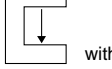
■ Detecting method



Basic type	PH4C	PH8AU
Photo	 <small>XX03-002A</small>	 <small>KK02-303A</small>
Description	AC/DC dual supply voltage. Highly compact with dimensions of 18 x 50 x 50mm. Retroreflective type equipped with mirror surface rejection function	Slot-type photoelectric switches ideal for conveyor applications, such as elevators and multi-level parking lifts. Same mounting method as our slot-type magnetically operated reed switches (type PM1U).
Detecting method	Transmission type Retroreflective type Diffuse reflection type	Slot type
Operation mode	Dark-ON or Light-ON	Dark-ON or Light-ON
Special function	–	–
Supply voltage	24 to 240V AC±10% 12 to 240V DC±10% (ripple ±10% or less)	10 to 30V DC
Output configuration	Relay output	NPN transistor, open collector output
Output (switching capacity)	3A max. (250V AC res. load) 10mA max. (5V DC)	–
Detectable object (material)	Transparent, opaque	Opaque
Detecting distance	30cm, 2.5m, 3.5m, 4m, 5m	30mm
Response time	30ms max.	1ms or less
Ambient temperature	Operation: –25 to +55°C Storage: –30 to +70°C	Operation: –25 to +55°C Storage: –30 to +70°C
Degree of protection	IP64 (IEC)	IP66 (IEC)
Page	05/61	05/65

05

■ Operation mode

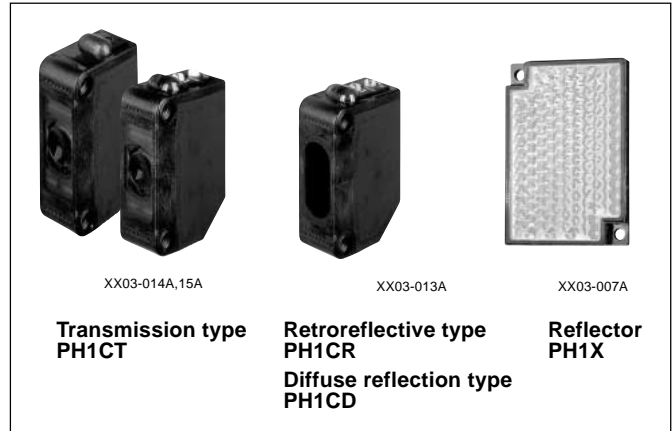
	Transmission type	Retroreflective type	Diffuse reflection type	Slot type
Dark-ON (operates when light is interrupted)			 without object	
Light-ON (operates when light is incident)			 with object	 without object

Photoelectric Switches PH1C

Photoelectric switches with built-in amplifier PH1C

■ Features

- Highly compact with dimensions of 10.8 x 31 x 20mm
- Energy-saving design
- Covers a wide range of detection with distances of 10m (transmission type), 3 or 4m (retroreflective type), or 1m (diffuse reflection type)
- Retroreflective type equipped with mirror surface rejection function
- High-speed response time of 1ms
- Light-ON/Dark-ON selectable with operation mode switch
- Equipped with various protective functions
- High degree of protection of IP67 (IEC) enables use even in environments where exposure to water is possible.
- Improved alignment ($\pm 2.5^\circ$) of optical and mechanical axes simplifies adjustment (transmission type, retroreflective type)
- Environment-friendly lead-free solder used
- Meets CE Mark requirements.



■ Types

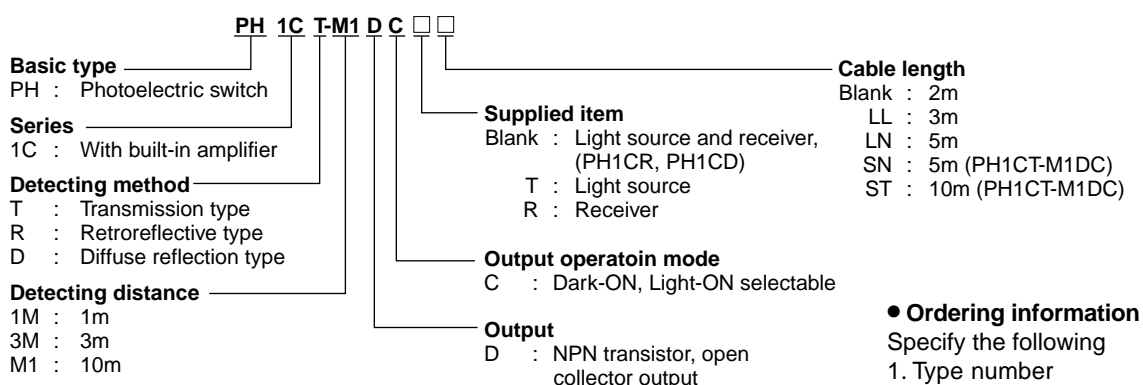
Detecting method	Detecting distance	Light emitting element	Output	Output operation mode	Type	Supplied item						
							Cable length					
Transmission type 	10m	Red LED	NPN transistor, open collector output	Dark-ON / Light-ON selectable	PH1CT-M1DC	Light source and receiver	2m					
					PH1CT-M1DCSN		5m					
					PH1CT-M1DCST		10m					
					Retroreflective type (with mirror surface rejection) 	0.1 to 3m (using PH1X-R1) 0.1 to 4m (using PH1X-R1S)	Red LED			PH1CT-M1DCR	Receiver	2m
										PH1CT-M1DCRLN		5m
										PH1CT-M1DCT	Light source	2m
PH1CT-M1DCTLN	5m											
Diffuse reflection type 	1m	Infrared LED			PH1CR-3MDC	Light source/receiver	2m					
					PH1CR-3MDCLN		5m					
					PH1CD-1MDC	Light source/receiver	2m					
					PH1CD-1MDCLL		3m					

■ Ratings and specifications

Detection method	Transmission type	Retroreflective type (with mirror surface rejection)	Diffuse reflection type
Type	PH1CT-M1DC	PH1CR-3MDC	PH1CD-1MDC
Light emitting element	Red LED		Infrared LED
Supply voltage	12 to 24V DC ±10% (ripple ±10% or less)		
Current consumption	Light source: 15mA, Receiver: 20mA	30mA max.	
Detecting distance	10m	0.1 to 3m (using PH1X-R1) 0.1 to 4m (using PH1X-R1S)	1m (white mat paper 30 x 30cm)
Detectable target	Opaque 12mm dia. min.	Opaque 75mm dia. min.	Transparent or opaque
Directional angle	Light source and receiver: 3 to 15° each	Light source/receiver: 2 to 10°, Reflector: 30°	–
Differential	–		Max. 20% of detecting distance
Detecting output	NPN transistor, open collector output Load current: 100mA max. (26.4V DC) Residual voltage: 1V DC max. at load current less than 10mA 2V DC max. at load current of 10 to 100mA		
Output operation mode	Dark-ON / Light-ON selectable		
Response time	1ms max. (operation/reset)		
Indicator	Operation indicator	Orange LED (Light source: power supply indicator)	Orange LED
	Stability level indicator	Green LED (Receiver)	Green LED
Connection	Attached cable (2m, 0.2mm ²)		
Sensitivity adjustment	Dial		
Ambient operating illumination	Incandescent lamp: 3000 lx max. (at receiving surface) Sunlight: 10000 lx max. (at receiving surface)		
Ambient temperature	Operating: –25 to +55°C (no icing), storage: –40 to +70°C		
Ambient humidity	Operating: 35 to 85%RH (no condensation), storage: 35 to 95%RH		
Degree of protection	IP67 (IEC)		
Protective function	Reverse polarity (input), short-circuit and reverse polarity (output)	Reverse polarity (input), short-circuit, reverse polarity (output) and mutual interference	
Insulation resistance	20MΩ (500V DC megger)		
Dielectric strength	1,000V AC for 1min		
Vibration	10 to 55Hz, 1.5mm double amplitude or 300m/s ² (2 hours for each X, Y, Z direction)		
Shock	500m/s ² (3 times for each X, Y, Z direction)		
Material	Casing	Polybutylene terephthalate resin (PBT)	
	Lens	Polyarylate resin (PAR)	Methacrylic resin (PMMA)
Mass	Approx. 120g	Approx. 65g	Approx. 65g
Accessory (option)	Mounting bracket (PH1X-P1, PH1X-P2)		

Note : Reflectors PH1X-R1 and R1S (for retroreflective type PH1CR use) are sold separately.

■ Type number nomenclature

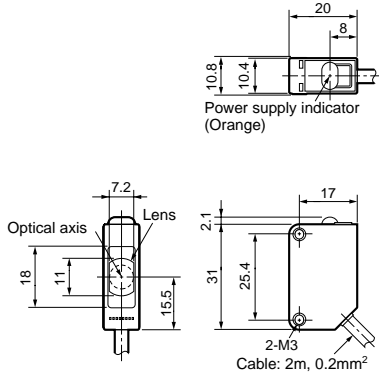


Photoelectric Switches PH1C

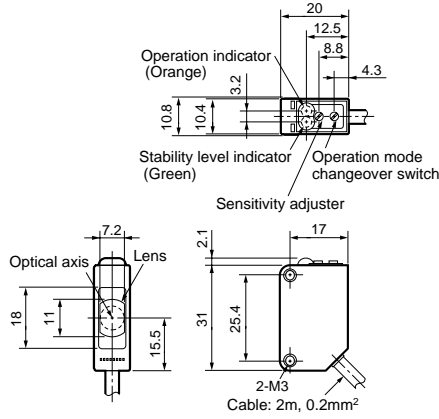
■ Dimensions, mm

● PH1CT-M1DC

Light source

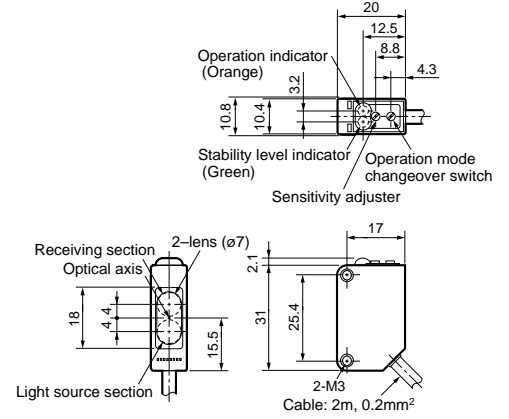


Receiver



● PH1CR-3MDC, PH1CD-1MDC

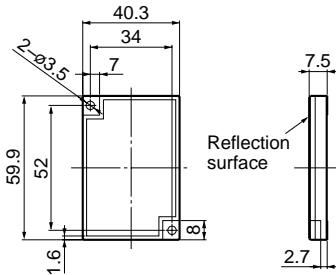
Light source/receiver



■ Dimensions, mm (sold separately)

● Reflector

PH1X-R1, PH1X-R1S

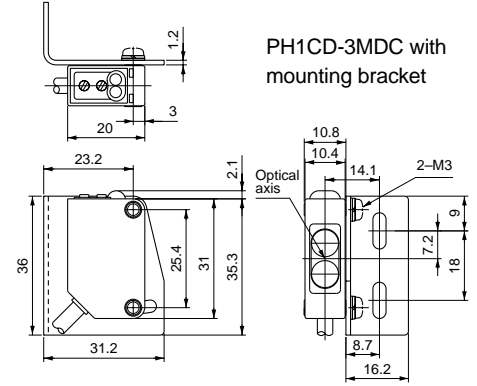
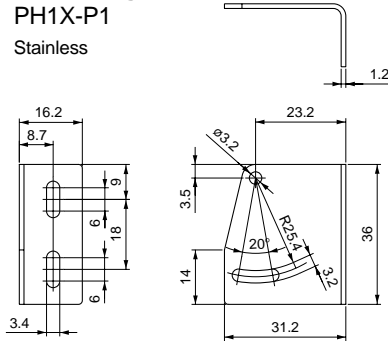


Reflection surface: Methacrylic resin (PMMA)
Reverse side: Acrylonitrile butadiene styrene resin (ABS)

● Mounting bracket

PH1X-P1

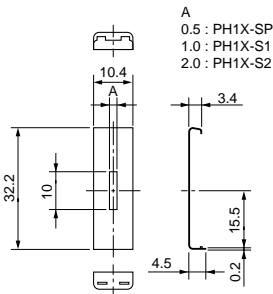
Stainless



● Slit

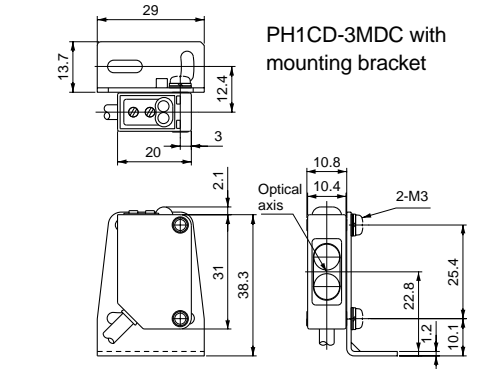
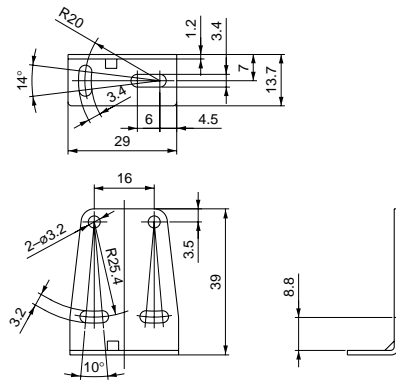
PH1X-SP, PH1X-S1, PH1X-S2

Stainless



PH1X-P2

Stainless



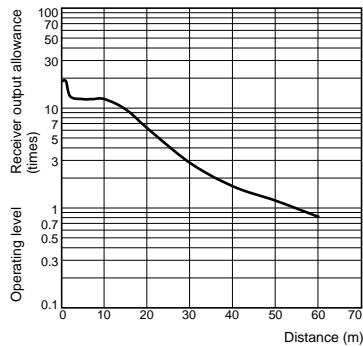
● Detection characteristics using PH1X slit

Photoelectric switch	PH1CT-M1DC		
Slit width (mm)	0.5×10	1×10	2×10
Detecting distance (m)	0.7	1.5	3.5
Minimum detectable target (mm dia.)	0.2	0.5	0.8

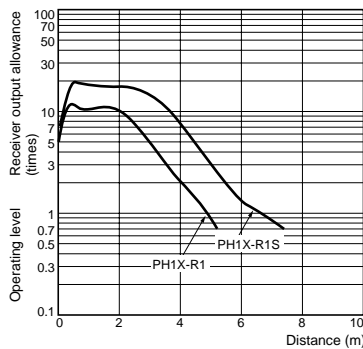
■ Characteristic curve, typical

● Receiver output-Distance

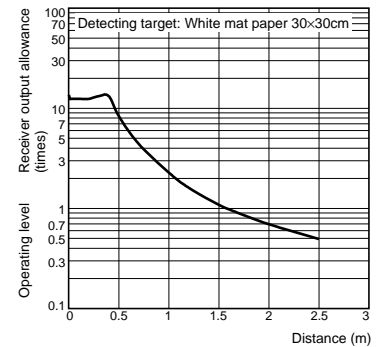
PH1CT-M1DC



PH1CR-3MDC + Reflector

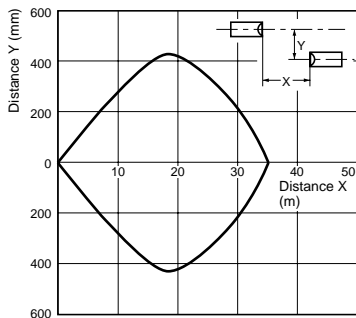


PH1CD-1MDC

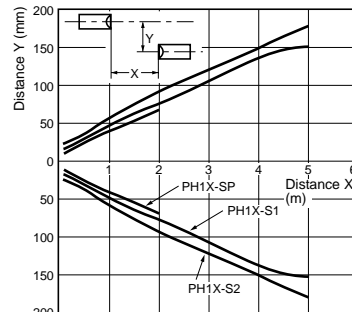


● Setting range of light source and receiver head

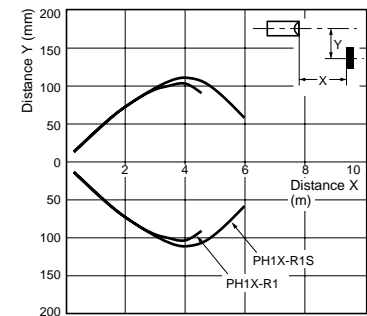
PH1CT-M1DC



PH1CT-M1DC + Slit

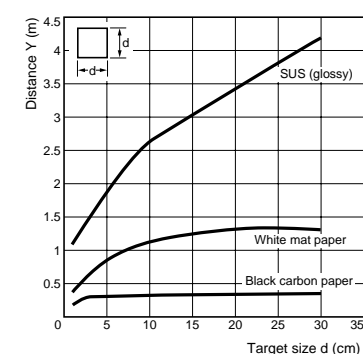


PH1CR-3MDC + Reflector



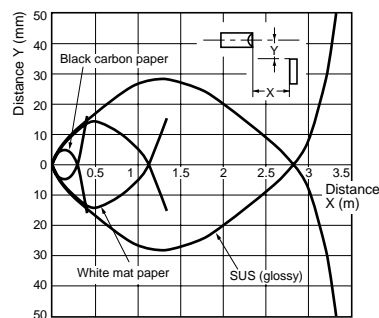
● Size of detecting target - Distance

PH1CD-1MDC



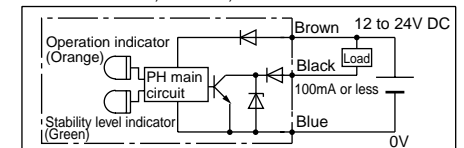
● Operating range

PH1CD-1MDC

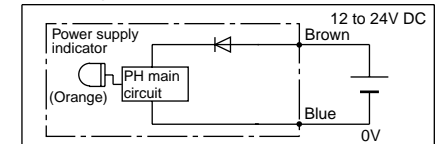


■ Wiring diagrams

PH1CT receiver, PH1CR, PH1CD

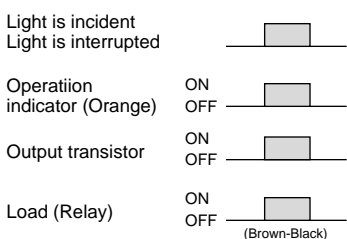


PH1CT light source

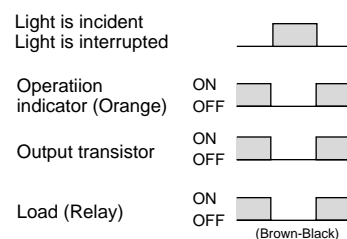


■ Timing diagrams

● "Light-ON" mode (switch: L side)



● "Dark-ON" mode (switch: D side)



Photoelectric Switches

PH1C

Indicator

● Operation indicator (Ope)

Lights when the switch is activated (output transistor ON) irrespective of Light-ON, Dark-ON.

● Stability level indicator (Stab)

Lights when the incident light or shaded light is good enough for stable level.

Status of incident light		Indicator	Stab (green)	Ope (orange)	Allowance
Light-ON	Dark-ON				
Stable incident	Stable shade		ON	ON	Operation level $\times 1.11$
Unstable incident	Unstable shade		OFF	ON	
Unstable shade	Unstable incident		OFF	OFF	Operation level
Stable shade	Stable incident		ON	OFF	Operation level $\times 0.86$

Optical axis adjustment

● Transmission type

Swinging the light source and receiver up and down and right and left when no objects exist, set and fix the light source and receiver to the center within the range where the operation indicator (orange) is lit or is turned off (Dark-ON). At the same time make sure that the stability level indicator (green) is lit.

● Retroreflective type

Swinging the unit and reflector up and down and right and left when no objects exist, set and fix the unit and reflector to the center within the range where the operation indicator (orange) is lit or is turned off (Dark-ON). At the same time make sure that the stability level indicator (green) is lit.

Sensitivity adjustment

● When carrying a normal detection, set the sensitivity adjuster at the maximum sensitivity value by turning it fully clockwise.

● Sensitivity adjustment is necessary for the following cases.

- Transmission type: To detect translucent or minute objects
- Reflection type: To detect objects with inadequate contrast

● Carry out the sensitivity adjustment as follows. (When excessive power is added to the sensitivity adjuster, it might be damaged.)

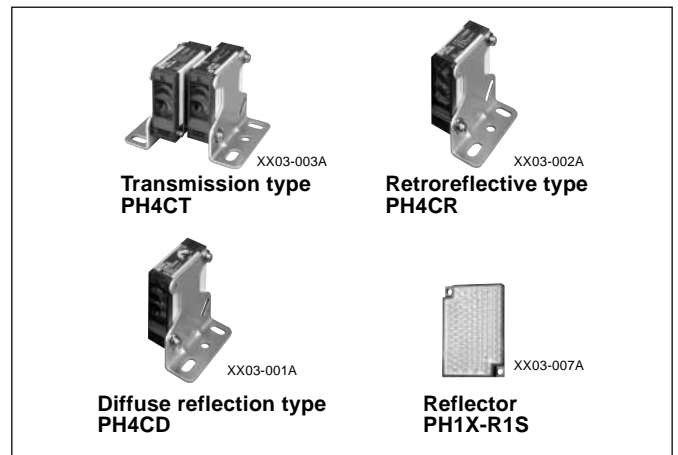
Step	State of detected object		Operation indicator and sensitivity adjuster		Step
	Transmission type	Reflection type	Light-ON	Dark-ON	
1		Detected object			By turning the sensitivity adjuster, obtain point A and B at that the status of the operation indicator changes. Unless the status changed, two points at finishing turning the sensitivity adjuster will be point A or B.
2		Background object			
3	—	—			An intermediate position between point A and B will be the optimum position.

Note: ◉ lit, ● not lit

Photoelectric switches with AC/DC input PH4C

■ Features

- Highly compact with dimensions of 18 x 50 x 50mm
- Accepts a wide range of supply voltage with AC/DC dual input
- Retroreflective type has a wider range of detecting distance. 3.5m for PH4CR-2HR□, 5m for PH4CR-4MR□ (using a separately-sold reflector PH1X-R1S)
- Retroreflective type equipped with mirror surface rejection function
- Meets CE Mark requirements



■ Types

Detecting method		Detecting distance	Light emitting element	Output	Operation mode	Type	Supplied item	Cable length
Transmission type 		5m	Infrared LED	Relay output (SPDT)	Light-ON	PH4CT-5MRA	Light source and receiver	2m
					Dark-ON	PH4CT-5MRB	Light source and receiver	2m
Retroreflective type 	Without mirror surface rejection	0.1 to 4m (0.1 to 5m)*	Red LED	Light-ON	PH4CR-4MRA	Light source/receiver	2m	
	With mirror surface rejection	0.1 to 2.5m (0.1 to 3.5m)*		Dark-ON	PH4CR-4MRB			
Diffuse reflection type 		30cm	Infrared LED	Light-ON	PH4CD-3CRA	Light source/receiver	2m	
				Dark-ON	PH4CD-3CRB			

Note: * The distances in () are the values where a separately-sold reflector PH1X-R1S is used.

Photoelectric Switches

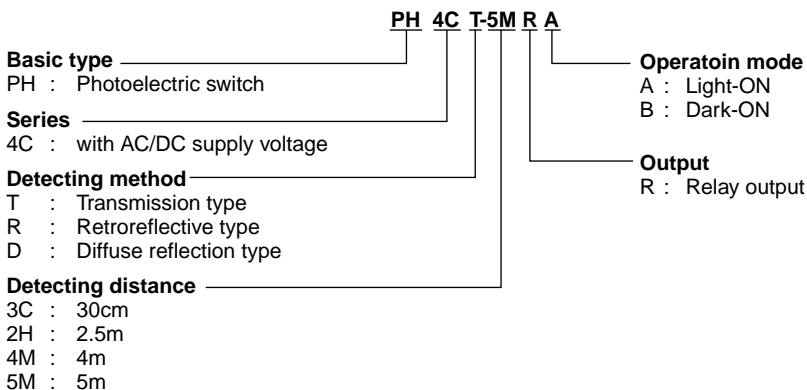
PH4C

■ Ratings and specifications

Detection method	Transmission type	Retroreflective type		Diffuse reflection type	
Type	Light-ON Dark-ON	PH4CT-5MRA PH4CT-5MRB	Without mirror surface rejection PH4CR-4MRA PH4CR-4MRB	With mirror surface rejection PH4CR-2HRA PH4CR-2HRB	PH4CD-3CRA PH4CD-3CRB
Light emitting element	Infrared LED	Red LED		Infrared LED	
Supply voltage	24 to 240V AC ±10% 50/60Hz, 12 to 240V DC ±10% (ripple ±10% or less)				
Current consumption	3W max.	2W max.			
Detecting distance	5m	0.1 to 4m (using PH1X-R1) *	0.1 to 2.5m (using PH1X-R1) *	30cm (white mat paper 10x10cm)	
		0.1 to 5m (using PH1X-R1S) *	0.1 to 3.5m (using PH1X-R1S) *		
Detectable target	Opaque 14.8mm dia. min.	Opaque 75mm dia. min.		Transparent or opaque	
Directional angle	Light source and receiver: 3 to 20° each	Light source/receiver: 1 to 5°, Reflector: 40°		—	
Differential	—			Max. 20% of detecting distance	
Detecting output	Contact output: 250V AC 3A (cos φ =1), 5V DC 10mA				
Relay durability	Mechanical	50 millions operations (at 18,000 operations/hour)			
	Electrical	100,000 operations (at 1,800 operations/hour)			
Response time	30ms max. (operation/reset)				
Indicator	Red LED (on when light is incident) Power supply indicator for light source				
Connection	Attached cable (2m, 0.3mm ²)				
Sensitivity adjustment	—			Dial type	
Ambient operating illumination	Incandescent lamp: 3,000 lx max. (at receiving surface)				
Ambient temperature	Operating: -25 to +55°C (no icing), storage: -30 to +70°C				
Ambient humidity	Operating: 45 to 85%RH (no condensation), storage: 35 to 95%RH				
Degree of protection	IP64 (IEC)				
Insulation resistance	20MΩ (500V DC megger)				
Dielectric strength	1,500V AC 50/60Hz for 1min				
Vibration	10 to 55Hz, 1.5mm double amplitude (2 hours for each X, Y, Z direction)				
Shock	500m/s ² (3 times for each X, Y, Z direction)				
Material	Casing	Acrylonitrile butadiene styrene resin (ABS)			
	Lens	Methacrylic resin (PMMA)			
Mass	Approx. 420g	Approx. 250g		Approx. 250g	
Accessory (supplied)	Mounting bracket (PH4X-P1), reflector PH1X-R1 (only for retroreflective type)				

Note: * Reflector PH1X-R1 is supplied, PH1X-R1S is sold separately.

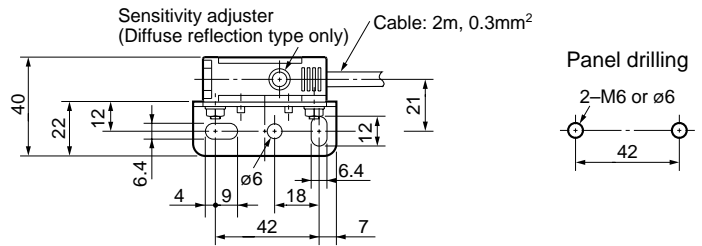
■ Type number nomenclature



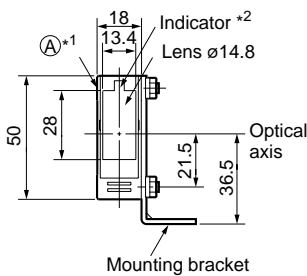
● Ordering information

Specify the following
1. Type number

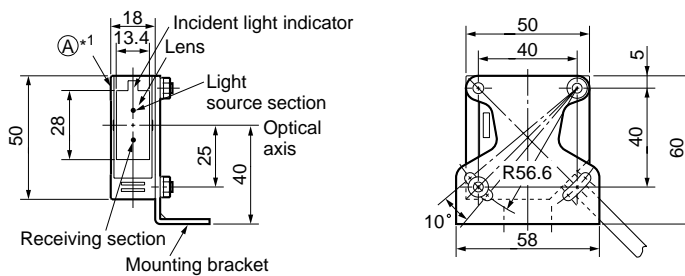
■ Dimensions, mm
● PH4CT, PH4CR, PH4CD



PH4CT



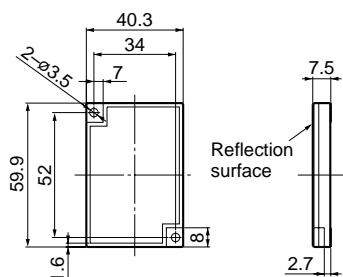
PH4CR, PH4CD



*1 Mounting bracket can be fit on the side "A" too.

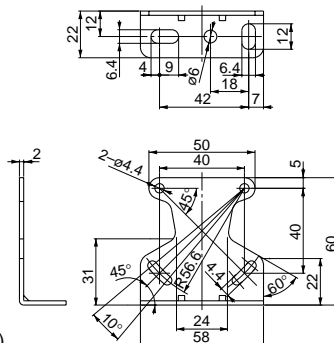
*2 Power supply indicator for light source, incident light indicator for receiver

● Reflector for PH4CR
PH1X-R1 (supplied)
PH1X-R1S (optional)

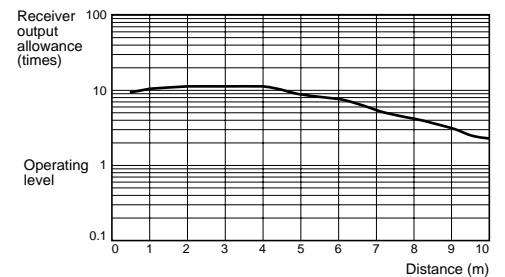


Reflection surface: Methacrylic resin (PMMA)
Reverse side: Acrylonitrile butadiene styrene resin (ABS)

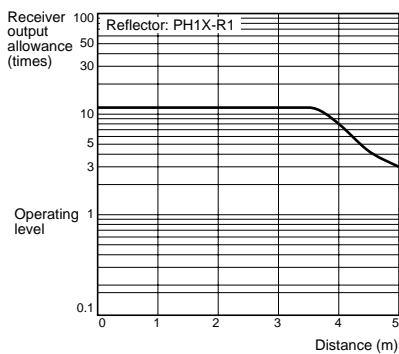
● Mounting bracket
PH4X-P1



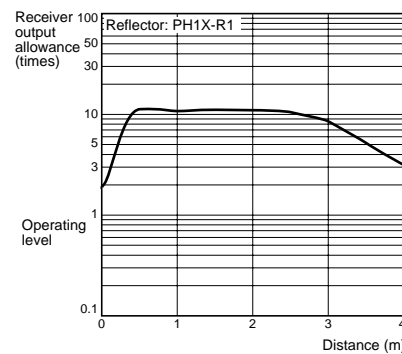
■ Characteristic curve, typical
Receiver output - Distance
PH4CT-5MR



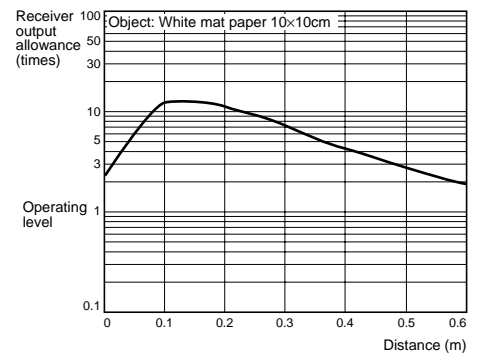
PH4CR-4MR + PH1X-R1 (supplied)



PH4CR-2HR + PH1X-R1 (supplied)



PH4CD-3CR



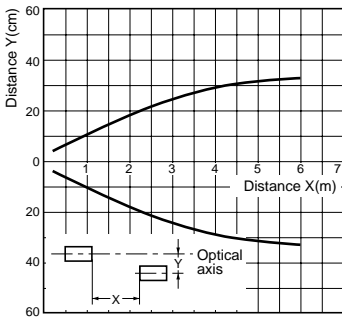
Photoelectric Switches

PH4C

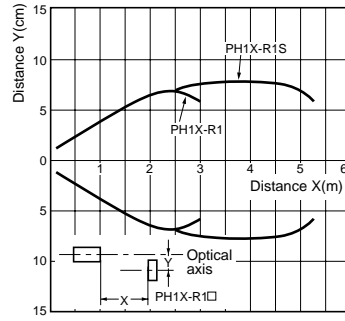
■ Characteristic curve, typical

● Setting range of light source and receiver head

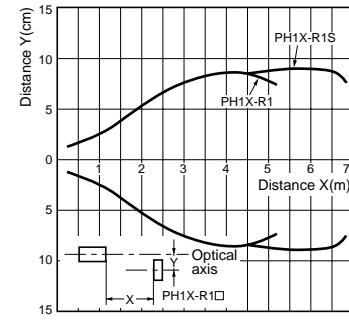
PH4CT-5MR



PH4CR-2HR + Reflector

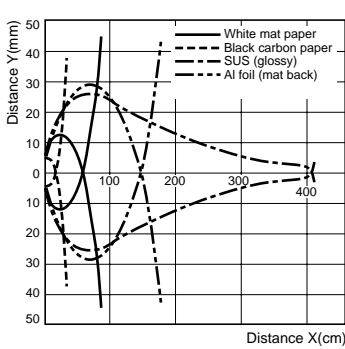


PH4CR-4MR + Reflector



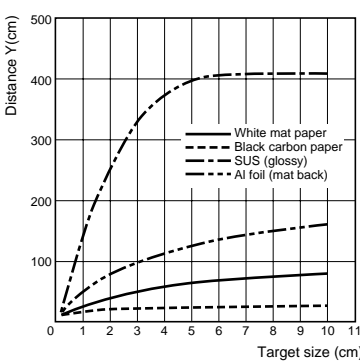
● Operating range

PH4CD-3CR



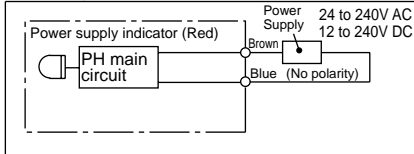
● Size of detecting target - Distance

PH4CD-3CR

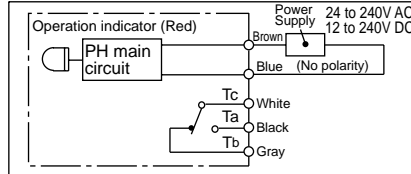


■ Wiring diagrams

PH4CT light source



PH4CT receiver, PH4CR, PH4CD



■ Timing chart

Type	Timing chart
PH4CT-5MRA	Light incident
PH4CT-5MRB	Light shaded
PH4CR-2HRA	Incident light indicator
PH4CR-2HRB	ON
	OFF
PH4CR-4MRA	Light-ON (PH4C□-□□RA)
PH4CR-4MRB	(Ta) ON
	OFF
PH4CD-3CRA	Dark-ON (PH4C□-□□RA)
PH4CD-3CRB	(Ta) ON
	OFF

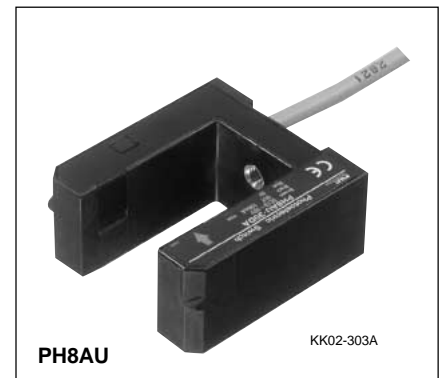
**Slot-type photoelectric switches
PH8AU**

■ Description

Slot-type photoelectric switches ideal for conveyer application, such as elevators and multi-level parking lifts. The emitter and receiver are constructed as a single unit, eliminating the need to adjust the optical axis or sensitivity. Same mounting method as our slot-type magnetically operated reed switches (type PM1U).

■ Features

- Protective structure conforms to IP66 (IEC standards), so the product can be used safely in environments with water droplets.
- High speed response time of 1ms.
- Wide supply operating voltage range from 10 to 30V DC.



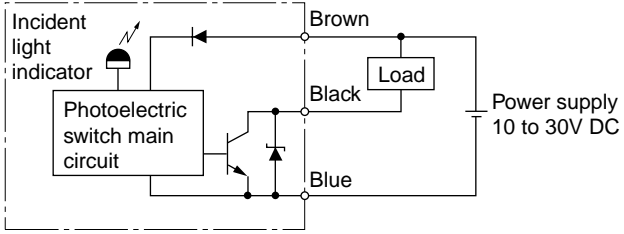
■ Specifications

Type	PH8AU-30DALF	PH8AU-30DBLF
Operating distance (slot width)	30mm	
Detectable object	Opaque, over 6mm diameter	
Light emitting element	Infrared LED	
Supply voltage	10 to 30V DC (Peak must be within this range)	
Current consumption	45mA or less	
Detecting output	(NPN) transistor open collector output, load current	
	Dark-ON	Light-ON
Response time	1ms or less	
Indicator	Output indicator (Red LED)	
Connection	1m attached cable	
Ambient operating illumination	Incandescent lamp: 3000 lx or less, sun light: 10000 lx or less at receiving surface	
Ambient temperature	Operating: -25 to +55°C	
	Storage: -30 to 70°C (no icing)	
Ambient humidity	Operating: 35 to 85%RH	
	Storage: 35 to 95%RH	
Degree of protection	IP66 (IEC)	
Insulation resistance	20MΩ min. (500V DC Megger)	
Dielectric strength	1000V AC 50/60Hz 1 minute	
Vibration	10 to 55Hz, 1.5mm double amplitude (X, Y, Z direction respectively 2 hours)	
Shock	500m/s ² three times for each of three directions X, Y and Z	
Protection circuit	Reverse connection and surge voltage	
Material	Lens	PC
	Casing	PPS

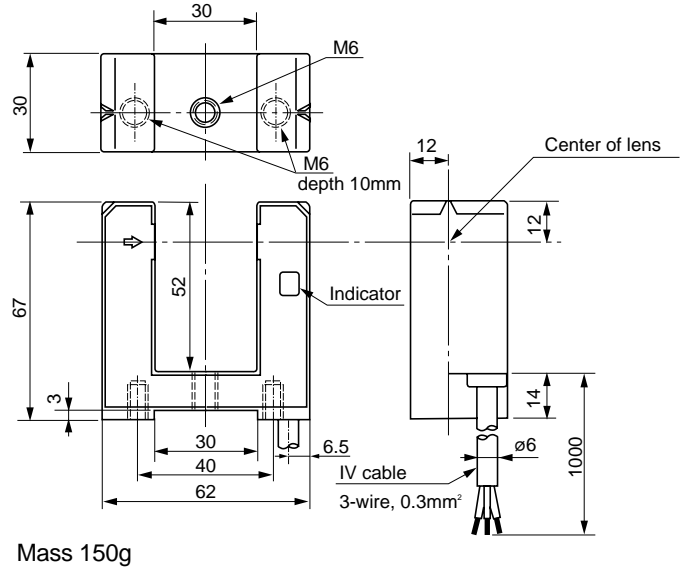
05

Photoelectric Switches PH8AU

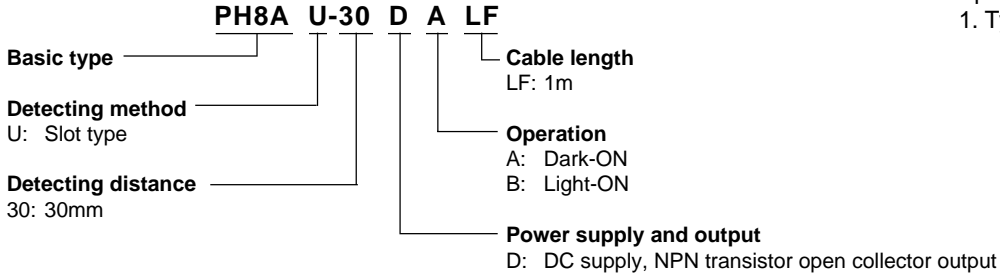
■ Wiring diagrams



■ Dimensions, mm



■ Type number nomenclature



■ Ordering information

- Specify the following:
1. Type number (ordering code)