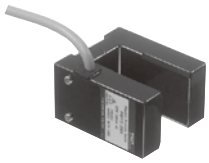
e-Front runners

Proximity switches



Photoelectric switches

Proximity switches

Limit switches

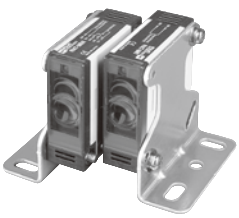
LIMIT SWITCHES

PROXIMITY SWITCHES

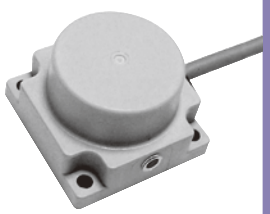
PHOTOELECTRIC SWITCHES

Limit switches

LOW VOLTAGE EQUIPMENT Up to 600 Volts



Photoelectric switches



Proximity switches

Proximity switches

INDIVIDUAL CATALOG 05

from D&C CATALOG 20th Edition

01 02 03 04 **05** 06 07 08 09 10 11 12

Fuji Electric FA Components & Systems Co., Ltd.

05 Limit switches, Proximity switches Photoelectric switches

MINIMUM ORDERS

Orders amounting to **less than ¥10,000** net per order will be charged as ¥10,000 net per order plus freight and other charges.

WEIGHTS AND DIMENSIONS

Weights and dimensions appearing in this catalog are the best information available at the time of going to press. FUJI ELECTRIC FA has a policy of continuous product improvement, and design changes may make this information out of date.
Please confirm such details before planning actual construction.

INFORMATION IN THIS CATALOG IS SUBJECT TO CHANGE WITHOUT NOTICE.

Limit switches, AL and K244 series

■ Description

FUJI AL and K244 series limit switches have wide application in such industrial equipment as machine tools, printing machines, and transfer machines. These switches feature a sturdy aluminum die-cast housing that is highly resistant to oil, water, and dust, and long mechanical life — 10 million operations minimum.

AL series

AL and AL-S series limit switches feature a forced contact opening mechanism.
Under abnormal conditions, the mechanism forces the contacts open to prevent pitting and fusing.
Gold-plated silver contacts with scrubbing action have high reliability.


KKD07-027

AL-SK


SF-2025

K244-xP-2


SK-580

K244-gR-2

K244 series

The K244 series is provided with four kinds of contact operating action: standard normal stroke, snap action, make-before-break, and extended stroke.
WK244 of the K244 series has bifurcated contacts, while HK244 features a scrubbing action mechanism. These limit switches can be used in low-level circuits of 3V, 5mA.

■ Selection guide

Basic type	**AL** Standard	**AL-S** Compact type	**K244** Standard	**HK244** For low-level circuit	**WK244** For low-level circuit
Rated voltage (max.)	550V AC, 250V DC*1		550V AC/DC		
Rated thermal current	10A (5A*1)		10A		
Operating cycles per hour	7,200		3,000		
Expected life (operations) Mechanical Electrical	10 millions 100,000 (at 125V AC, 5A res. load for snap action type)		10 millions 1 million*2 (at 220V AC, 10A res. load)	10 millions 400,000 (at 220V AC, 10A res. load)	10 millions 500,000 (at 220V AC, 2.5A res. load)
Contact arrangement	1NO+1NC		1NO+1NC, 2NO+2NC		
Contact	Single button		Single button		Bifurcated
Degree of protection (IEC)	IP67		–		
Features	Forced contact opening mechanism as standard Highly reliable gold-plated silver contacts		A wide variety of contact operating action Sealed types for oily and wet environments		
Page	*05/2*		*05/16*	*05/23*	*05/23*

*1: For snap action type
*2: 400,000 for snap action type

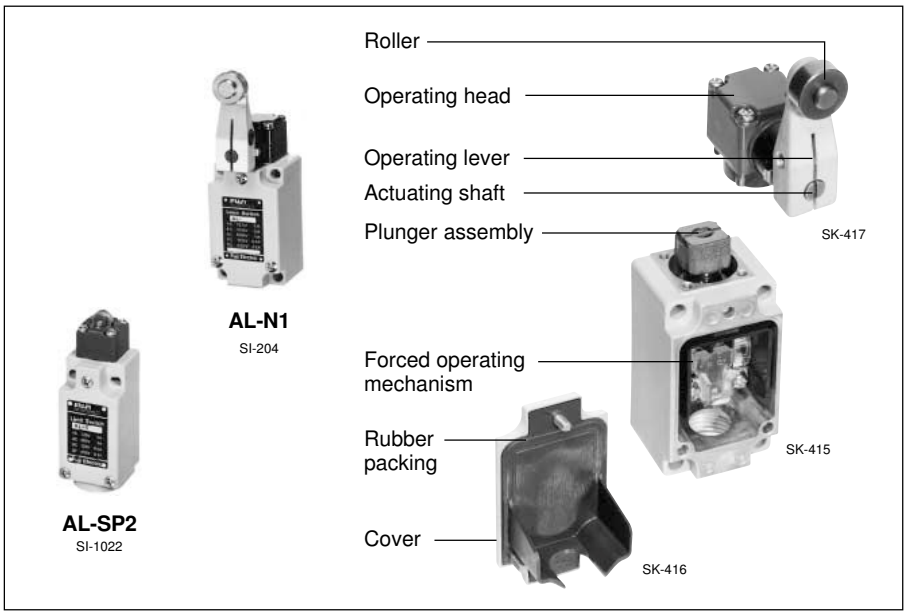
Forced contact opening limit switches, AL and AL-S series

■ Description

The AL and AL-S series limit switches feature a forced contact opening mechanism. This mechanism prevents contact welding and subsequent malfunctioning. These series therefore result in extremely dependable system controls.
The AL series is available in standard sizes and the AL-S series is compact versions of the AL types.

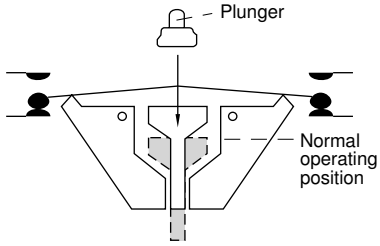
■ Features

- The forced contact opening mechanism is provided so as to overcome contact problems.
- Gold-plated contacts and a self cleaning action ensure contact reliability.
- Sealed construction
  Double oil seals prevent moving parts and contacts from being contaminated by exterior oil, grime and grease, an advantage in dirty industrial locations.
- Operational mode indicator can replace existing cover with lamp indicator cover when required.
  An LED or neon lamp is used depending on supply voltage.
- Contact mechanical design
  Contact operating mechanisms can be selected according to the application- snap, overlap and normal actions
- Conform to IEC Standard



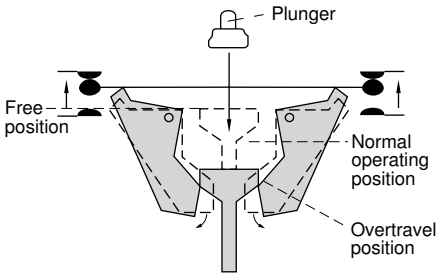
■ Forced contact opening mechanism

This mechanism does not operate under normal conditions. However, when the switch plunger overtravels under abnormal conditions the mehcanism comes into operation and forcibily opens the NC contacts thus preventing contact welding.
This action improves the dependability of electrical systems.



Switching is carried out at the normal operating position

Normal operating condition



The mechanism operates to open the contacts when the plunger overtravels

Abnormal condition

■ Contact ratings

Contact action	Thermal current (A)	Make and break current * AC Voltage (V)	Resistive (A)	Inductive (A)	DC Voltage (V)	Resistive (A)	Inductive (A)
Snap	5	125	5	3	30 or less	5	3
		250	3	2	125	0.4	0.05
		500	1	0.6	250	0.2	0.03
Normal Overlap	10	24	10	10	24	7	7
		110	10	10	110	1.5	0.9
		220	10	10	220	0.63	0.28
		440	5	5	440	0.28	0.14
		550	3	3	550	0.22	0.1

*: When NO and NC contacts are wired in the same potential.

■ UL listed (File No. E44592)
Contact ratings

AC (B300) Voltage (V)	Operational current (A) Make	Break	DC Voltage (V)	Operational current (Res. load) (A)
120	30	3	30	5
240	15	1.5	125	0.4
			250	0.2

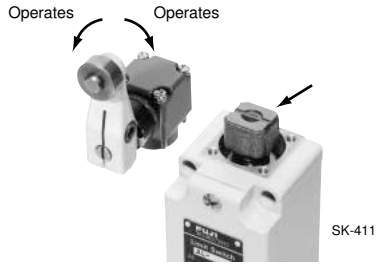
■ Technical data

Insulation resistance:
Over 100MΩ at 500V DC
Life expectancy
Mechanical: Over 10 million operations
Electrical: Snap action type
100,000 operations at
125V AC 5A res. load
Normal action type
100,000 operations at
110V AC 10A res. load
Allowable ambient temperature:
–10°C to +80°C
Degree of protection: IEC IP67

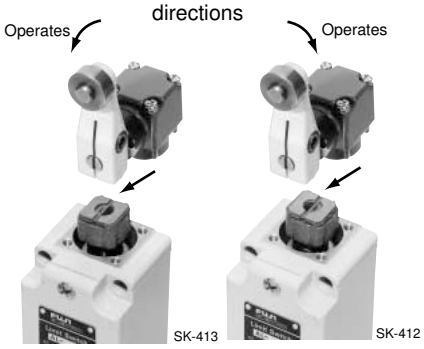
■ Directional contact operation

AL-N1, AL-N2 and AL-N3 can be modified in their operational directions. They will switch in both directions, or in only one direction, either clockwise or counterclockwise. The adjustment is easily carried out by removing the operating head and changing the plunger as shown in the photograph. After the plunger has been reassembled, replace the head and tighten the screws. Check operation by moving the arm in the desired direction.

Standard operating position



Both directions



Counter-clockwise directions

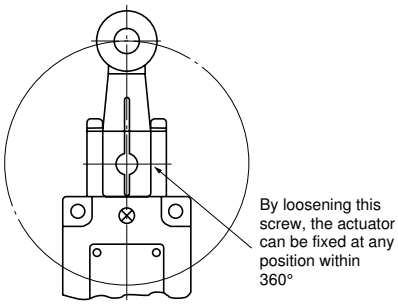
Clockwise directions

■ Changing direction of operating head

The operating head direction can be changed through 90° after having removed the screw. Care must be taken because the contact action changes according to the direction of the plunger assembly. Check for correct assembly after each step has been completed. Limit switches with adjustable head direction are AL-N1, AL-N2, AL-N3, AL-SN1, AL-SN2 and AL-SN3. In the case of AL-P2 and AL-SP2, the head direction of a top push roller plunger type can be shifted 90° in either direction.

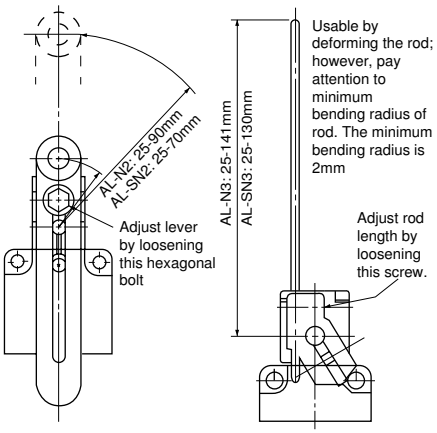
■ Adjustment of operating lever

Loosen the locking screw, turn over the lever and then retighten at the required position.
Type:
AL-N1, AL-N2, AL-N3, AL-SN1, AL-SN2, AL-SN3, AL-F1.



■ Adjustment of lever length

Loosen the adjustment screw, adjust the length and retighten.

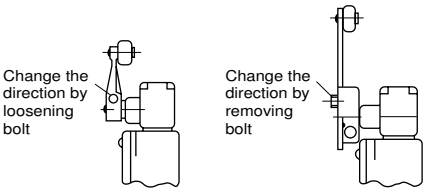


AL-N2
AL-SN2

AL-N3
AL-SN3

■ Roller installable on inner side

AL-N1, SN1 **AL-N2, SN2, SN5**



■ Dimensions:

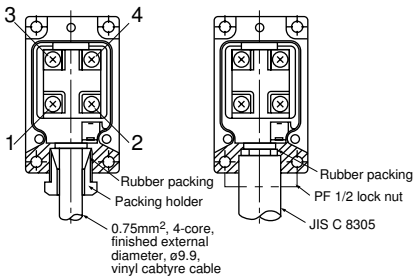
See pages 05/13 to 05/15.

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Cable connection

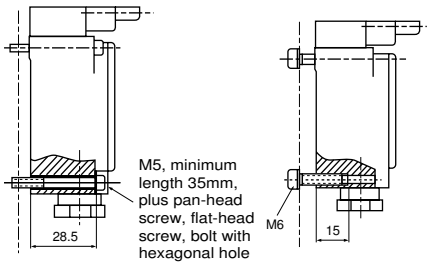
Refer to the wiring diagram for connection.
When connecting to conduit remove the plastic packing piece.



Contact: 1-2 Normally closed
3-4 Normally open

■ Mounting

AL type limit switches can be attached either from the front or the back. In the case of front mounting type clamp at 4 positions using M5 screws. When attaching from the back of the panel tighten at 4 positions by means of M6 screws.
The thread depth of the switch body is 15mm.



Front mounting Rear mounting

05

■ Type number nomenclature

AL–N1 1 H1 UL

UL approved

Lamp voltage
A2 : 5 to 8V (LED)
B2 : 10 to 15V (LED)
E2 : 18 to 24V (LED)
H1 : 110 to 220V (Neon)

Contact action
1 : Snap action
2 : Normal action
3 : Overlap action
1S : Snap action (Sealed contact)

Type of actuator
N1 : Roller lever
N2 : Adjustable length roller lever
N3 : Adjustable length rod lever
N5 : Adjustable length roller lever (Rubber roller)
P1 : Top push rod plunger
P2 : Top push roller plunger
P3 : Top ball push rod plunger
F1 : Fork roller lever
S1 : Wobble head coil spring rod
S2 : Wobble plastic head spring rod
W1 : Wobble head with cat's whisker
Y1 : Side push rod plunger
Y2 : Side push roller plunger
Y3 : Side ball push rod plunger

AL : Standard type
AL-S : Compact type

■ Ordering code

PL 1 A–1 A ZU

UL approved

Lamp voltage
A : LED 5 to 8V
B : LED 10 to 15V
E : LED 18 to 24V
D : Neon

Contact action
1 : Snap action
2 : Normal action
3 : Overlap action

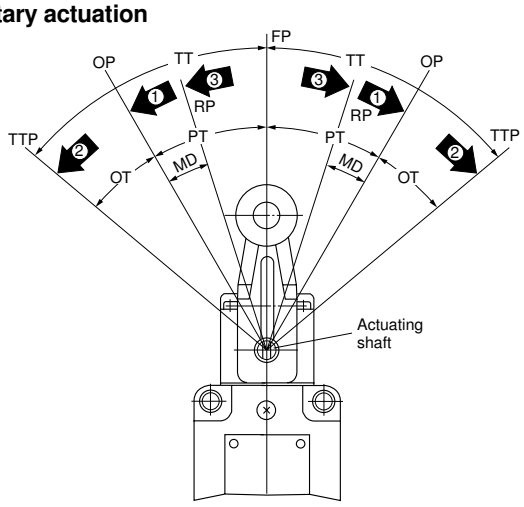
Type of actuator
A : Roller lever
B : Adjustable length roller lever
C : Adjustable length rod lever
D : Top push rod plunger
E : Top push roller plunger
F : Top ball push rod plunger
G : Fork roller lever
H : Wobble head coil spring rod
J : Wobble plastic head spring rod
K : Wobble head with cat's whisker
L : Side push rod plunger
M : Side push roller plunger
N : Side ball push rod plunger
R : Adjustable length roller lever (Rubber roller)

Series
1 : Standard type
2 : Compact type

Limit switch

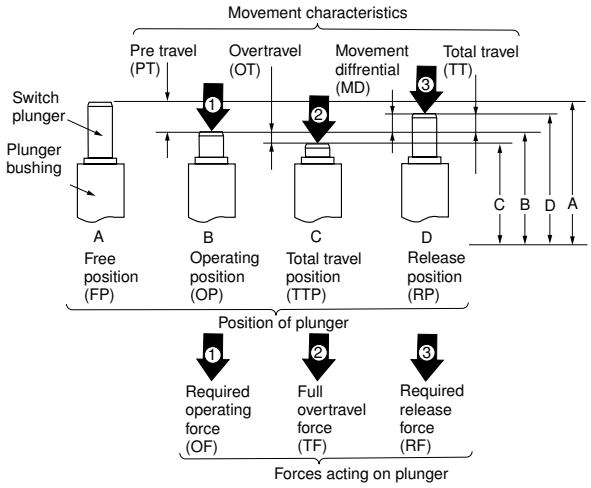
■ Operating and definitions (for snap action type)

● Rotary actuation



FP: Free Position
This is the position where there is no load on the actuator.
OP: Operating Position
This is the position where the actuator travels from the free position to NO contact closes.
TTP: Total Travel Position
This is the furthest position where the actuator can travel to after passing the OP without damage to the limit switch.
RP: Release Position
This is the position where the contact resets after the actuator has travelled from OP.
PT: Preoperating Travel
This indicates the travelling angle or distance from FP to OP.
OT: Overtravel
This indicates the travelling angle or distance from OP to TTP.

● Plunger actuation



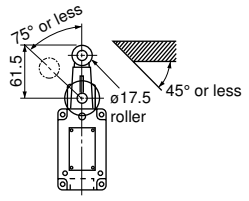
TT: Total Travel
This indicates the travelling angle or distance from FP to TTP.
MD: Movement Differential (Travel to Reset)
This indicates the travelling angle or distance from OP to the position where the contact resets.
OF: Required Operating Force ①
This indicates the minimum operating force which is required for the contact to close.
RF: Required Resetting Force ③
This indicates the force required for the contact to reset.
TF: Full Overtravel Force ②
This indicates the force required for the actuator to travel from FP to TTP.

■ Actuating slider face angle and approach speed

• Standard type

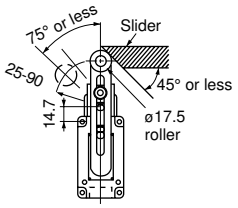
Type		AL-N1		AL-N2		AL-N3	AL-F1	AL-S1	AL-P1	AL-P2	AL-P3
Slider angle (degree)		30	45	30	45	—	45	—	—	30	30
Slider approach speed	Maximum (meter/second)	0.5	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.3
	Minimum (millimeter/second)	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1

AL-N1



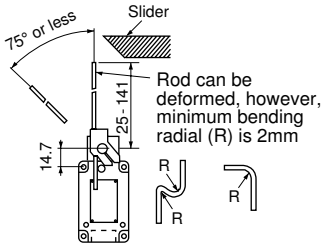
AL-N2

Determine slider depth within range of these dimensions

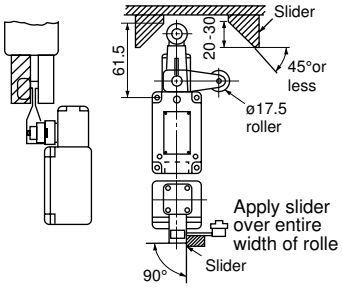


AL-N3

Determine slider depth within range of these dimensions

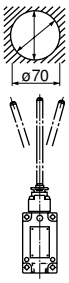


AL-F1

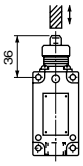


AL-S1

When actuating switch beyond this range, contact may make/break two times or more

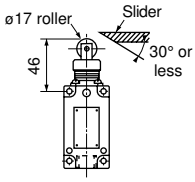


AL-P1

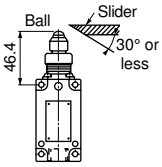


Actuate AL-P1 type in direction coinciding with plunger shaft direction

AL-P2



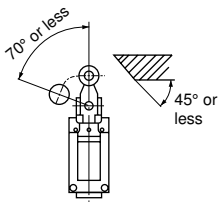
AL-P3



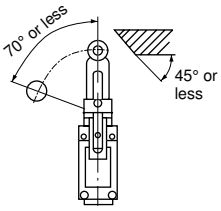
• Compact type

Type		AL-SN1		AL-SN2, SN5		AL-SN3	AL-SK1	AL-SK2	AL-SS1	AL-SP1	AL-SP2
Slider angle (degree)		30	45	30	45	—	30	45	—	—	30
Slider approach speed	Maximum (meter/second)	0.5	0.2	0.2	0.1	0.2	ν_1: 0.6 ν_2: 0.2	0.5 —	0.2	0.2	0.3
	Minimum (millimeter/second)	0.1	0.1	0.2	0.2	0.2	ν_1: 0.1 ν_2: 0.1	0.1 —	0.2	0.1	0.1

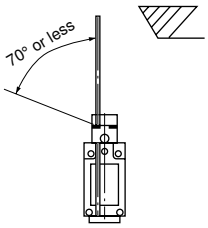
AL-SN1



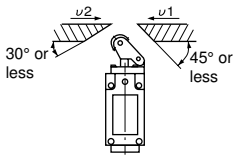
AL-SN2, SN5



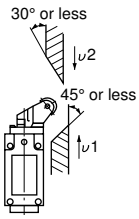
AL-SN3



AL-SK1



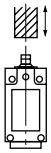
AL-SK2



AL-SS1

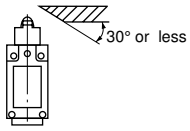
When actuating switch beyond this range, contact may make/break two times or more

AL-SP1



Actuate AL-SP1 type in direction coinciding with plunger shaft direction

AL-SP2



■ AL series

Description

SI-204

Roller lever
- The angle from the free position to the maximum travel position is 75°
- Spring return
- The most popular limit switch which is best suited for machine tools, automatic machines, conveyor control and similar applications.

Type	Ordering code
AL-N11	PL1A-1
AL-N12	PL1A-2
AL-N13	PL1A-3
AL-N11UL	PL1A-1ZU

SI-203

Adjustable length roller lever
- The lever length can be adjusted between 25mm and 90mm.
- Spring return
- The graduated scales on the lever facilitate adjustment

Type	Ordering code
AL-N21	PL1B-1
AL-N22	PL1B-2
AL-N23	PL1B-3
AL-N21UL	PL1B-1ZU

SI-202

Adjustable length rod lever
- The ø3.2mm stainless steel rod can be extended up to 141mm max.
- Spring return
- The rod can be used by bending. (Radial 2mm min.)

Type	Ordering code
AL-N31	PL1C-1
AL-N32	PL1C-2
AL-N33	PL1C-3
AL-N31UL	PL1C-1ZU

SI-209

Top push rod plunger
- Operated by a vertical rod plunger
- Momentary action

Type	Ordering code
AL-P11	PL1D-1
AL-P12	PL1D-2
AL-P13	PL1D-3
AL-P11UL	PL1D-1ZU

SI-207

Top push roller plunger
- This is a limit switch where the roller is attached to the plunger.
- The direction of the roller can be shifted 90°.
- This feature makes it highly suitable for the control of precision machinery.
- Momentary action

Type	Ordering code
AL-P21	PL1E-1
AL-P22	PL1E-2
AL-P23	PL1E-3
AL-P21UL	PL1E-1ZU

Description

SI-208

Top ball push rod plunger
- The ball rod can be operated from any direction.
- The ball turns smoothly at all times.
- Best suited for detecting objects which travel horizontally from left to right or right to left while turning.

Type	Ordering code
AL-P31	PL1F-1
AL-P32	PL1F-2
PL-P33	PL1F-3
AL-P31UL	PL1F-1ZU

SI-205

Fork roller lever
- The angle of the lever is 90°
- Maintained
- This limit switch is used when detecting the direction in which the lever inclines — i.e. in the right or left.

Type	Ordering code
AL-F11	PL1G-1
AL-F11UL	PL1G-1ZU

SI-211

Side push rod plunger
- Push rod is attached to the side of the operating head.
- The operating head can be changed 90° in direction.
- Momentary action
- This limit switch is used to detect the end limit of low speed transfer.

Type	Ordering code
AL-Y11	PL1H-1
AL-Y11UL	PL1H-1ZU

SI-212

Side push roller plunger
- The push roller is attached to the side of the operating head.
- Momentary action
- This is used to detect the position, speed and direction in high precision machinery and equipment.

Type	Ordering code
AL-Y21	PL1J-1
AL-Y21UL	PL1J-1ZU

SI-210

Side ball push rod plunger
- The ball rod is attached to the side of the operating head.
- The ball turns smoothly in operation.
- Momentary action
- This limit switch is used to detect objects which travel horizontally from left to right or right to left while turning.

Type	Ordering code
AL-Y31	PL1K-1
AL-Y31UL	PL1K-1ZU

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■ AL series

Description

SI-200

Wobble head coil spring rod
- Operates by forces from any directions.
- Used in packing and other conveyors.

Type	Ordering code
AL-S11	PL1H-1
AL-S11UL	PL1H-1ZU

SI-201

Wobble plastic head spring rod
- The length of rod is 140mm from the head.
- Operates by forces from any directions.

Type	Ordering code
AL-S21	PL1M-1
AL-S21UL	PL1M-1ZU

Description

SI-199

Wobble head with cat's whisker
- The length of the stainless steel rod is 190mm from the head.
- Can be operated from any direction.
- Require little torque

Type	Ordering code
AL-W11	PL1N-1
AL-W11UL	PL1N-1ZU

■ Operating characteristics

Standard type (Snap action)

Type	**AL-N11 AL-N11S**	**AL-N21*1 AL-N21S*1**	**AL-N31*2 AL-N31S*2**	**AL-P11 AL-P11S**	**AL-P21 AL-P21S**	**AL-P31 AL-P31S**	**AL-F11 AL-F11S**
Required operating force OF (max.)	9N	9N	2.9N	15N	15N	15N	9.5N
Required resetting force RF (min.)	0.5N	0.5N	0.15N	8.2N	8.2N	8.2N	—
Preoperating travel PT (min.)	12°	12°	12°	2mm	2mm	2mm	55°
Overtravel OT (min.)	65°	65°	65°	5mm	5mm	5mm	35°
Movement differential (Travel to reset) MD (max.)	7°	7°	7°	1mm	1mm	1mm	—
Total travel TT (min.)	75°	75°	75°	—	—	—	90°±10°

Notes: *1 At lever length 38mm
*2 At rod lever length 135mm

Type	**AL-Y11 AL-Y11S**	**AL-Y21 AL-Y21S**	**AL-Y31 AL-Y31S**	**AL-S11 AL-S11S**	**AL-S21 AL-S21S**	**AL-W11 AL-W11S**
Required operating force OF (max.)	40N	40N	40N	1.5N	1.5N	1.5N
Required resetting force RF (min.)	8.9N	8.9N	8.9N	—	—	—
Preoperating travel PT (min.)	2.8mm	2.8mm	2.8mm	30mm	30mm	40mm
Overtravel OT (min.)	4mm	4mm	4mm	—	—	—
Movement differential (Travel to reset) MD (max.)	1mm	1mm	1mm	—	—	—

Standard type (Normal action, overlap action)

	Normal action			Overlap action		
Type	**AL-N12 *1 AL-N22**	**AL-N32 *2**	**AL-P12 AL-P22 AL-P32AL**	**AL-N13 *1 AL-N23**	**AL-N33 *2**	**AL-P13 AL-P23 AL-P33**
Required operating force OF (max.)	11N	3.1N	18N	11N	3.1N	18N
Movement to NC contact open	28°	28°	3.5mm	45°	45°	5mm
Movement to NO contact closed	45°	45°	5mm	28°	28°	3.5mm
Total travel TT (min., max.)	75°	75°	7mm	75°	75°	7mm

Notes: *1 At lever length 38mm
*2 At rod lever length 135mm

■ AL-S series/Compact-size

Description

KKD07-032

Top push rod plunger
- Operated by a vertical rod plunger.
- Momentary action

Type	Ordering code
AL-SP11	PL2D-1
AL-SP12	PL2D-2
AL-SP13	PL2D-3
AL-SP11UL	PL2D-1ZU

SI-1022

Top push roller plunger
- This is a limit switch where the roller is attached to the plunger.
- The direction of the roller can be shifted 90°
- Momentary action

Type	Ordering code
AL-SP21	PL2E-1
AL-SP22	PL2E-2
AL-SP23	PL2E-3
AL-SP21UL	PL2E-1ZU

KKD07-027

Top roller lever plunger
- This limit switch is used to detect objects which travel horizontally from left to right or right to left while turning.
- Used in packing and other conveyors.

Type	Ordering code
AL-SK11	PL2P-1
AL-SK12	PL2P-2
AL-SK13	PL2P-3
AL-SK11UL	PL2P-1ZU

KKD07-043

Reversing top roller lever plunger
- This type is designed to detect the movements in the vertical direction.

Type	Ordering code
AL-SK21	PL2Q-1
AL-SK22	PL2Q-2
AL-SK23	PL2Q-3
AL-SK21UL	PL2Q-1ZU

KKD07-031

Adjustable length rubber roller lever (ø40)
- The lever length can be adjusted between 30mm and 76mm
- Spring return
- The graduated scales on the lever facilitate adjustment

Type	Ordering code
AL-SN51	PL2C-1

Description

KKD07-028

Roller lever
- The angle from the free position to the maximum travel position is 70°
- Spring return

Type	Ordering code
AL-SN11	PL2A-1
AL-SN11UL	PL2A-1ZU

KKD07-029

Adjustable length roller lever
- The lever length can be adjusted between 25mm and 76mm.
- Spring return
- The graduated scales on the lever facilitate adjustment

Type	Ordering code
AL-SN21	PL2B-1
AL-SN21UL	PL2B-1ZU

KKD07-030

Adjustable length rod lever
- The ø3.2mm stainless steel rod can be extended up to 130mm max.
- Spring return
- The rod can be used by bending. (Radial 2mm min.)

Type	Ordering code
AL-SN31	PL2C-1
AL-SN31UL	PL2C-1ZU

SI-1016

Wobble head coil spring rod
- The length of rod is 113mm from the head.
- Can be operated from any direction.
- Require little torque

Type	Ordering code
AL-SS11	PL2H-1
AL-SS11UL	PL2H-1ZU

■ Operating characteristics

Compact type (Snap action)

Type	AL-SP11	AL-SP21	AL-SK11	AL-SK21	AL-SN11 *1	AL-SN21 *1	AL-SN31	AL-SN51 *2	AL-SS11
Required operating force OF (max.)	4.5N	8.5N	4N	4N	7N	7N	7N	7N	1.5N
Required resetting force RF (min.)	2N	4.5N	1.8N	1.8N	0.5N	0.5N	0.5N	0.5N	—
Preoperating travel PT (min.)	2mm	2mm	2.5mm	2.5mm	30°	30°	30°	30°	30mm
Overtravel OT (min.)	4mm	3mm	5mm	5mm	40°	40°	40°	40°	—
Movement differential (Travel to reset) MD (max.)	1mm	1mm	1.8mm	1.8mm	8°	8°	8°	8°	—

Notes: *1 At lever or rod level length 25mm
*2 At lever or rod level length 30mm

Compact type (Normal action, overlap action)

	Normal action			Overlap action		
Type	AL-SP12	AL-SP22	AL-SK□2	AL-SP13	AL-SP23	AL-SK□3
Required operating force OF (max.)	7N	10.5N	6.3N	7N	10.5N	6.3N
Movement to NC contact open	1.5mm	1.5mm	2mm	3mm	3mm	4mm
Movement to NO contact closed	3mm	3mm	4mm	1.5mm	1.5mm	2mm
Total travel TT (min., max.)	6mm	6mm	8mm	6mm	6mm	8mm

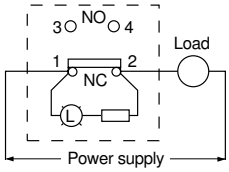
Description	Standard/Compact Type	Ordering code	UL approved Type	Ordering code
With indicating lamp	**AL-N1□■**	PL1A-□■	**AL-N11■UL**	PL1A-1■ZU
• The indicating lamp can be fitted to all the AL limit switches.	**AL-N2□■**	PL1B-□■	**AL-N21■UL**	PL1B-1■ZU
• Neon lamp or LED, and stabilizing resistor are attached inside the housing so that the lamp lights or goes out when the switch is operating.	**AL-N3□■**	PL1C-□■	**AL-N31■UL**	PL1C-1■ZU
• The nylon cover makes the signal highly visible.	**AL-P1□■**	PL1D-□■	**AL-P11■UL**	PL1D-1■ZU
• Indicating lamps do not affect the switch dimensions or operating characteristics.	**AL-P2□■**	PL1E-□■	**AL-P21■UL**	PL1E-1■ZU
• The wiring connections for snap action type are shown below.	**AL-P3□■**	PL1F-□■	**AL-P31■UL**	PL1F-1■ZU
	AL-F1□■	PL1G-□■	**AL-F11■UL**	PL1G-1■ZU
	AL-Y1□■	PL1L-□■	**AL-Y11■UL**	PL1L-1■ZU
	AL-Y2□■	PL1M-□■	**AL-Y21■UL**	PL1M-1■ZU
	AL-T3□■	PL1N-□■	**AL-T31■UL**	PL1N-1■ZU
	AL-S1□■	PL1H-□■	**AL-S11■UL**	PL1H-1■ZU
	AL-S2□■	PL1J-□■	**AL-S21■UL**	PL1J-1■ZU
	AL-W1□■	PL1K-□■	**AL-W11■UL**	PL1K-1■ZU
	AL-SP1□■	PL2D-□■	**AL-SP11■UL**	PL2D-1■ZU
	AL-SP2□■	PL2E-□■	**AL-SP11■UL**	PL2E-1■ZU
	AL-SK1□■	PL2P-□■	**AL-SK11■UL**	PL2P-1■ZU
	AL-SK2□■	PL2Q-□■	**AL-SK21■UL**	PL2Q-1■ZU
	AL-SN1□■	PL2A-□■	**AL-SN11■UL**	PL2A-1■ZU
	AL-SN2□■	PL2B-□■	**AL-SN21■UL**	PL2B-1■ZU
	AL-SN3□■	PL2C-□■	**AL-SN31■UL**	PL2C-1■ZU
	AL-SS1□■	PL2H-□■	**AL-SS11■UL**	PL2H-1■ZU

SI-314

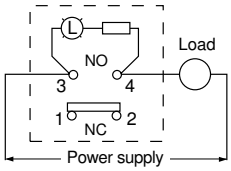
Standard type

KKD07-028

Compact type



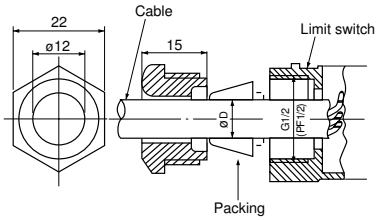
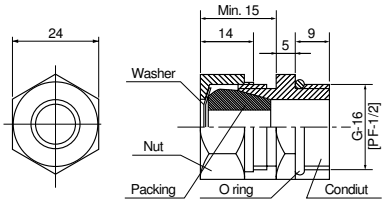
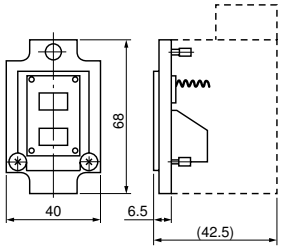
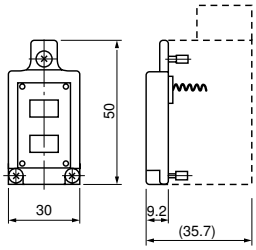
The lamp lights when NO contact closes



The lamp lights when NO contact opens

Replace the □ mark by the contact action code
Replace the ■ mark by the lamp voltage code

■ Accessories

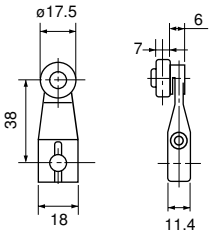
Description		Operating	Type	Ordering code
Standard type sealed conduit (Plastic)		Cable dia. (øD) ø7.5 – ø11.5 (for AL type) ø7 – ø11 (for AL-S type)	**ALX-016** **ALX-510**	PL1XW-A PL1XW-B
Complete type sealed conduit (Metal)	 SI-233	Cable dia. (øD) ø6 – ø9 ø8 – ø11 ø12 – ø14 (for AL type, AL-S type, AL1-S type)	**ALX-013** **ALX-014** **ALX-015**	PL1XW-C PL1XW-D PL1XW-E
Lamp cover for AL series	 SI-232 	For snap action: LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC For normal action: LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC	**ALX-011A** **ALX-011B** **ALX-011E** **ALX-011H** **ALX-012A** **ALX-012B** **ALX-012E** **ALX-012H**	PL1XL-1A PL2XL-1B PL1XL-1C PL1XL-1D PL1XL-2A PL1XL-2B PL1XL-2C PL1XL-2D
Lamp cover for AL-S series	 SI-350 	For snap action: LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC For normal action: LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC	**ALX-507A** **ALX-507B** **ALX-507E** **ALX-507H** **ALX-508A** **ALX-508B** **ALX-508E** **ALX-508H**	PL2XL-1A PL2XL-1B PL2XL-1C PL2XL-1D PL2XL-2A PL2XL-2B PL2XL-2C PL2XL-2D

■ Actuators

● For AL series

Description	Type
Roller lever	**ALX-001**

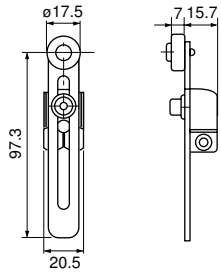
SI-177



Stainless steel roller

Adjustable length roller lever	**ALX-003**

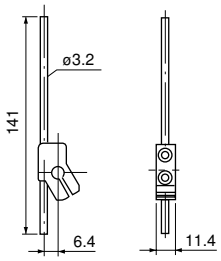
SI-173



Stainless steel roller

Adjustable length rod lever	**ALX-005**

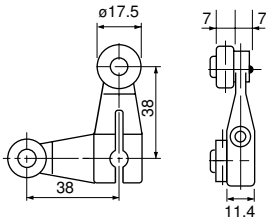
SI-171



Stainless steel rod

Fork roller lever	**ALX-007**

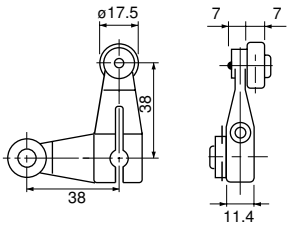
SI-175



Stainless steel roller

Fork roller lever	**ALX-009**

SI-176

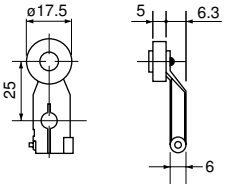


Stainless steel roller

● For AL-S series

Description	Type
Roller lever	**ALX-501**

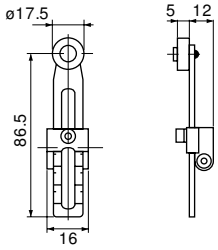
SI-316



Stainless steel roller

Adjustable length roller lever	**ALX-503**

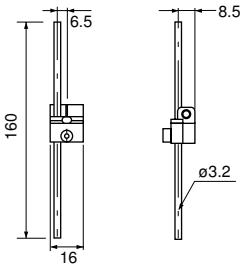
KKD07-033



Stainless steel roller

Adjustable length rod lever	**ALX-505**

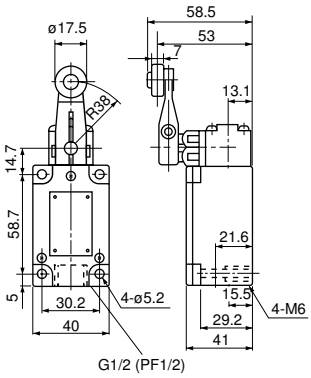
KKD07-034



Stainless steel rod

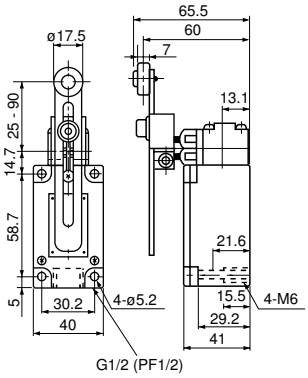
■ Dimensions, mm (AL series)

Roller lever
AL-N1



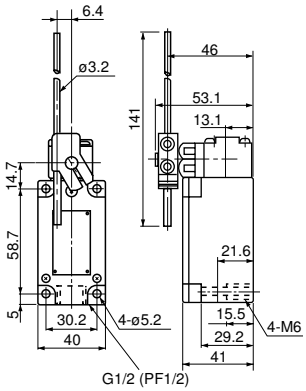
Mass: 265g Stainless steel roller

Adjustable length roller lever
AL-N2



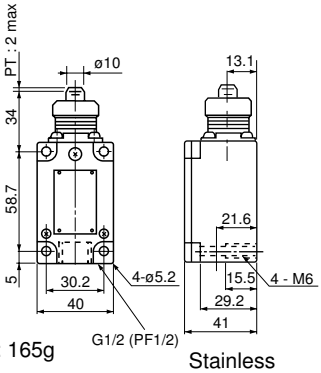
Mass: 305g Stainless steel roller

Adjustable length rod lever
AL-N3



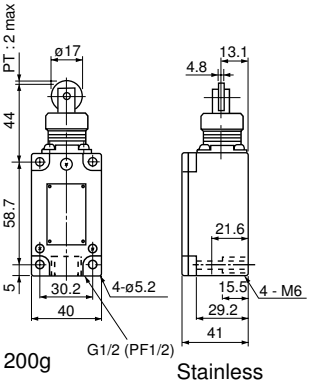
Mass: 260g Stainless steel rod

Top push rod plunger
AL-P1



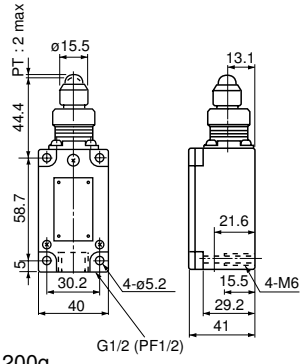
Mass: 165g Stainless steel plunger

Top push roller plunger
AL-P2



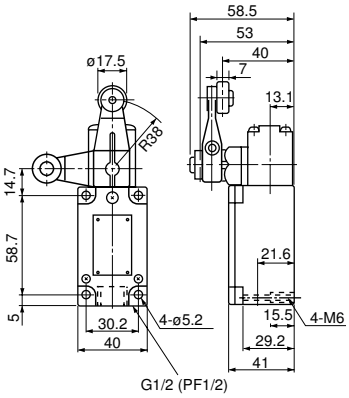
Mass: 200g Stainless steel roller

Top ball push rod plunger
AL-P3



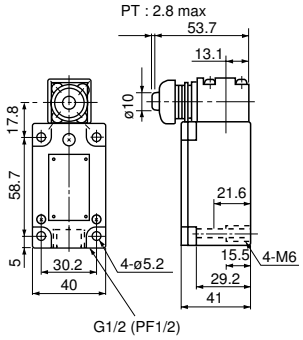
Mass: 200g Stainless steel ball

Fork roller lever
AL-F1



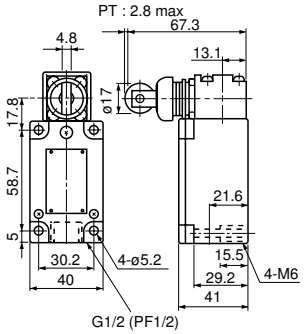
Mass: 310g Stainless steel roller

Side push rod plunger
AL-Y1



Mass: 275g Stainless steel plunger

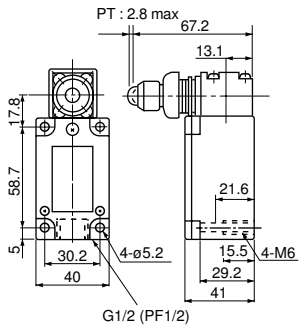
Side push roller plunger
AL-Y2



Mass: 285g Stainless steel roller

■ Dimensions, mm (AL series)

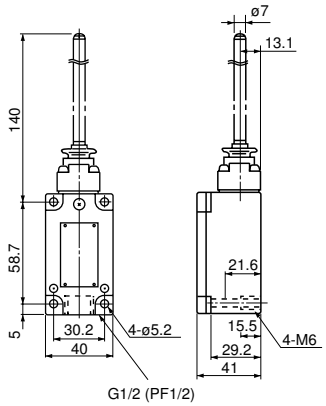
Side ball push rod plunger
AL-Y3



Mass: 285g

Stainless steel ball

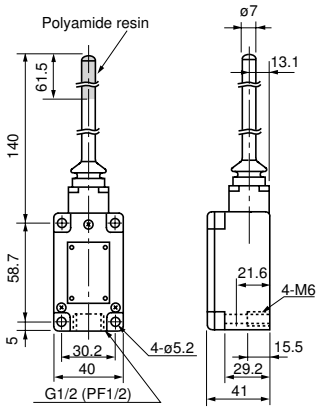
Wobble head coil spring rod
AL-S1



Mass: 220g

Stainless steel coil spring

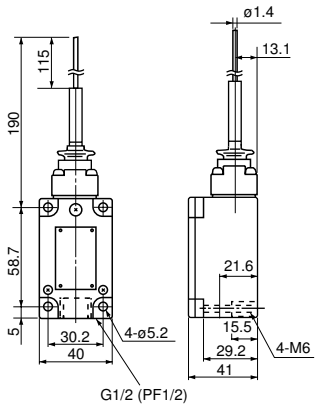
Wobble plastic head spring rod
AL-S2



Mass: 210g

Stainless steel coil spring

Wobble head with cat's whisker
AL-W1



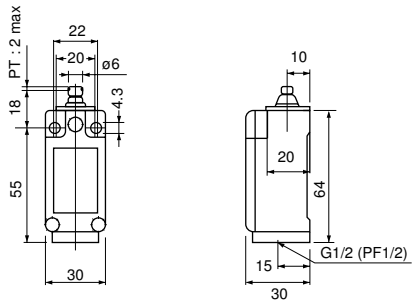
Mass: 210g

Stainless steel coil spring

MSA CONTROL - (11) 3961-1171 - comercial@msacontrol.com.br

■ Dimensions, mm (AL-S series/Compact size)

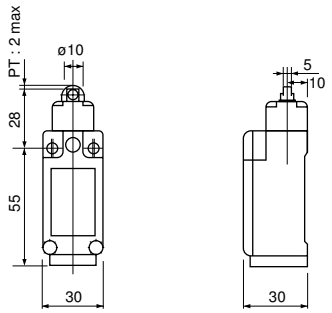
Top push rod plunger
AL-SP1



Mass: 55g

Polyamide resin plunger

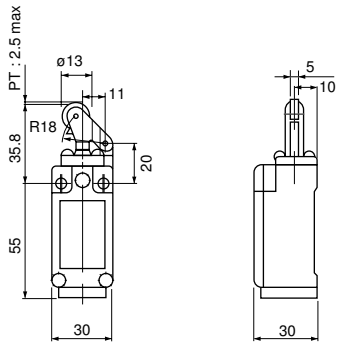
Top push roller plunger
AL-SP2



Mass: 60g

Stainless steel roller

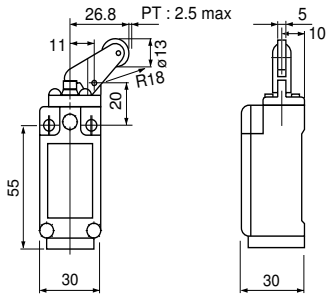
Top roller lever plunger
AL-SK1



Mass: 65g

Stainless steel roller

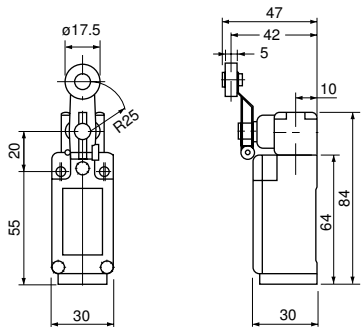
Reversing top roller lever plunger
AL-SK2



Mass: 65g

Stainless steel roller

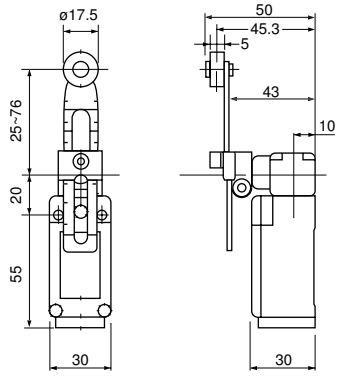
Roller lever
AL-SN1



Mass: 100g

Stainless steel roller

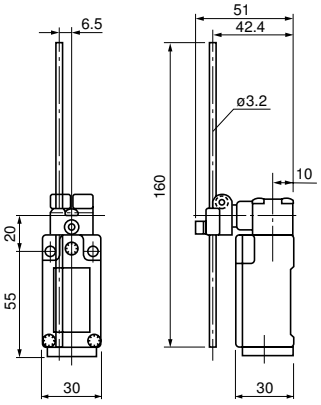
Adjustable length roller lever
AL-SN2



Mass: 120g

Stainless steel roller

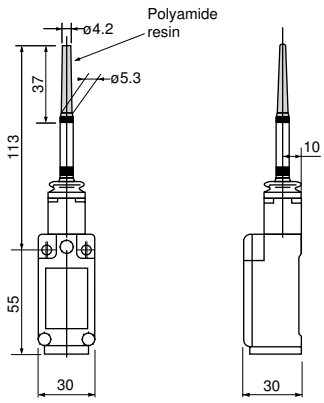
Adjustable length rod lever
AL-SN3



Mass: 105g

Stainless steel rod

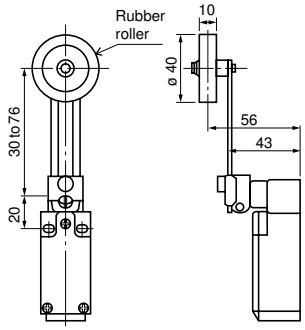
Wobble plastic head spring rod
AL-SS1



Mass: 80g

Stainless steel coil spring

Adjustable length rubber roller lever
AL-SN51



Mass: 130g

Rubber roller

Momentary-contact limit switches K244 series

■ Description

FUJI K244 type limit switches have an excellent performance.
K244 limit switches employ a highly dependable and long lasting double break silver alloy contact system.
These can be expected to perform more than 10 million mechanical operations and a rate of 3,000 operations per hour.
The large variety of operating types such as standard stroke, snap-action type, make-before-break type and extended stroke type, etc. allow you to select a suitable limit switch that fully meets your requirements.
K244 limit switches are widely used for industrial machinery such as machine tools, printing machines, conveyors, automatic machines and door interlocking and similar applications.
The aluminum die-cast housing can also be supplied in an oil and water proof version.

■ Technical data

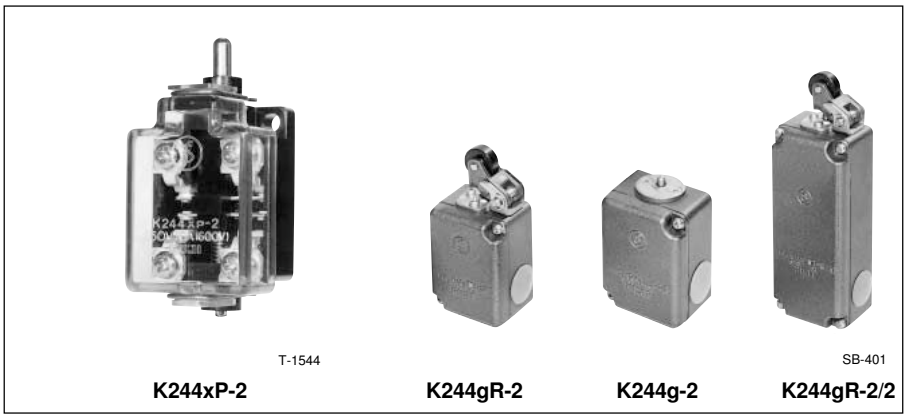
Insulation resistance:
  Over 100MΩ at 500V DC
Dielectric strength:
  2500V AC rms 1 minute
Max. operating cycle:
  3000 cycles per hour
Life expentancy
  Mechanical: 10 million operations
  Electrical:
- K244-2, 2U and 2V
  3.3 million operations at 24 to 550V AC 3A
- K244-2S
  1.3 million operations at 24 to 550V AC 3A

■ Ordering information

Specify the following:
1. Type number or ordering code

Example

Limit switch ..... PL
With enclosure 5
Standard contact ..... N
Cast-metal clad enclosure ..... G
With top roller lever plunger ..... R
Contact, normal action 1NO+1NC 22
Ordering code PL5NGR22



■ Ratings

Type	Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	Current (A)	DC Voltage (V)	Current (A) Resistive	Inductive
K244-2	10	50	24	10	24	10	10
K244-2U			110	10	110	2.2	1.3
K244-2V			220	10	220	0.9	0.4
			440	10	440	0.4	0.2
			550	10	550	0.32*2	0.15*2
K244-2S	10	50	24	10	24	7	7
			110	10	110	1.5	0.9
			220	10	220	0.63	0.28
			440	10	440	0.28	0.14
			550	10	550	0.22*2	0.1*2

Notes: *1 When NO and NC contacts are wired in the same potential.
*2 Value of the breaking current when opposite contacts are not applied with potential.

■ Type number nomenclature

K244□□ - 2 □

Basic type

Enclosure
xP: With transparent cover
g: Cast-metal clad
go: Cast-metal clad oil-tight
gw: Cast-metal clad water-tight

Actuator
Blank: Top push rod plunger
R: Top roller lever plunger

Contact type
Blank: Standard contact (Normal stroke)
S: Snap action contact
U: Make-before-break contact
V: Extended stroke

Contact arrangement
2: 1NO+1NC
2/2: 2NO+2NC

■ Ordering code

PL 5 N G N – 22

Product category
PL: Limit switch

Enclosure
4: Without enclosure
5: With enclosure

Contact
N: Standard
W: Bifurcated
H: Scrubbing action

Enclosure type
G: Cast-metal clad
L: Cast-metal clad oil-tight
W: Cast-metal clad water-tight

Contact arrangement
22: 1NO+1NC, normal action
21: 1NO+1NC, snap action
23: 1NO+1NC, make-before-break
25: 1NO+1NC, extended stroke
42: 2NO+2NC, normal action
41: 2NO+2NC, snap action
43: 2NO+2NC, make-before-break
45: 2NO+2NC, extended stroke
46: 2NO+2NC, complex

Roller head position
N: Top push rod plunger
R: Top roller lever plunger
W: Reversing, right-hand side roller

■ Actuating slider face angles and approach speeds

Although K244 limit switches have an excellent performance they should not be operated at an extremely high speed or extremely low speeds, since these conditions will cause contact trouble and reduce the mechanical life expectancy of the devices. The slider face angles and approach speeds should be kept within the following recommendations.

● Push rod plunger type

This type of switch obtains the movement from the vertical travel of the rod.

Speed : Max. 1m/sec
Min. 0.015m/sec

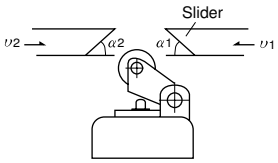
Snap-action types can be used at speeds less than the minimum value.

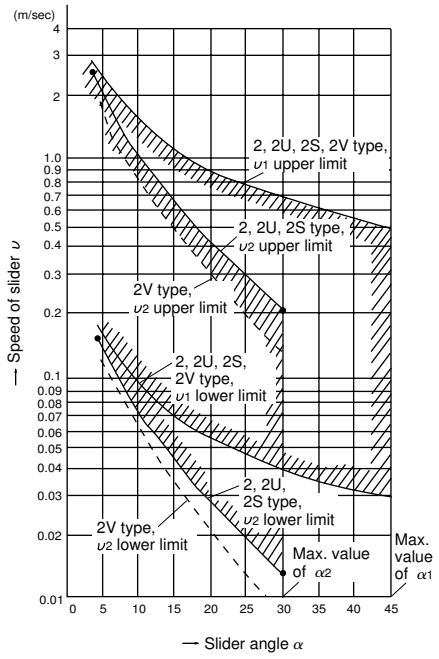
● Roller lever type

The actuating slider face angles and speeds should be within the following range.

The maximum angle of the slider face:
α_1=45° α_2=30°

Snap-action type switches can be used at speeds less than the minimum value.

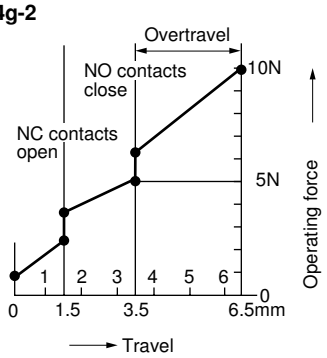




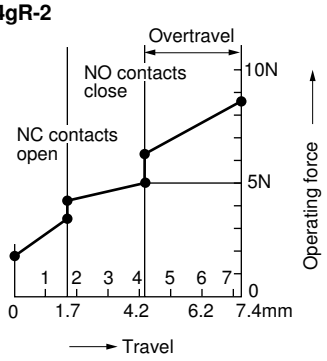
■ Travel operating force curve (Typical example)

The curve indicates forces to operate the contact.

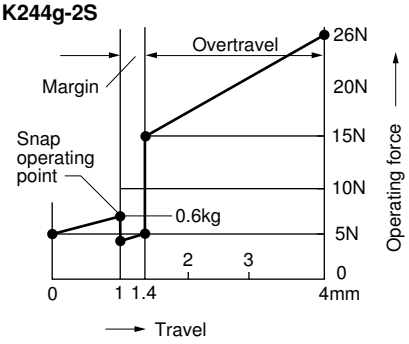
Standard type
K244g-2



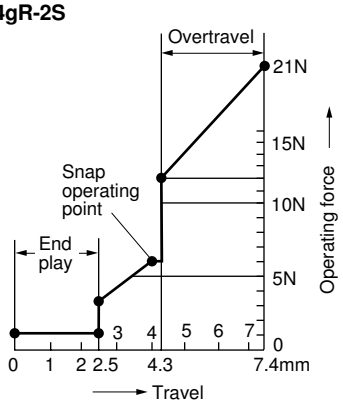
K244gR-2



Snap action contact type
K244g-2S



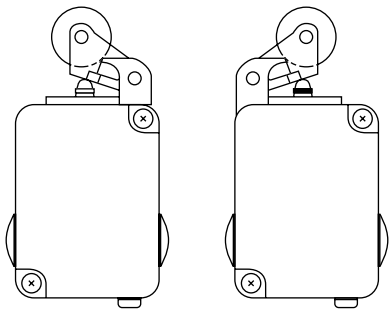
K244gR-2S



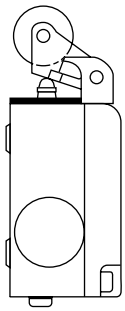
■ Changing direction of operating roller head

Roller head positions can be shifted by 90° in each direction. The head is attached at the standard position when shipped from factory.

Standard **ℓ type**

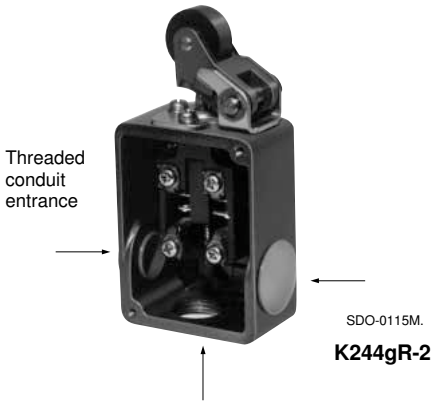


f type

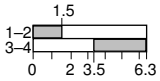
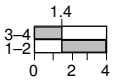
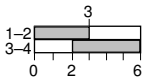
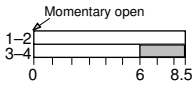


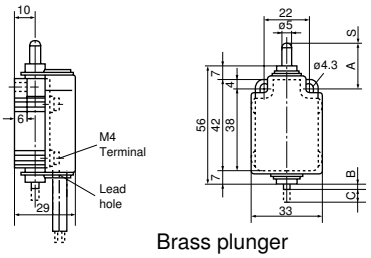
■ Cable connection

Threaded conduit entrances are provided at 3 locations–left, right and lower side of the limit switch housing. Knockout the plug to carry out wiring. Do not remove plugs from holes not requiring wiring.



■ K244 series/Standard

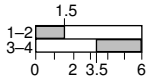
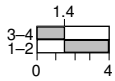
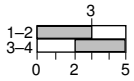
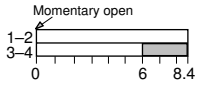
Description	Contact arrangement	Terminal No.	Travel ▩ Contact closed □ Contact open	Type	Ordering code
Top push rod plunger with transparent plastic cover	1NO+1NC		S (mm)		
Normal stroke				**K244xp-2**	PL4NN-22
Snap-action				**K244xp-2S**	PL4NN-21
Make-before-break				**K244xp-2U**	PL4NN-23
SF2025 Extended stroke				**K244xp-2V**	PL4NN-25

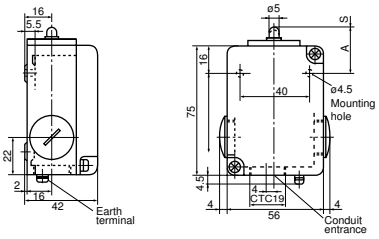


Brass plunger

	-2	-2S	-2U	-2V
A	21	19	21	21
B	1.5	1.5	1.5	1.0
C	6.5	1.4	6	8.5

Mass: 60g

Description	Contact arrangement	Terminal No.	Travel ▩ Contact closed □ Contact open	Type	Ordering code
Top push rod plunger cast-metal clad	1NO+1NC		S (mm)		
Normal stroke				**K244g-2**	PL5NGN-22
Snap-action				**K244g-2S**	PL5NGN-21
Make-before-break				**K244g-2U**	PL5NGN-23
T-1535 Extended stroke				**K244g-2V**	PL5NGN-25

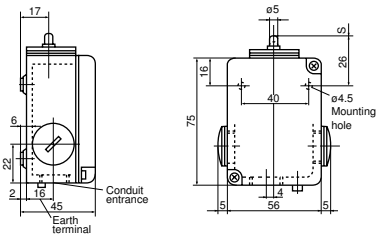


Brass plunger

	-2	-2S	-2U	-2V
A	26	24	26	26

Mass: 200g

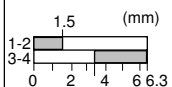
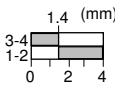
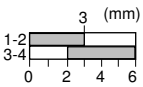
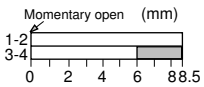
Description	Contact arrangement	Terminal No.	Travel ▩ Contact closed □ Contact open	Type	Ordering code
Top push rod plunger oiltight and watertight cast-metal clad	1NO+1NC		S (mm)		
Snap-action				Oiltight **K244go-2S**	PL5NLN-21
				Watertight **K244gw-2S**	PL5NWN-21



Brass plunger

Mass: 210g

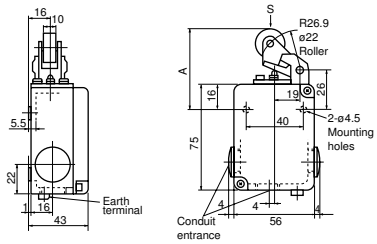
■ Contact action (Typical)

Contact	Standard type (Normal stroke)	Snap action contact	Make-before-break contact	Extended stroke
Contact diagram				
Contact travel ▩ : Contact closed □ : Contact open				

■ K244 series/Standard

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger cast-metal clad	1NO+1NC		S (mm)		
Normal stroke			1.7; 1–2, 3–4; 0, 4.2, 7.5	**K244gR-2**	PL5NGR-22
Snap-action			4.3; 3–4, 1–2; 0, 7.5	**K244gR-2S**	PL5NGR-21
Make-before-break			3.6; 1–2, 3–4; 0, 2.4, 7.5	**K244gR-2U**	PL5NGR-23
Extended stroke			0.5; 1–2, 3–4; 0, 7.5, 10	**K244gR-2V**	PL5NGR-25


T-1537



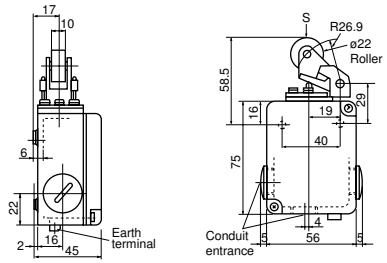
Phenal-formaldehyde roller

	-2	-2S	-2U	-2V
A	55	55	55	57

Mass: 240g

Description	Contact arrangement	Terminal No.	Travel	Type	Ordering code
Top roller lever plunger oiltight and watertight cast-metal clad	1NO+1NC		S (mm)		
Snap-action			6.2; 3–4, 1–2; 0, 7.5	Oiltight **K244goR-2S**	PL5NLR-21
				Watertight **K244gwR-2S**	PL5NWR-21


T-1531

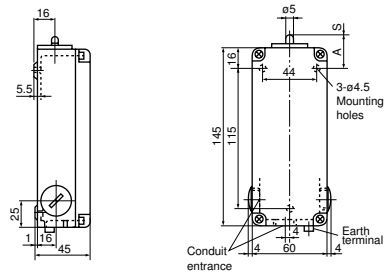


Phenal-formaldehyde roller

Mass: 250g

Description	Contact arrangement	Terminal No.	Travel	Type	Ordering code
Top push rod plunger cast-metal clad	2NO+2NC		S (mm)		
Normal stroke			1.5; 1–2, 3–4; 0, 3.5, 6	**K244g-2/2**	PL5NGN-42
Snap-action			1.4; 3–4, 1–2; 0, 4	**K244g-2S/2S**	PL5NGN-41
Make-before-break			3; 1–2, 3–4; 0, 2, 5	**K244g-2U/2U**	PL5NGN-43
Extended stroke			② 0.5; 1–2, 3–4; ① 1–2, 3–4; 0, 6, 8.4	**K244g-2V/2V**	PL5NGN-45
Complex (Normal stroke + Make-before-break)			② 0, 2, 3, 5; 1–2, 3–4; ① 1–2, 3–4; 1.5, 3.5	**K244g-2/2U**	PL5NGN-46


T-1567



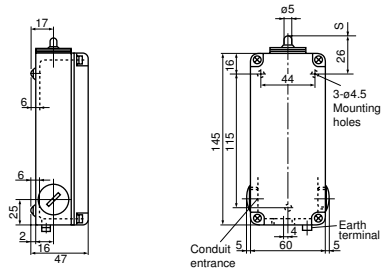
Brass plunger

	2/2	2S/2S	2U/2U	2V/2V	2/2U
A	26	24	26	26	26

Mass: 410g

Description	Contact arrangement	Terminal No.	Travel	Type	Ordering code
Top push rod plunger oiltight and watertight cast-metal clad	2NO+2NC		S (mm)		
Snap-action			1.4; 3–4, 1–2; 0, 2.4	Oiltight **K244go-2S/2S**	PL5NLN-41
				Watertight **K244gw-2S/2S**	PL5NWN-41

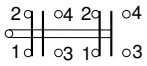
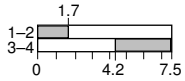
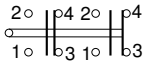
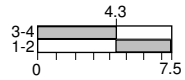
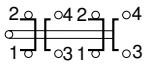
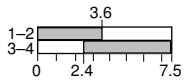
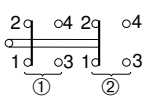
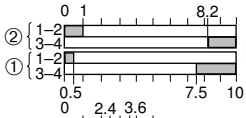
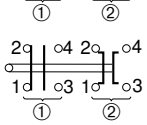
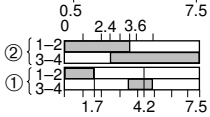

T-1567



Mass: 420g

Brass plunger

■ K244 series/Standard

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger cast-metal clad	2NO+2NC		S (mm)		
Normal stroke				**K244gR-2/2**	PL5NGR-42
Snap-action				**K244gR-2S/2S**	PL5NGR-41
Make-before-break				**K244gR-2U/2U**	PL5NGR-43
Extended stroke				**K244gR-2V/2V**	PL5NGR-45
Complex (Normal stroke + Make-before-break)				**K244gR-2/2U**	PL5NGR-46

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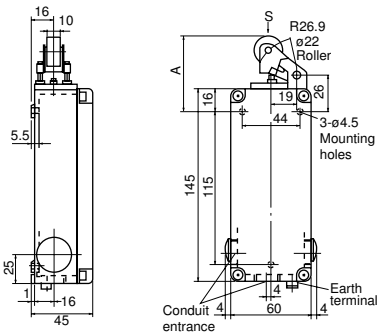
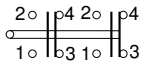
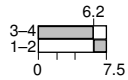
Dimensions, mm



Phenal-formaldehyde roller

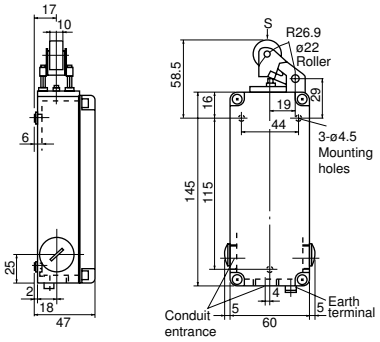
	2/2	2S/2S	2U/2U	2V/2V	2/2U
A	55	55	55	57	55

Mass: 440g

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger oiltight and watertight cast-metal clad	2NO+2NC		S (mm)		
Snap-action				Oiltight **K244goR-2S/2S**	PL5NLR-41
				Watertight **K244gwR-2S/2S**	PL5NWR-41

T-1567

Dimensions, mm



Phenal-formaldehyde roller

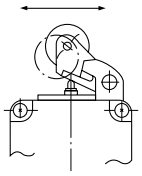
Mass: 450g

Reversing roller lever momentary-contact limit switches, K244g□R

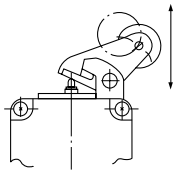
■ Description

These limit switches are designed to detect the movements in the vertical direction. The switch body is identical to the standard type except that one roller is extended from the housing.
The performance is the same as for the standard type.

● **Standard**



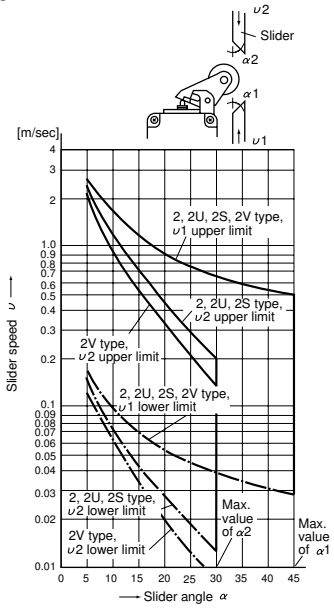
● **Reversing**



Right side roller

■ Actuating slider face angles and approach speeds

K244 limit switches have an outstanding performance and will have a long service life under normal conditions. They are designed to carry out 3,000 operations per hour but if they are operated at an extremely high speeds or on the contrary at extremely low speeds contact trouble could develop which would reduce the mechanical life expectancy of the devices.
Reversing roller levers are provided with sliders in their vertical direction. The slider face angles and approach speeds should be kept within the range shown by curves. The maximum angle of the actuating slider is α_1=45°, α_2=30° and under. Snap-action types can be used at speeds less than the minimum value given.



S-2900

K244gRA-2

SF-2028

K244gRA-2/2

■ Ratings

Type	Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	Current (A) Resistive	Inductive
K244gRA-2	10	50	24	10	24	10	10
K244gRA-2U			110	10	110	2.2	1.3
K244gRA-2V			220	10	220	0.9	0.4
			440	10	440	0.4	0.2
			550	10	550	0.32	0.15*2
K244gRA-2S	10	50	24	10	24	7	7
			110	10	110	1.5	0.9
			220	10	220	0.63	0.28
			440	10	440	0.28	0.14
			550	10	550	0.22	0.1*2

Notes: *1 When NO and NC contacts are wired in the same polarity.
*2 Opposite contacts are not permitted to carry potential.

■ Ordering information

Specify the following
1. Type number or ordering code

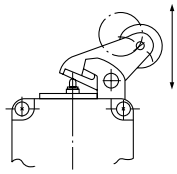
Example
Limit switch ..... PL
With enclosure 5
Standard contact ..... N
Cast-metal clad enclosure ..... G
With reversing roller plunger ..... W
Contact 1NO+1NC, snap-action ..... -21
Ordering code PL5NGW-21

■ Ordering code: *See page 05/16.*

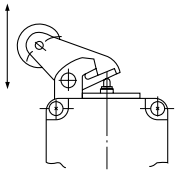
■ Travel operating force: *See page 05/17.*

■ Cable connection: *See page 05/17.*

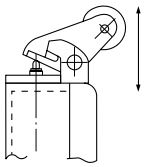
■ Changing direction of operating head



Right side roller



Left side roller



Front-side roller

■ Type number nomenclature

K244 □□□ - 2 □

Basic type

Enclosure
g: Cast-metal clad
go: Cast-metal clad oil-tight
gw: Cast-metal clad water-tight

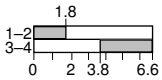
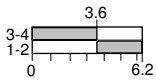
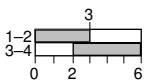
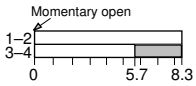
Actuator
R: Top roller lever plunger
A: Reversing roller

Contact type
Blank: Standard contact (Normal stroke)
S: Snap-action contact
U: Make-before-break contact
V: Extended stroke contact

Contact arrangement
2: 1NO+1NC
2/2: 2NO+2NC

■ Technical data: Same as standard type, *see page 05/16.*

■ K244 series/Reversing roller

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Reversing top roller lever plunger cast-metal clad	1NO+1NC		S (mm)		
Normal stroke		1–2, 3–4	 1.8; 0, 2, 3.8, 6.6	**K244gRA-2**	PL5NGW-22
Snap-action		3-4, 1-2	 3.6; 0, 6.2	**K244gRA-2S**	PL5NGW-21
Make-before-break		1–2, 3–4	 3; 0, 2, 6	**K244gRA-2U**	PL5NGW-23
Extended stroke		1–2, 3–4	Momentary open  0, 5.7, 8.3	**K244gRA-2V**	PL5NGW-25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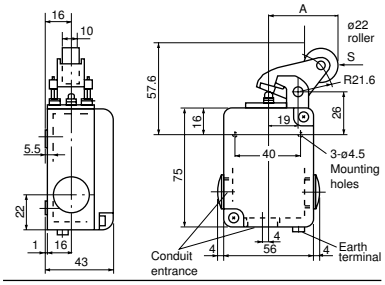
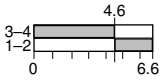
Dimensions, mm



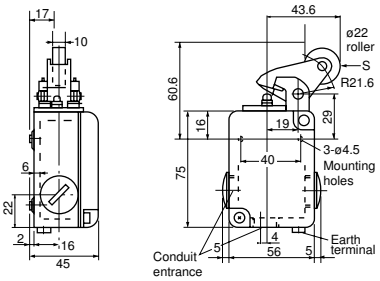
	-2	-2S	-2U	-2V
A	43.6	43.6	43.6	45.8

Mass: 240g Phenal-formaldehyde roller

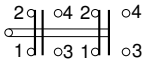
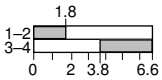
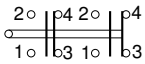
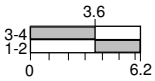
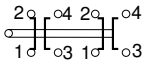
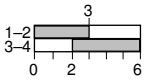
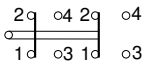
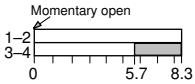
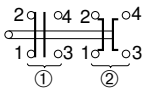
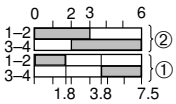
Description	Contact arrangement	Terminal No.	Travel	Type	Ordering code
Reversing top roller lever plunger oiltight and watertight cast-metal clad	1NO+1NC		S (mm)		
Snap-action		3-4, 1-2	 4.6; 0, 6.6	Oiltight **K244goRA-2S**	PL5NLW-21
				Watertight **K244gwRA-2S**	PL5NWW-21


S-2900

Dimensions, mm



Mass: 250g Phenal-formaldehyde roller

Description	Contact arrangement	Terminal No.	Travel	Type	Ordering code
Reversing top roller lever plunger cast-metal clad	2NO+2NC		S (mm)		
Normal stroke		1–2, 3–4	 1.8; 0, 2, 3.8, 6.6	**K244gRA-2/2**	PL5NGW-42
Snap-action		3-4, 1-2	 3.6; 0, 6.2	**K244gRA-2S/2S**	PL5NGW-41
Make-before-break		1–2, 3–4	 3; 0, 2, 6	**K244gRA-2U/2U**	PL5NGW-43
Extended stroke		1–2, 3–4	Momentary open  0, 5.7, 8.3	**K244gRA-2V/2V**	PL5NGW-45
Complex (Normal stroke + Make-before-break)		1–2, 3–4, 1–2, 3–4	 0, 2, 3, 6; ②, ①; 1.8, 3.8, 7.5	**K244gRA-2/2U**	PL5NGW-46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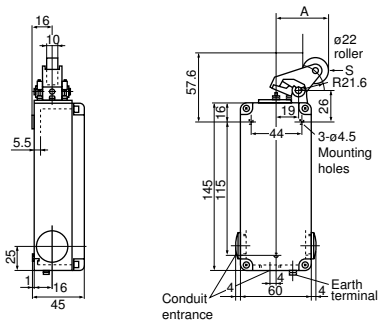
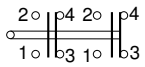
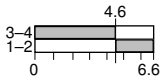
Dimensions, mm



Phenal-formaldehyde roller

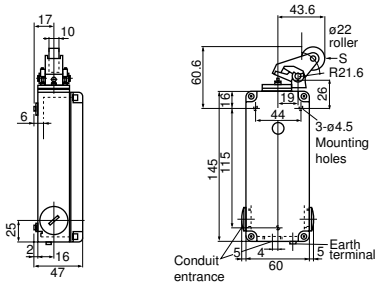
	2/2	2S/2S	2U/2U	2V/2V	2/2U
A	43.6	43.6	43.6	45.8	43.6

Mass: 440g

Description	Contact arrangement	Terminal No.	Travel	Type	Ordering code
Reversing top roller lever plunger oiltight and watertight cast-metal clad	2NO+2NC		S (mm)		
Snap-action		3-4, 1-2	 4.6; 0, 6.6	Oiltight **K244goRA -2S/2S**	PL5NLW-41
				Watertight **K244gwRA -2S/2S**	PL5NWW-41


SF-2028

Dimensions, mm



Phenal-formaldehyde roller

Mass: 450g

Momentary-contact limit switches for low voltage circuit HK244 and WK244

■ Description

HK244 and WK244 limit switches have been developed for use in low voltage and low current circuits. They will operate effectively in 3 Volts AC or DC, 5mA circuits although they are recommended that they are used in 48 Volts or 110 Volts circuits for best results.

HK244 limit switches

HK244 limit switches are provided with pure silver contacts. The movable contact carries out a scrubbing action during make/break operation ensuring good connections at all times.
The switch body is molded from a high performance resin, and versions with transparent plastic covers and with aluminum die-cast housing are also available.

WK244 limit switches

The bifurcated contact is made of pure silver and like the HK244 series they are also suitable for use with low voltage circuits. The dimensions and operating strokes are similar to the standard type.

■ Ordering information

Specify the following:
1. Type number or ordering code

Example

Limit switch ..... PL
With enclosure 5
Scrubbing contact ..... H
Cast-metal clad enclosure ..... G
Top roller lever plunger ..... R
Contact 1NO+1NC, normal stroke ..... -22
Ordering code PL5HGR-22

■ Dimensions, mm

Same as standard type limit switch K244 series. *See page 05/18 to 05/20, 05/22.*

■ Ordering code: *See page 05/16.*


SK-583
WK244xp-2


T-1537
HK244gR-2


T-1535
HK244g-2

■ Ratings

HK244

Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	DC Current (A) Resistive	DC Current (A) Inductive
10	50	24	10	24	7	7
		110	10	110	1.5	0.9
		220	10	220	0.63	0.28
		440	10	440	0.28	0.14
		550	10	550	0.22*2	0.1*2

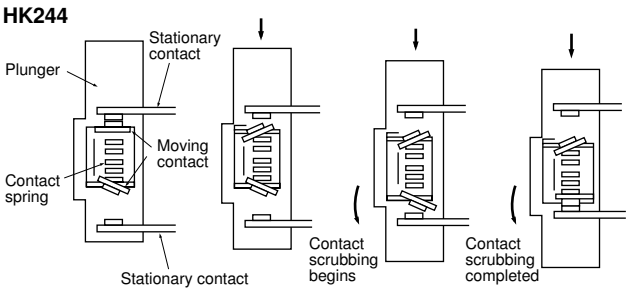
WK244

Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	DC Current (A) Resistive	DC Current (A) Inductive
10	12.5	110	2.5	110	1.5	0.2
		220	2.5	220	0.63	–

Notes: *1 When NO and NC contacts are wired in same polarity.
*2 Opposite contacts are not permitted to carry potential.

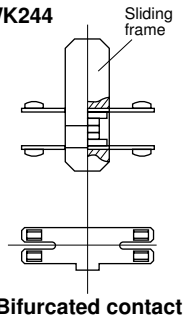
■ Contacts

HK244



Process of scrubbing contact

WK244



Bifurcated contact

■ Technical data

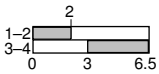
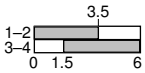
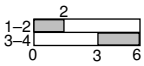
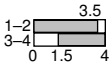
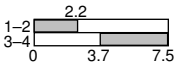
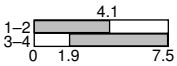
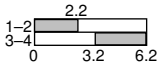
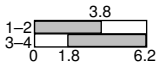
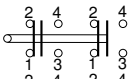
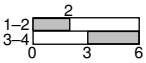
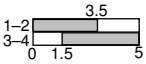
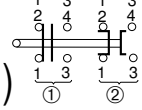
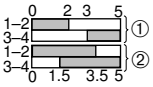
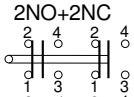
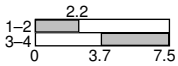
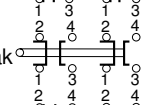
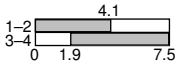
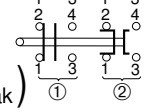
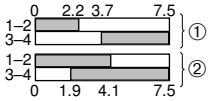
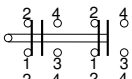
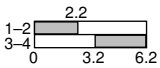
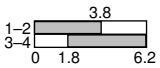
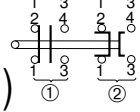
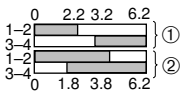
HK244

Insulation resistance: Over 100MΩ at 500VDC
Dielectric strength: 2500V AC rms 1 minute
Max. operating cycle: 3000 cycles per hour
Life expectancy Mechanical: 10 million operations
Electrical: 1.3 million operations at 24 to 550V AC 3A
Allowable ambient temperature: –5° to +60°C

WK244

Insulation resistance: Over 100MΩ at 500VDC
Dielectric strength: 2500VAC rms 1 minute
Max. operating cycle: 3000 cycles per hour
Life expectancy Mechanical: 10 million operations
Electrical: 1 million operations at 220V AC 1.5A
Allowable ambient temperature: –5° to +60°C

■ HK244 and WK244 series

Description	Contact arrangement	Travel (mm) of HK series (WK series: Same as standard series, pages 05/115 to 05/117)	HK series With scrubbing contact action Type	Ordering code	WK series With bifurcated contact Type	Ordering code	Dimensions (Same as K244)
Top push rod plunger transparent plastic cover	1NO+1NC						
Normal stroke			**HK244xp-2**	PL4HGN-22	**WK244xp-2**	PL4WGN-22	*Page 05/18*
Make-before-break			**HK244xp-2U**	PL4HGN-23	**WK244xp-2U**	PL4WGN-23	*Page 05/18*
Top push rod plunger cast-metal clad	1NO+1NC						
Normal stroke			**HK244g-2**	PL5HGN-22	**WK244g-2**	PL5WGN-22	*Page 05/18*
Make-before-break			**HK244g-2U**	PL5HGN-23	**WK244g-2U**	PL5WGN-23	*Page 05/18*
Top roller lever plunger cast-metal clad	1NO+1NC						
Normal stroke			**HK244gR-2**	PL5HGR-22	**WK244gR-2**	PL5WGR-22	*Page 05/19*
Make-before-break			**HK244gR-2U**	PL5HGR-23	**WK244gR-2U**	PL5WGR-23	*Page 05/19*
Reversing top roller lever plunger cast-metal clad	1NO+1NC						
Normal stroke			**HK244gRA-2**	PL5HGW-22	**WK244gRA-2**	PL5WGW-22	*Page 05/22*
Make-before-break			**HK244gRA-2U**	PL5HGW-23	**WK244gRA-2U**	PL5WGW-23	*Page 05/22*
Top push rod plunger cast-metal clad	2NO+2NC						
Normal stroke			**HK244g-2/2**	PL5HGN-41	**WK244g-2/2**	PL5WGN-41	*Page 05/19*
Make-before-break			**HK244g-2U/2U**	PL5HGN-43	**WK244g-2U/2U**	PL5WGN-43	*Page 05/19*
Complex (Normal stroke + Make-before-break)			**HK244g-2/2U**	PL5HGN-46	**WK244g-2/2U**	PL5WGN-46	*Page 05/19*
Top roller lever plunger cast-metal clad	2NO+2NC						
Normal stroke			**HK244gR-2/2**	PL5HGR-41	**WK244gR-2/2**	PL5WGR-41	*Page 05/20*
Make-before-break			**HK244gR-2U/2U**	PL5HGR-43	**WK244gR-2U/2U**	PL5WGR-43	*Page 05/20*
Complex (Normal stroke + Make-before-break)			**HK244gR-2/2U**	PL5HGR-46	**WK244gR-2/2U**	PL5WGR-46	*Page 05/20*
Reversing top roller lever plunger cast-metal clad	2NO+2NC						
Normal stroke			**HK244gRA-2/2**	PL5HGW-41	**WK244gRA-2/2**	PL5WGW-41	*Page 05/22*
Make-before-break			**HK244gRA-2U/2U**	PL5HGW-43	**WK244gRA-2U/2U**	PL5WGW-43	*Page 05/22*
Complex (Normal stroke + Make-before-break)			**HK244gRA-2/2U**	PL5HGW-46	**WK244gRA-2/2U**	PL5WGW-46	*Page 05/22*

Contact closed
Contact open

SP-387

PE-L

KK02-298A

PE1-C, PE2-C

AF89-193

PE1-Y

AF89-458

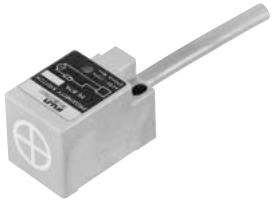
PE2-CTS

SM-81

PE-U

AF89-744

PE-T



SK586

PE-B7

AF91-508

PE-X3D

05

Proximity switches, PE series

■ Description

These proximity switches have many advantages over conventional limit switches, enabling their use where other switches will not do. FUJI offers two types – inductive and magnetic. Sensors and switching components are completely enclosed for protection against oil mist, metal fillng, dust, and moisture.
Inductive types use a solid-state switching device; magnetic types use a reed switch.

PE series proximity switches
Inductive type

Inductive proximity switches are available in AC or DC versions.
The PE-U series is slot type.
The PE1-C and PE1-Y series are cylindrical. The detecting surface of PE-B series is square. The PE-T series switches are slim types. The PE1B2P is compact square type. The PE-L series has analog outputs with the sensor and amplifier separated. The PE2-C series is cylindrical and with stable operating indicator. The PE-X3D is flat type, and PE-4BS2 series is multiple type.
The PE-G4D is space-saving square type.

■ Features

PE-U series *(See page 05/28)*
- Operating distance: 7mm and 10mm
- Operating voltage range: 10 to 30V DC
- Suitable for detecting of ferromagnetic materials

PE1-C and PE1-Y series *(See page 05/29)*
- Short length achieved with IC
- 6 shielded and 4 non-shielded types
- AC 2-wire, DC 2-wire, and DC 3-wire systems
- Stable operating indicator provided as standard (mounting diameter M12 or more, and NO contact type).

PE-B series *(See page 05/33)*
- 4mm to 50mm operating distance
- Types with operating distance exceeding 20mm conform to the CENELEC Standard.
- Operating voltage range: 80 to 250V AC or 10 to 30V DC

PE-X15D series *(See page 05/36)*
- Square-flat type
- DC supply/3-wire, 12/24V DC
- Operating distance: 15mm

PE-T series *(See page 05/36)*
- Unique “Magnetic Shield Method” permits side-by-side mounting
- Only 12mm thick – achieved with IC
- Built-in reverse polarity and surge voltage protection

PE-L series *(See page 05/39)*
- Output voltage proportional to distance
- Linearity: ±1.5% of full scale
  Resolution: ±0.05% of full scale
- Operating frequency: Up to 10kHz
- Operating distance: 2 to 10mm

PE2-C series *(See page 05/43)*
- 4 shielded and 3 non-shielded types
- Stable operating level indicating lamp facilitates adjustment
- DC 2-wire, DC 3-wire and AC/DC 2-wire operating systems
- 40 to 250V AC/20 to 250V DC (AC/DC 2-wire system)

PE-X3D series *(See page 05/47)*
- Only 7mm thick
- Operating voltage range: 10 to 30V DC

PE-G4D *(See page 05/49)*
- Requires about half the mounting space of PE-B4 type.

AES, AER and PM type proximity switches (Magnetically-operated reed switches)
In the standard type PM the reed switch element and the sensing magnet are separate elements. The AES type is also a separate type but is a miniaturized version. In the AER type the sensing magnet element and the reed switch are integrated in one housing.

■ Features

- Since these proximity switches make use of a permanent magnet no external power source is required to operate the reed switch.
- The dry reed contact switch is dependable in operation and has an extended service life.
- The unit strongly resists vibration and is both water-and dust-tight (except for AES type).
- Either an AC or DC power source can be used for the reed switch output.
- Compact in design and easy to install anywhere.
- Can be mounted on a steel frame (In this case the effective operating distance is reduced by one-half).

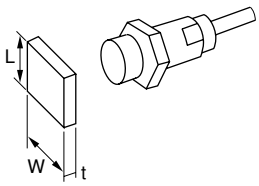
■ For further information

See pages 05/51, 52, 54, 55.

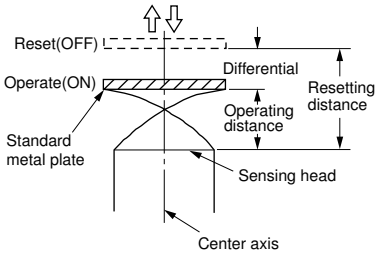
Inductive type

■ Description

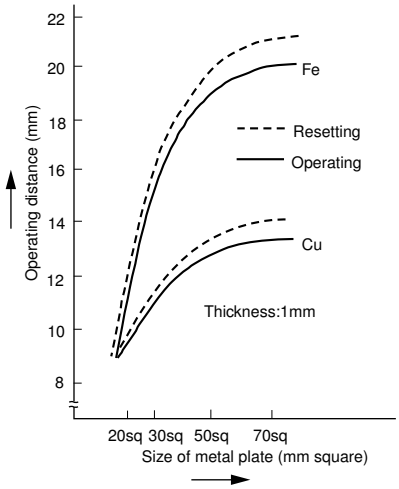
● Standard metal plate (object)
Standard metal plate (object) is a standard sensing target to measure the basic performance. Its shape, size, and material are stipulated. Iron is usually used as material.



● Operating distance
The operating distance is the distance along the center axis of the head from the sensing head to the point where a metal plate traveling along the path actuates the switch.
Normally the operating distance means this distance in vertical direction.

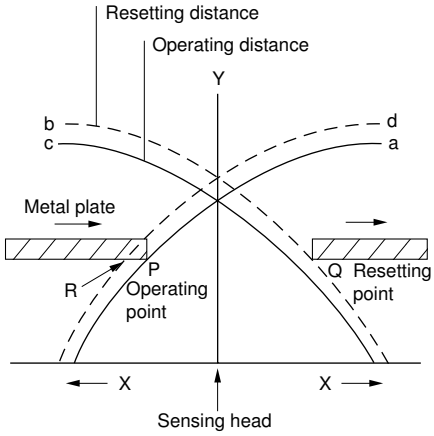


The following curves indicate typical operating distances. Values for aluminum or copper will be less than 1/2 those indicated for iron. In order for an object to be detected, its dimensions must be no smaller than 30 × 30mm, or no larger than 70 × 70mm. Objects smaller or larger will not be detected, regardless of material.



● Differential distance
This is the distance between the actuating point where the switch is actuated and the reset point where the switch resets after the metal plate is withdrawn from the sensing head.

● Response curve
This curve shows the detect-to-reset range with object distance from the head. The switch operates when the object approaching form the left reaches point P on curve 'a', and resets when the trailing edge of the object reaches point Q on curve 'b'.
The switch also resets when the object is withdrawn from point P to R on curve 'd'.



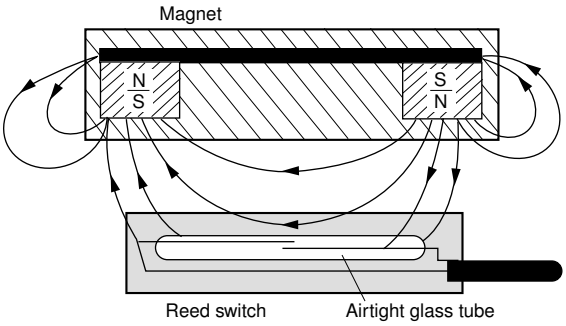
Magnetically operated type

■ Operating

These switches comprise a sensor and a reed switch element, which closes when a magnetic object approaches.

■ Reed switch

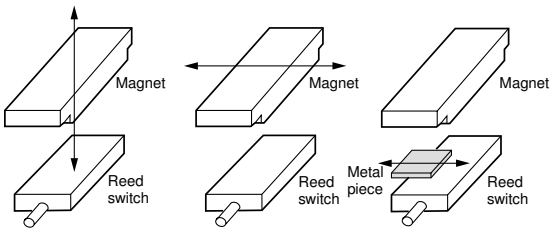
The constructions of the reed switch and its magnetic element are shown in the diagram. The reed switch is made up of two magnetic reeds in an airtight glass tube. The 2 reeds are magnetized when they come within the magnetic field of the magnetic element. In this case the tips of these 2 reeds have positive and negative charges respectively and are attracted to each other. When the magnetic field is removed the magnetic charge is lost and the reed switch opens.
FUJI's reed switches are designed to operate in the same manner as the snap-action of conventional limit switches.



■ Mode of operation

The operation methods of the magnetic type proximity switches are as illustrated.

Separation type

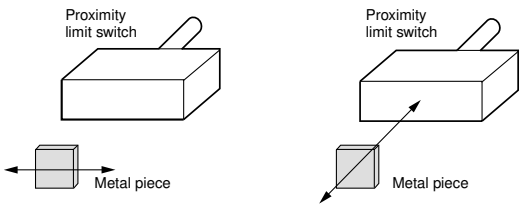


Reed switch is fixed but magnet moves in a vertical direction.

Reed switch is fixed but magnet moves in a horizontal direction.

Both the reed switch and magnet are fixed. And metal object passes between these two.

Integrated type

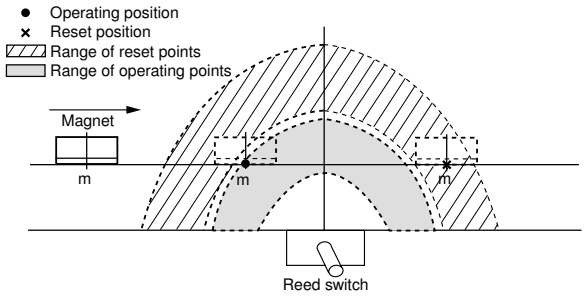


Proximity switch is fixed and the metal object moves in a horizontal direction.

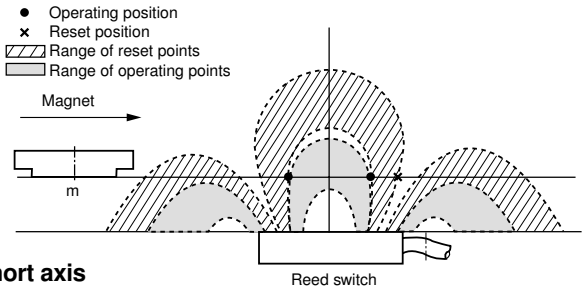
Proximity switch is fixed and the metal piece moves forwards and backwards.

■ Operating characteristics

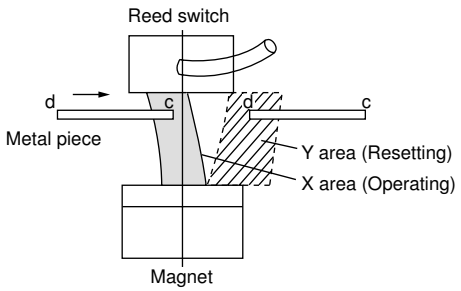
Short axis
Magnet: Travel
Reed switch: Fixed
The reed switch closes when 'm' the magnet center reaches '●' position. It resets at 'x' position.



Long axis
Magnet: Travel
Reed switch: Fixed
This method is feasible but if the distance between the magnet and the reed switch is not correct the reed switch may switch 3 times when the magnet carries out only 1 travel.
Try to avoid using this arrangement.



Short axis
Magnet: Fixed
Reed switch: Fixed
(In this case the reed switch operates as an NC contact.)
Reed switch closes when the metal piece is out of 'X' region between the magnet and the reed switch.
When the metal piece passes through the 'X' region the reed switch will open. Thus the reed switch opens as soon as 'c' the tip of the metal piece reaches 'X' region and closes as soon as 'd' the end leaves 'Y' region.



Inductive proximity switches–Slot type, PE-U

Supply voltage: 12/24V DC
Output: Transistor 50, 100mA max.
Operating distance: 7, 10mm

■ Features

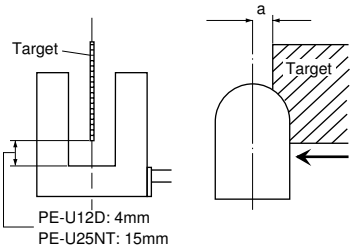
- The slot type detecting surfaces of 12 and 25mm are available.
  Stable detection characteristics can be obtained when a metal plate passes through the slot ON or OFF-center.
- Best suited for detection of magnetic metal plates passing through the slot.
- Provided with built-in reverse polarity and surge voltage protection circuits.
- LED indicator lamps are provided, thus facilitating operational checks.
- Degree of protection meets the requirement of IP67 (IEC), thus permitting operation in unfavorable environments.
- NPN transistor voltage/current outputs are provided, thus permitting a wide range of applications.

PE-U12D AF91-511 **PE-U25NT** SM-81

■ Specifications

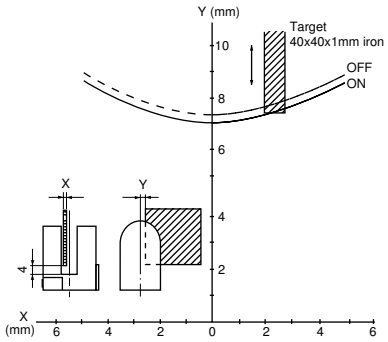
Type (Ordering code)	**PE-U25NT** (PE1U25-ND)	**PE-U12D** (PE1U12-D)
Operating distance	10mm ± 2*	7mm ± 1*
Standard target size (iron)	50 × 50 × 2.3mm	40 × 40 × 1mm
Supply voltage	12/24V DC	
Operating voltage range	10 to 30V DC	
Power consumption	Max. 20mA at 24V DC	Max. 15mA at 24V DC
Output capacity	Max. 100mA	Max. 50mA
Response time or frequency	Max. 3ms. (ON time)	Min. 50Hz
Differential	0.3 to 2mm	Max. 15% of operating distance
Ambient temperature	–25 to +70°C	
Degree of protection	IP67 (IEC)	
Insulation resistance	Over 50MΩ at 500V DC	
Dielectric strength	2000V AC rms. 1minute	1000V AC rms. 1minute
Mass	210g	120g

Note: * This indicates the distance "a" shown in figure at right.

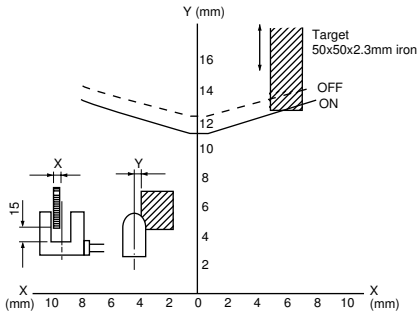


■ Response curve

PE-U12D

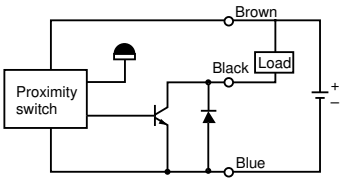


PE-U25NT



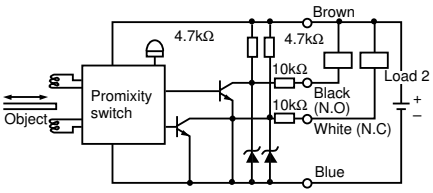
■ Wiring diagrams

PE-U12D



NPN transistor current output, 1NO

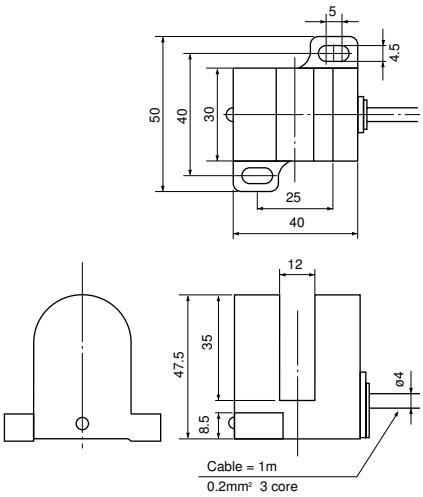
PE-U25NT



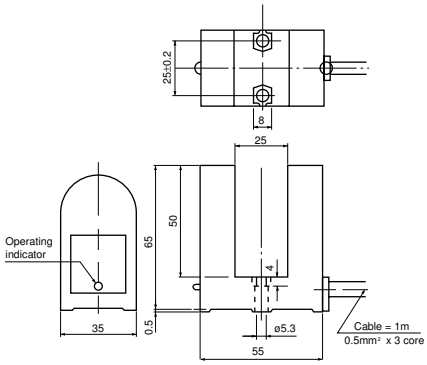
NPN transistor voltage/current output, SPDT

■ Dimensions, mm

PE-U12D



PE-U25NT



■ Ordering information

Specify the following:
1. Type number or ordering code

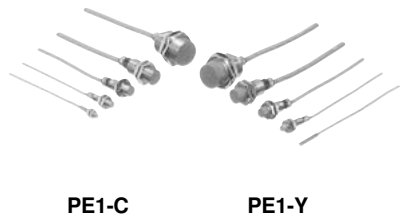
MSA CONTROL - (11) 3961-1171 - comercial@msacontrol.com.br

Inductive proximity switches–Cylindrical type, PE1-C, PE1-Y

Operating system
DC supply/3-wire and 2-wire system
AC supply/2-wire system
Operating distance: 0.8 to 20mm
This proximity switch has a cylindrical shape. The sensor is fitted to an end of the cylinder and the body is provided with a built-in control circuit.
This type conforms to the requirements of the CENELEC (Europe) Standards and as the dimensions, ratings and performance comply with the requirements of these Standards, this type can be used as replacement units.

■ Features

- Short length because of the use of IC circuit.
- Shielded and non-shielded type are available.
- Red and green LED is provided for a stable operating indication and easy setting, mounting diameter M12 or more and NO contact type only.
- Provided with reverse polarity and surge voltage protection circuits.
- Degree of protection: IEC IP67



■ Type number nomenclature

PE 1-C S 10 D B

Basic type

Series
C: Cylindrical, screwed
Y: Cylindrical, straight

Shield
Blank: Non-shielded
S: Shielded

Operating distance
0.8 : 0.8mm 2 : 2mm 10 : 10mm
1 : 1mm 5 : 5mm

Operating system
D: DC, 3-wire, NPN
Q: DC, 3-wire, PNP
S: DC, 2-wire
A: AC, 2-wire

Contact
Blank: 1NO
B: 1NC

■ Ordering code

PE1 S 10-D B

Basic type

Series
Y: Cylindrical, straight
C: Cylindrical, non-shielded
S: Cylindrical, shielded

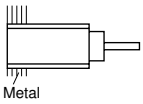
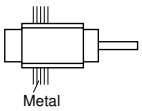
Operating distance
P8: 0.8mm 05: 5.0mm
1P: 1.5mm 10: 10.0mm
02: 2.0mm 20: 20.0mm

Operating system
D: DC, 3-wire, NPN
Q: DC, 3-wire, PNP
S: DC, 2-wire
A: AC, 2-wire

Contact
Blank: 1NO
B: 1NC

05

■ Specifications

Description	Operating system	Operating distance (mm)	Mounting diameter	Supply voltage (Operating voltage range)	1NO Type	Ordering code	1NC Type	Ordering code
Shielded  Metal	DC supply 3-wire, NPN transistor output	0.8 0.8 1.5 2 5 10	4mm-dia. M5 M8 M12 M18 M30	12/24V DC (10 to 30V DC)	**PE1-YS08D** **PE1-CS08D** **PE1-CS1R5D** **PE1-CS2D** **PE1-CS5D** **PE1-CS10D**	PE1YP8-D PE1SP8-D PE1S1P-D PE1S02-D PE1S05-D PE1S10-D	**PE1-YS08DB** **PE1-CS08DB** **PE1-CS1R5DB** **PE1-CS2DB** **PE1-CS5DB** **PE1-CS10DB**	PE1YP8-DB PE1SP8-DB PE1S1P-DB PE1S02-DB PE1S05-DB PE1S10-DB
	DC supply 3-wire, PNP transistor output	0.8 0.8 1.5 2 5 10	4mm-dia. M5 M8 M12 M18 M30	12/24V DC (10 to 30V DC)	**PE1-YS08Q** **PE1-CS08Q** **PE1-CS1R5Q** **PE1-CS2Q** **PE1-CS5Q** **PE1-CS10Q**	PE1YP8-Q PE1SP8-Q PE1S1P-Q PE1S02-Q PE1S05-Q PE1S10-Q	**PE1-YS08QB** **PE1-CS08QB** **PE1-CS1R5QB** **PE1-CS2QB** **PE1-CS5QB** **PE1-CS10QB**	PE1YP8-QB PE1SP8-QB PE1S1P-QB PE1S02-QB PE1S05-QB PE1S10-QB
	DC supply 2-wire	2 5 10	M12 M18 M30	12/24V DC (10 to 30V DC)	**PE1-CS2S** **PE1-CS5S** **PE1-CS10S**	PE1S02-S PE1S05-S PE1S10-S	**PE1-CS2SB** **PE1-CS5SB** **PE1-CS10SB**	PE1S02-SB PE1S05-SB PE1S10-SB
	AC supply 2-wire	2 5 10	M12 M18 M30	120/240V AC (45 to 260V AC)	**PE1-CS2A** **PE1-CS5A** **PE1-CS10A**	PE1S02-A PE1S05-A PE1S10-A	**PE1-CS2AB** **PE1-CS5AB** **PE1-CS10AB**	PE1S02-AB PE1S05-AB PE1S10-AB
Non-shielded  Metal	DC supply 3-wire, NPN transistor output	2 5 10 20	M8 M12 M18 M30	12/24V DC (10 to 30V DC)	**PE1-C2D** **PE1-C5D** **PE1-C10D** **PE1-C20D**	PE1C02-D PE1C05-D PE1C10-D PE1C20-D	**PE1-C2DB** **PE1-C5DB** **PE1-C10DB** **PE1-C20DB**	PE1C02-DB PE1C05-DB PE1C10-DB PE1C20-DB
	DC supply 3-wire, PNP transistor output	2 5 10 20	M8 M12 M18 M30		**PE1-C2Q** **PE1-C5Q** **PE1-C10Q** **PE1-C20Q**	PE1C02-Q PE1C05-Q PE1C10-Q PE1C20-Q	**PE1-C2QB** **PE1-C5QB** **PE1-C10QB** **PE1-C20QB**	PE1C02-QB PE1C05-QB PE1C10-QB PE1C20-QB
	DC supply 2-wire	5 10 20	M12 M18 M30	12/24V DC (10 to 30V DC)	**PE1-C5S** **PE1-C10S** **PE1-C20S**	PE1C05-S PE1C10-S PE1C20-S	**PE1-C5SB** **PE1-C10SB** **PE1-C20SB**	PE1C05-SB PE1C10-SB PE1C20-SB
	AC supply 2-wire	5 10 20	M12 M18 M30	120/240V AC (45 to 260V AC)	**PE1-C5A** **PE1-C10A** **PE1-C20A**	PE1C05-A PE1C10-A PE1C20-A	**PE1-C5AB** **PE1-C10AB** **PE1-C20AB**	PE1C05-AB PE1C10-AB PE1C20-AB

■ Specifications

Type	PE1-YS08D, DB PE1-CS08D, DB	PE1-YS08Q, QB PE1-CS08Q, QB	PE1-CS□D, DB PE1-C□D, DB	PE-CS□Q, QB PE1-C□Q, QB	PE1-CS□S, SB PE1-C□S, SB	PE1-CS□A, AB PE1-C□A, AB
Output	NPN transistor, open collector output	PNP transistor, open collector output	NPN transistor, open collector output	PNP transistor, open collector output	Transistor output	Thyristor output
Current consumption	10mA or less at 24V DC		15mA or less at 24V DC		–	–
Leakage current	–		–		0.8mA or less at 24V DC	1.5mA or less at 200V AC
Ambient temperature	–25 to 70°C		–25 to 80°C		–25 to 80°C	–25 to 80°C
Dielectric strength	250V AC 1 min.		1000V AC 1min.		1000V AC 1 min.	2000V AC 1 min.
Insulation resistance	50MΩ or more at 250V DC megger		50MΩ or more at 500V DC megger			
Degree of protection	IP67 (IEC Standard)					
Vibration	10-55Hz, 1.5mm double amplitude (in X, Y, Z directions, respectively for 2 hours)					
Shock	500m/s²		–			
Protection circuit	Reverse polarity and surge voltage		Reverse polarity, short-circuit and surge voltage			Surge voltage

■ Response frequency

Type	Frequency (Hz)
PE1-CS1R5D, 5DB, 5Q, 5QB	2000
PE1-CS2D, 2DB, 2Q, 2QB	1500
PE1-YS08D, 08DB, 08Q, 08QB PE1-CS08D, 08DB, 08Q, 08QB PE1-CS2S, 2SB	1000
PE1-C2D, 2DB, 2Q, 2QB PE1-C5S, 5SB	800
PE1-CS5D, 5DB, 5Q, 5QB	600
PE1-CS5S, 5SB	500
PE1-CS10D, 10DB, 10Q, 10QB, 10S, 10SB PE1-C5D, 5DB, 5Q, 5QB, 10S, 10SB	400
PE1-C10D, 10DB, 10Q, 10QB	200
PE1-C20D, 20DB, 20Q, 20QB	100
PE1-CS2A, 2AB, 5A, 5AB, 10A, 10AB PE1-C5A, 5AB, 10A, 10AB, 20A, 20AB	25

■ Output capacity

Type	Output
PE1-YS08D, 08DB, 08Q, 08QB PE1-CS08D, 08DB, 08Q, 08QB	Current output*1 100mA max.
PE1-CS1R5D, 5DB, 5Q, 5QB PE1-CS2D, 2DB, 2Q, 2QB PE1-CS5D, 5DB, 5Q, 5QB PE1-CS10D, 10DB, 10Q, 10QB PE1-C2D, 2DB, 2Q, 2QB PE1-C5D, 5DB, 5Q, 5QB PE1-C10D, 10DB, 10Q, 10QB PE1-C20D, 20DB, 20Q, 20QB	Current output*1 200mA max.
PE1-CS2S, 2SB, 5S, 5SB, 10S, 10SB PE1-C5S, 5SB, 10S, 10SB, 20S, 20SB	Current output 3 to 200mA
PE1-CS2A, 2AB, 5A, 5AB, 10A, 10AB PE1-C5A, 5AB, 10A, 10AB, 20A, 20AB	Current output*2 5 to 200mA

*1 Transistor, open collector output
*2 Refer to output capacity derating curve, *see page 05/128*

■ Accessories (optional)

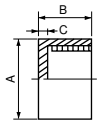
• Mounting brackets

Type	Ordering code	Dimensions, mm A	B	C	D	Screw (supplied)	Used with
PX1-P4	PE1Z0036	13	7.5	6	20	M3 × 10	PE1-YS08
PX1-P8	PE1Z0037	18	10	18	28	M4 × 20	PE1-CS1R5 PE1-C2
PX1-P12	PE1Z0033	24	12.5	20	37	M4 × 25	PE1-CS2 PE1-C5
PX1-P18	PE1Z0034	32	17	30	47	M5 × 32	PE1-CS5 PE1-C10
PX1-P30	PE1Z0035	45	17	50	60	M5 × 50	PE1-CS10 PE1-C20

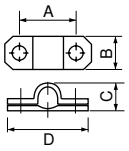
• Surface protection covers

Type	Ordering code	Dimensions, mm A	B	C	Used with
PX1-C12S	PE1Z0030	ø15	5	0.6	PE1-CS2
PX1-C18S	PE1Z0031	ø22.5	8	1.1	PE1-CS5
PX1-C30S	PE1Z0032	ø35	12	1.6	PE1-CS10

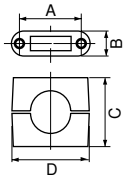
KK02-301A



PX1-P4

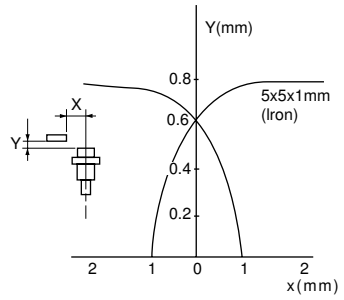


PX1-P8 to P30

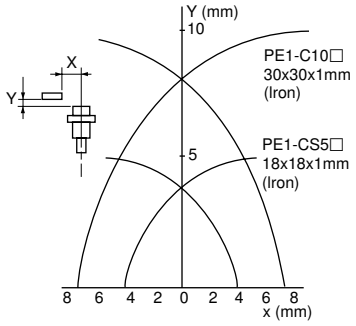


■ Response curve for iron (Typical)

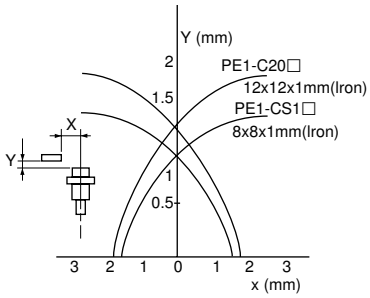
PE1-YS08
PE1-CS08



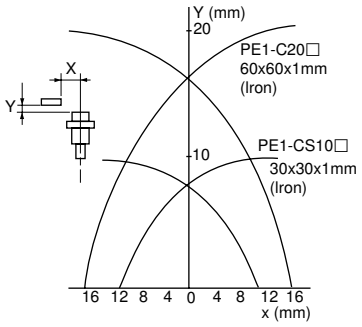
PE1-CS5□
PE1-C10□



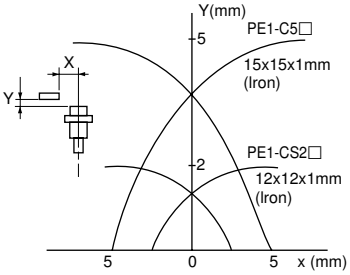
PE1-CS1R5
PE1-C2□



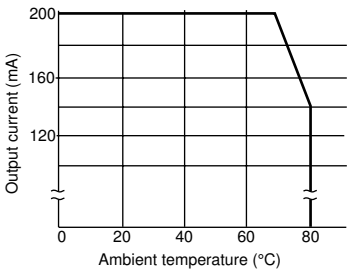
PE1-CS10□
PE1-C20□



PE1-CS2□
PE1-C5□

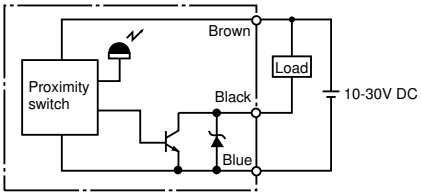


Output capacity derating
PE1-C□A

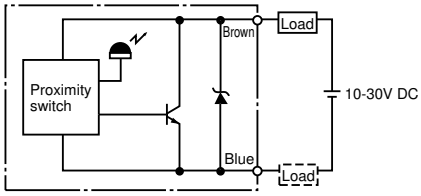


■ Wiring diagrams

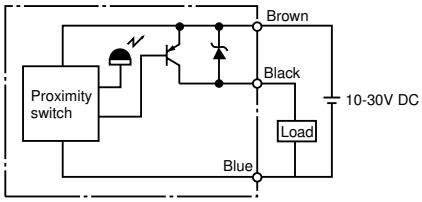
● DC supply/3-wire system, NPN transistor output



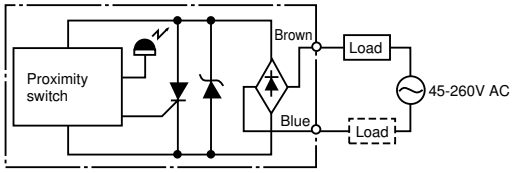
● DC supply/2-wire system
PE1-C□S (1NO, 1NC)



● DC supply/3-wire system, PNP transistor output

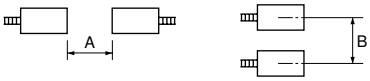


● AC supply/2-wire system
PE1-C□A (1NC)



■ Mutual interference

Be sure to space two switches at a distance greater than that shown in the table at right to prevent mutual interference.



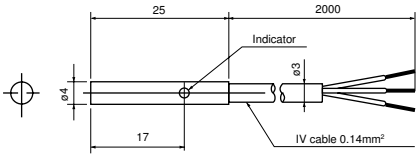
Type	A (mm)	B (mm)
PE1-YS08□	10	5
PE1-CS08□	10	5
PE1-CS1R5□	20	15
PE1-CS2□	30 (15)	20 (12)
PE1-CS5□	50 (25)	30 (18)
PE1-CS10□	100 (50)	70 (35)
PE1-C2□	30	30
PE1-C5□	80 (40)	80 (40)
PE1-C10□	200 (100)	120 (60)
PE1-C20□	300 (150)	200 (100)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

■ Dimensions, mm

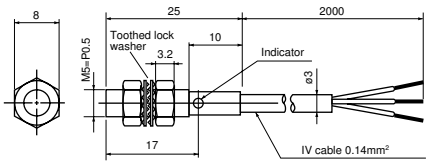
● Shielded

PE1-YS08□



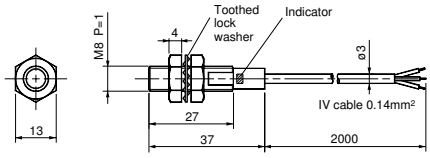
Mass: 30g

PE1-CS08□



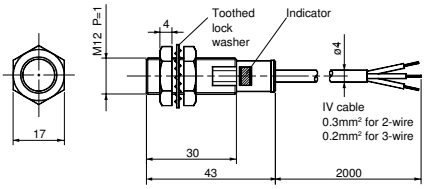
Mass: 30g

PE1-CS1R5□



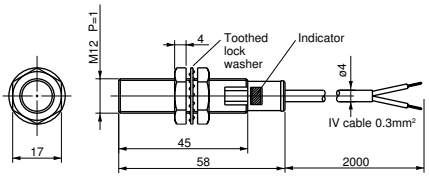
Mass: 40g

PE1-CS2□



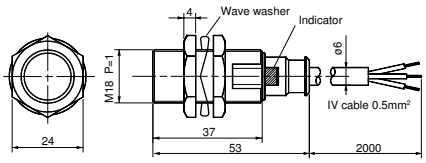
Mass: 70g

PE1-CS2A



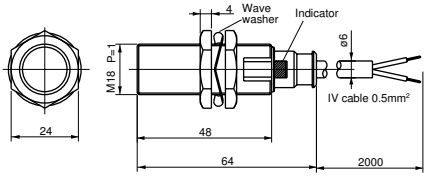
Mass: 100g

PE1-CS5□



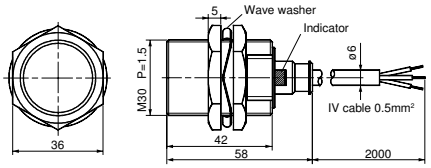
Mass: 160g

PE1-CS5A



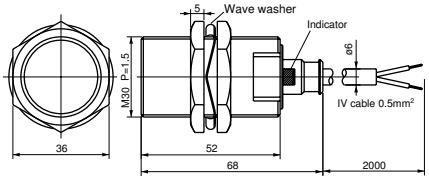
Mass: 170g

PE1-CS10□



Mass: 280g

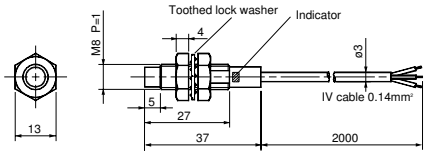
PE1-CS10A



Mass: 340g

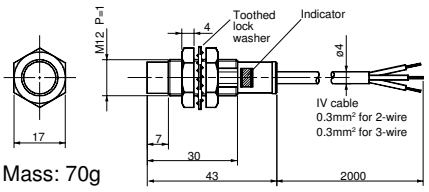
● Non-shielded

PE1-C2□



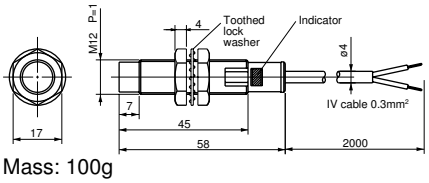
Mass: 40g

PE1-C5□



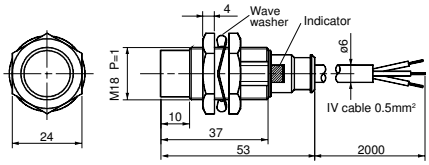
Mass: 70g

PE1-C5A



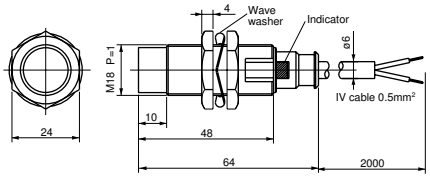
Mass: 100g

PE1-C10□



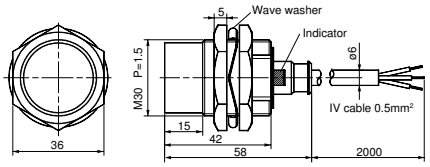
Mass: 160g

PE1-C10A



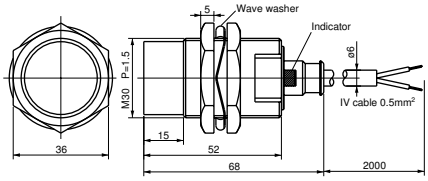
Mass: 170g

PE1-C20□



Mass: 280g

PE1-C20A



Mass: 340g

Inductive proximity switches– Square type, PE-B

Supply voltage:
10-30V DC
80-250V AC, 50/60Hz
Operating distance: 4 to 50mm

■ Features

- Operating distance from 4mm to 50mm permits a variety of applications.
- LED's for operating indication lamp are provided for all types thus facilitating operation checks.
- Ones with an operating distance of over 20mm meet the requirements of the CENELEC Standards.
- Wide operating voltage range Operating range of supply voltage is from 80 to 250V AC or from 10 to 30V DC.
- Provided with built-in reverse polarity and surge voltage protection circuits.
- PNP output types are also available thus permitting application to machine tools in Europe.

PE-B SK-588

■ Type number nomenclature

PE – B 4 D 3 B

Basic type

Series
B: Square shaped

Operating distance
4: 4mm 20: 20mm
7: 7mm 30: 30mm
10:10mm 50: 50mm
15:15mm

Operating system
D: DC, 3-wire, NPN output
Q: DC, 3-wire, PNP output
A: AC, 2-wire
S: DC, 2-wire

Sensing head direction
Blank: Standard
3: Upper side (PE–B4 only)

Contact
Blank: 1NO
B: 1NC

■ Ordering code

PE1 B 10 – D B 3

Basic type

Series
B: Square shaped

Operating distance
04: 4mm 20: 20mm
07: 7mm 30: 30mm
10: 10mm 50: 50mm
15: 15mm

Operating system
D: DC, 3-wire, NPN output
Q: DC, 3-wire, PNP output
A: AC, 2-wire
S: DC, 3-wire

Contact
Blank: 1NO
B: 1NC

Sensing head direction
Blank: Standard
3: Upper side (PE-B4 only)

05

■ Versions

Operating system	Target size (mm)	Operating distance (mm)	Output * 1NO Type	Ordering code	1NC Type	Ordering code	Output * 1NO Type	Ordering code	1NC Type	Ordering code
DC supply 3-wire	20 × 20 × 1	4	**PE-B4D**	PE1B04-D	**PE-B4DB**	PE1B04-DB	**PE-B4Q**	PE1B04-Q	**PE-B4QB**	PE1B04-QB
	20 × 20 × 1	4	**PE-B4D3**	PE1B04-D3	**PE-B4D3B**	PE1B04-DB3	**PE-B4Q3**	PE1B04-Q3	**PE-B4Q3B**	PE1B04-QB3
	30 × 30 × 1	7	**PE-B7D**	PE1B07-D	**PE-B7DB**	PE1B07-DB	**PE-B7Q**	PE1B07-Q	**PE-B7QB**	PE1B07-QB
	40 × 40 × 1	10	**PE-B10D**	PE1B10-D	**PE-B10DB**	PE1B10-DB	**PE-B10Q**	PE1B10-Q	**PE-B10QB**	PE1B10-QB
	50 × 50 × 1	15	**PE-B15D**	PE1B15-D	**PE-B15DB**	PE1B15-DB	–	–	–	–
	50 × 50 × 1	20	**PE-B20D**	PE1B20-D	**PE-B20DB**	PE1B20-DB	**PE-B20Q**	PE1B20-Q	**PE-B20QB**	PE1B20-QB
	90 × 90 × 1	30	**PE-B30D**	PE1B30-D	**PE-B30DB**	PE1B30-DB	**PE-B30Q**	PE1B30-Q	**PE-B30QB**	PE1B30-QB
	150 × 150 × 1	50	**PE-B50D**	PE1B50-D	**PE-B50DB**	PE1B50-DB	**PE-B50Q**	PE1B50-Q	**PE-B50QB**	PE1B50-QB
AC supply 2-wire	30 × 30 × 1	7	**PE-B7A**	PE1B07-A	–	–	–	–	–	–
	40 × 40 × 1	10	**PE-B10A**	PE1B10-A	–	–	–	–	–	–
	50 × 50 × 1	20	**PE-B20A**	PE1B20-A	–	–	–	–	–	–
	90 × 90 × 1	30	**PE-B30A**	PE1B30-A	**PE-B30AB**	PE1B30-AB	–	–	–	–
	150 × 150 × 1	50	**PE-B50A**	PE1B50-A	**PE-B50AB**	PE1B50-AB	–	–	–	–
DC supply 2-wire	20 × 20 × 1	4	**PE-B4S**	PE1B04-S	**PE-B4SB**	PE1B04-SB	–	–	–	–
	30 × 30 × 1	7	**PE-B7S**	PE1B07-S	**PE-B7SB**	PE1B07-SB	–	–	–	–
	40 × 40 × 1	10	**PE-B10S**	PE1B10-S	**PE-B10SB**	PE1B10-SB	–	–	–	–
	50 × 50 × 1	20	**PE-B20S**	PE1B20-S	**PE-B20SB**	PE1B20-SB	–	–	–	–
	90 × 90 × 1	30	**PE-B30S**	PE1B30-S	**PE-B30SB**	PE1B30-SB	–	–	–	–
	150 × 150 × 1	50	**PE-B50S**	PE1B50-S	**PE-B50SB**	PE1B50-SB	–	–	–	–

Notes: *PE-B□D: NPN transistor, open collector output
PE-B□Q: PNP transistor, open collector output
PE-B□A: Thyristor output
PE-B□S: Transistor output

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Specifications

Type	**PE-B□D, PE-B□DB**	**PE-B□Q, PE-B□QB**	**PE-B□S, PE-B□SB**	**PE-B□A, PE-B□AB**
Output	NPN transistor, open collector output	PNP transistor, open collector output	Transistor, output	Thyristor, output
Supply voltage	12/24V DC *1		12/24V DC *1	120/240V AC *2
Output capacity	Max. 200mA at 12/24V DC (PE-B4D□, PE-B4Q□: Max. 50mA at 12/24V DC)		Max. 100mA	10 to 200mA
Current consumption	Max. 15mA at 24V DC		0.8mA or less (Leakage current)	2mA at 200V AC (Leakage current)
Ambient temperature	–25 to +75°C		–25 to +75°C	–25 to +75°C
Dielectric strength	2000V AC, 1 min.		2000V AC, 1 min.	2000V AC, 1 min.
Insulation resistance	Over 50MΩ (500V DC megger)			
Degree of protection	IP67 (IEC)			
Response frequency	See table below			
Vibration	10 to 55Hz, 1.5mm double amplitude (in X, Y and Z direction, respectively for two hours)			
Shock	500m/s²			
Circuit protection	Short-circuit (except PE-B□A and PE-B□AB), reverse polarity, surge voltage			

Notes: *1 Operational voltage range: 10 to 30V DC *2 Operational voltage range: 80 to 250V AC.

■ Response frequency

DC supply

PE-B7D, PE-B7Q, PE-B7S	300Hz
PE-B4D, PE-B4Q, PE-B4S	200Hz
RE-B10D, PE-B10Q, PE-B10S	

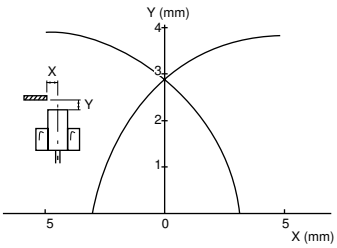
PE-B15D, PE-B20D, PE-B20Q, PE-B20S	100Hz
PE-B30D, PE-B30Q, PE-B30S	50Hz
PE-B50D, PE-B50Q, PE-B50S	10Hz

AC supply

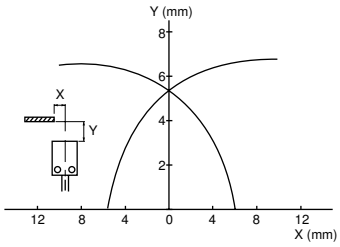
PE-B7A, PE-B10A, PE-B20A	20Hz
PE-B30A, PE-B50A	5Hz

■ Response curve for iron (Typical)

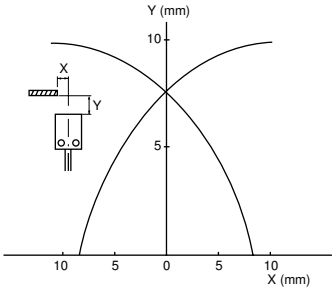
PE-B4□
Material: Iron
20 × 20 × 1mm



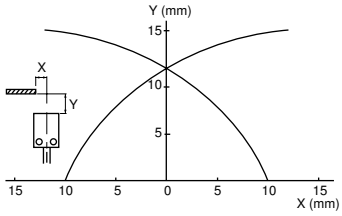
PE-B7□
Material: Iron
30 × 30 × 1mm



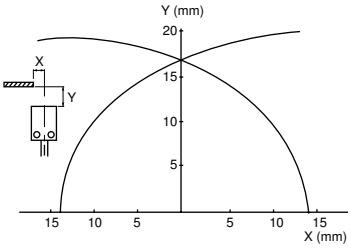
PE-B10□
Material: Iron
40 × 40 × 1mm



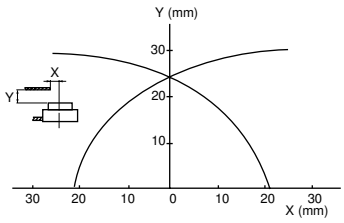
PE-B15□
Material: Iron
50 × 50 × 1mm



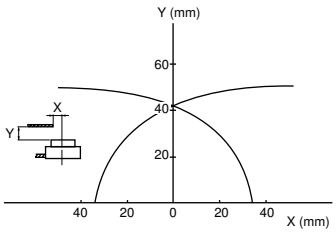
PE-B20□
Material: Iron
50 × 50 × 1mm



PE-B30□
Material: Iron
90 × 90 × 1mm



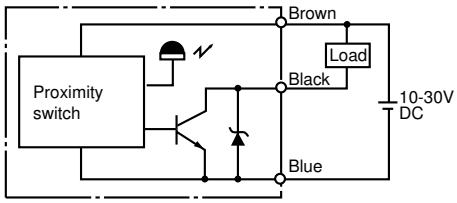
PE-B50□
Material: Iron
150 × 150 × 1mm



■ Wiring diagrams

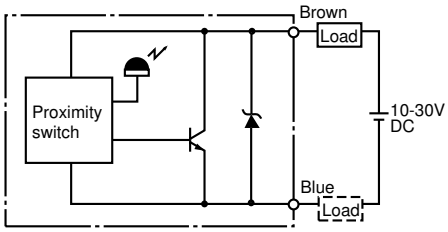
● DC supply/3-wire system

PE-B□D



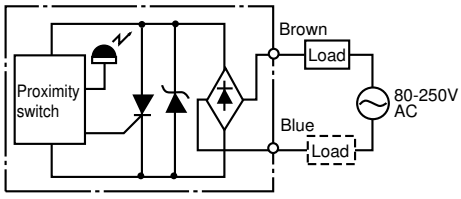
● DC supply/2-wire system

PE-B□S

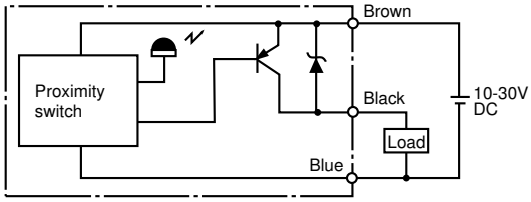


● AC supply/2-wire system

PE-B□A

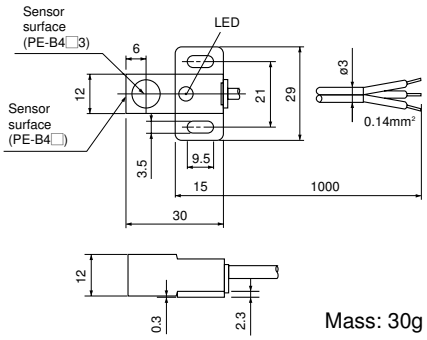


PE-B□Q



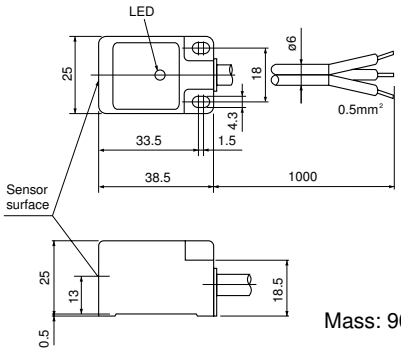
■ Dimensions, mm

PE-B4□, B4□3 PE-B4□B, B4□3B



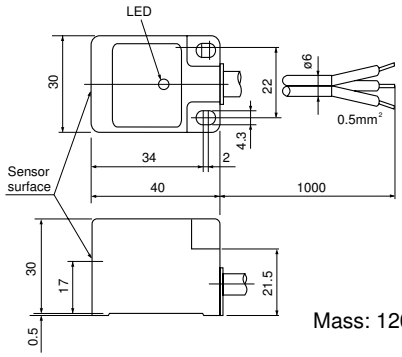
Mass: 30g

PE-B7□, PE-B7□B



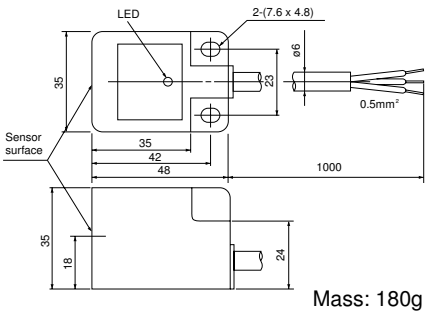
Mass: 90g

PE-B10□, PE-B10□B



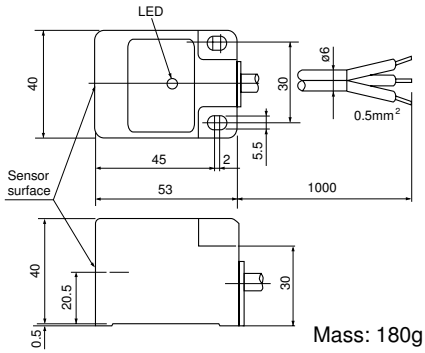
Mass: 120g

PE-B15D, PE-B15DB



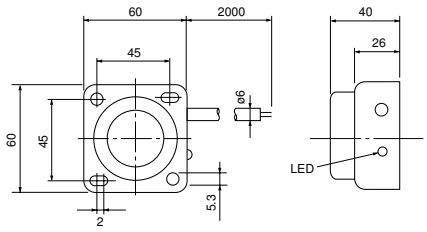
Mass: 180g

PE-B20□, PE-B20□B



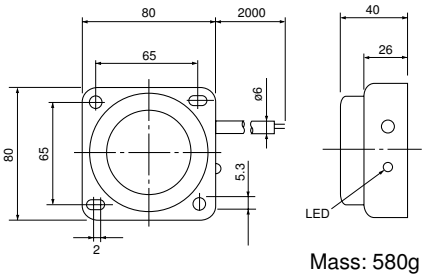
Mass: 180g

PE-B30□, PE-B30□B



Mass: 330g

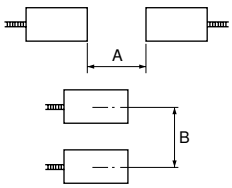
PE-B50□, PE-B50□B



Mass: 580g

■ Mutual interference:

Be sure to space two switches at a distance greater than that shown in the table at right to prevent mutual interference.



Type	A (mm)	B (mm)
PE-B4□	60 (30)	60 (30)
BE-B7□	80 (40)	80 (40)
PE-B10□	120 (60)	120 (60)
PE-B15□	200 (100)	120 (60)
PE-B20□	200 (100)	200 (100)
PE-B30□	300 (150)	300 (150)
PE-B50□	500 (250)	500 (250)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

Inductive proximity switches– Square flat type, PE-X15D

Operating system:
DC supply/3-wire system
Supply voltage range: 10 to 30V DC
Operating distance: 15mm

■ Features

- Degree of protection meets the requirements of IEC IP66, thus permitting operations in unfavorable environment.
- Only two screws are needed to affix each switch, eliminating the need for exclusive mounting brackets.
- Incorporates surge suppression circuits and protection circuits against reverse polarity and short-circuits.

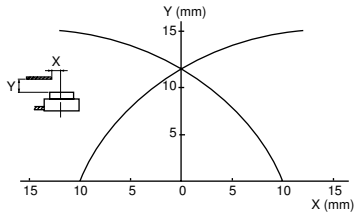
PE-X15D

■ Specifications

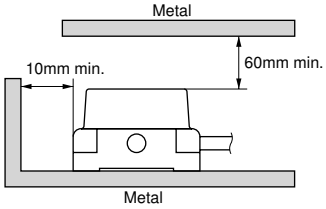
Type (Ordering code)	**PE-X15D**
Operating system	DC supply/3-wire
Output	NPN transistor, open collector, 1NO
Operating distance	15mm ±10%
Target size (iron)	50×50×1mm (iron)
Differential distance	Max. ±10% of operating distance
Rated voltage	12/24V DC (10 to 30V DC)
Switching capacity	200mA max.
Current consumption	15mA max. at 24V DC
Residual voltage	1.5V max. at 24V DC, 200mA
Response frequency	100Hz
Variation due to voltage fluctuation	Max. ±1% of operating distance at 12/24V DC when operated within 10 to 30V DC
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within temperature range of –25 to +70°C
Dielectric strength	1000V AC, 1min.
Insulation resistance	50MΩ or more (500V DC)
Degree of protection	IP66 (IEC)
Ambient temperature	–25 to +70°C (avoid icing)
Humidity	35 to 95% RH
Vibration	10–55Hz, 1.5mm double amplitude
Shock	500m/s² (approx. 50G)

■ Response curve for iron

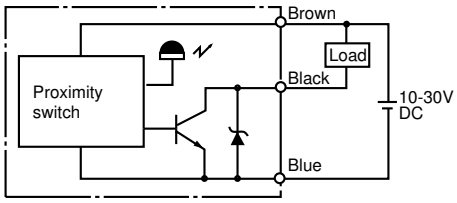
Material: Iron
50×50×1mm



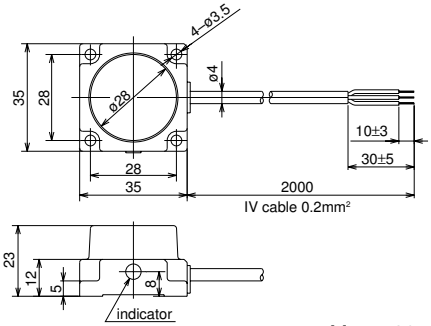
- Influence of surronding metals:
  When mounting a proximity switch surrounded by metals, be sure to provide a minimum distance as shown below.



■ Wiring diagrams



■ Dimensions, mm



Mass: 80g

Inductive proximity switches–Slim type, PE-T
Supply voltage: 12/24V DC
120/240V AC
Output capacity: Max. 200mA

■ Features

- Unusual "Magnetic Shield Method" permits to mount these units side by side, touching each other. (Shielded type PE-TS2)
- Only 12mm in thickness because of the use of IC.
- Wide operating voltage range
  Operating range of supply voltage is from 80 to 250V AC or from 10 to 30V DC.
- LED indicators are provided for all types thus facilitating operation checks.
- Provided with built-in reverse polarity and surge voltage protection circuits.
- Water and oil-tight
  Degree of protection meets the requirements of IEC IP67 thus permitting operations in unfavorable environment.

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Versions

Description	Operating system	Target size (mm)	Operating distance (mm)	Output 1NO Type	Ordering code	1NC Type	Ordering code
Shielded	DC supply/3-wire	12 × 12 × 1	2	**PE-TS2D** **PE-TS2Q**	PE1T02-D PE1T02-Q	**PE-TS2DB** **PE-TS2QB**	PE1T02-DB PE1T02-QB
	DC supply/2-wire	12 × 12 × 1	2	**PE-TS2S**	PE1T02-S	**PE-TS2SB**	PE1T02-SB
	AC supply/2-wire	12 × 12 × 1	2	**PE-TS2A**	PE1T02-A	—	—
Non-shielded	DC supply/3-wire	20 × 20 × 1	4	**PE-T4D** **PE-T4Q**	PE1N04-D PE1N04-Q	**PE-T4DB** **PE-T4QB**	PE1N04-DB PE1N04-QB
	DC supply/2-wire	20 × 20 × 1	4	**PE-T4S**	PE1N04-S	**PE-T4SB**	PE1N04-SB
	AC supply/2-wire	20 × 20 × 1	4	**PE-T4A**	PE1N04-A	—	—

05

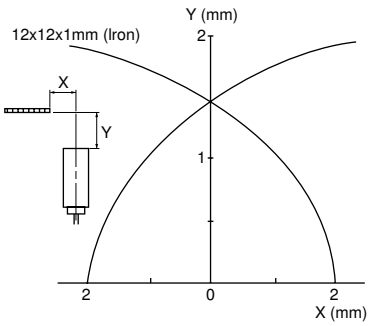
■ Specifications

Type	**PE-TS2D, PE-T4D**	**PE-TS2Q, PE-T4Q**	**PE-TS2S, PE-T4S**	**PE-TS2A, PE-T4A**
Output	NPN transistor, open collector output	PNP transistor, open collector output	Transistor output	Thyristor output
Supply voltage	12/24V DC*1			120/240V AC*2
Output capacity	Max. 200mA			10 to 200mA
Current consumption	Max. 15mA at 24V DC		Max. 0.8mA (Leakage current)	Max. 2mA at 200V AC (Leakage current)
Ambient temperature	–25 to +70°C	–25 to +70°C	–25 to +70°C	–25 to +70°C
Dielectric strength	2000V AC, 1 min.	2000V AC 1 min.	2000V AC, 1 min.	2000V AC 1 min.
Insulation resistance	Over 50MΩ (500V DC)	Over 50MΩ at 500V DC	Over 50MΩ (at 500V DC)	Over 50MΩ (at 500V DC)
Degree of protection	IP67 (IEC)	IP67 (IEC)	IP67 (IEC)	IP67 (IEC)
Response frequency	See table below			

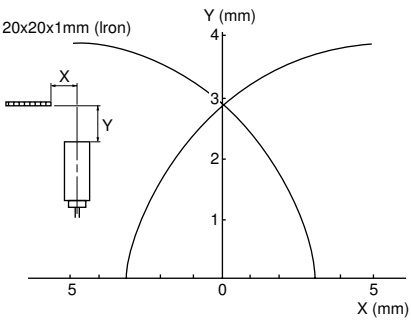
Notes: *1 Operating voltage range: 10 to 30V DC *2 Operating voltage range: 80 to 250V AC.

■ Response curve for iron

PE-TS2□



PE-T4□



■ Response frequency

DC supply types

PE-TS2D, PE-TS2Q PE-TS2S	800Hz
PE-T4D, PE-T4Q PE-T4S	250Hz

AC supply types

PE-TS2A, PE-T4A	20Hz

■ Type number nomenclature

PE – TS 2 – D B

- **Contact**
  Blank: 1NO
  B: 1NC
- **Operating system**
  D: DC, 3-wire, NPN output
  Q: DC, 3-wire, PNP output
  S: DC, 2-wire
  A: AC, 2-wire
- **Operating distance**
  2: 2mm
  4: 4mm
- **Series**
  TS: Shielded, slim type
  N: Non-shielded, slim type
- **Basic type**

■ Ordering code

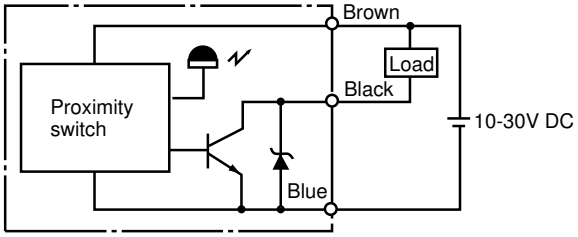
PE1 T 02 – D B

- **Contact**
  Blank: 1NO
  B: 1NC
- **Operating system**
  D: DC, 3-wire, NPN output
  Q: DC, 3-wire, PNP output
  S: DC, 2-wire
  A: AC, 2-wire
- **Operating distance**
  02: 2mm
  04: 4mm
- **Series**
  T: Shielded, slim type
  N: Non-shielded, slim type
- **Basic type**

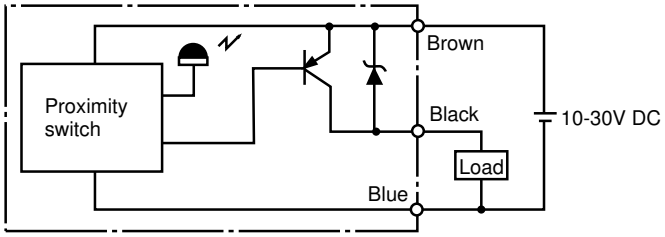
■ Wiring diagrams

● DC supply/3-wire system

PE-T□D

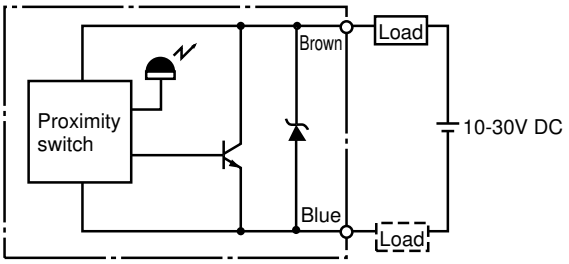


PE-T□Q



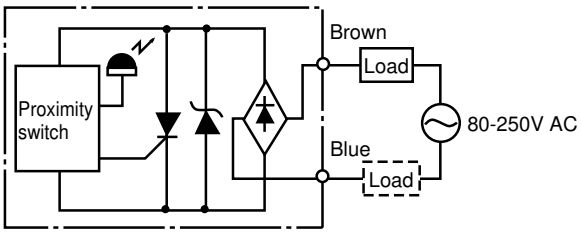
● DC supply/2-wire system

PE-T□S

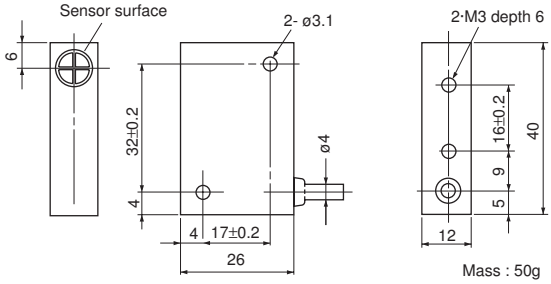


● AC supply/2-wire system

PE-T□A

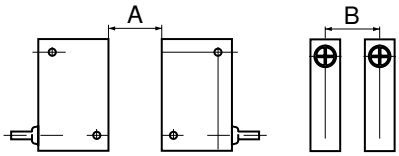


■ Dimensions, mm



■ Mutual interference:

Be sure to space two switches at a distance greater than that shown in the table below to prevent mutual interference.



Type	A (mm)	B (mm)
PE-TS2□	24(12)	24(12)
PE-T4□	60(30)	60(30)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

Inductive proximity switches-Analog output type, PE-L

■ Description

These switches are ideally suited for deformation inspections, position controls of laser beam machines and similar displacement measurements and controls of a variety of machines.

■ Features

- Red LED indicator lamp
- Output voltage proportional to the distance from the object.
- The accuracy of linearity is ±1.5% of full scale and the resolution accuracy ±0.05% of full scale, thus permitting a highly accurate measurement and detection of minute displacement of distance.
- Provided with 2 switching output circuits so as to detect an arbitrary position within the detecting range by incorporating a built-in comparator circuit.
- Provided with a SPAN indicator lamp.

PE-LA PE-LS

SP-387

● Sensor

External diameter	Type	Ordering code
M12	**PE-LS2**	PE1L02
M18	**PE-LS5**	PE1L05
M30	**PE-LS10**	PE1L10

● Amplifier unit

12/24V DC Type	Ordering code	110V AC Type	Ordering code	220V AC Type	Ordering code
PE-LA2D	PE1LA02-T	**PE-LA2A/1**	PE1LA02-H	**PE-LA2A/2**	PE1LA02-M
PE-LA5D	PE1LA05-T	**PE-LA5A/1**	PE1LA05-H	**PE-LA5A/2**	PE1LA05-M
PE-LA10D	PE1LA10-T	**PE-LA10A/1**	PE1LA10-H	**PE-LA10A/2**	PE1LA10-M

■ Specifications

● Sensor

Type	PE-LS2	PE-LS5	PE-LS10
Rated operating distance	2mm	5mm	10mm
Standard material of target	Magnetic materials		
Operating distance range Standard target size (Iron) t: thickness Response frequency	0.4–2mm 12 x 12 x 1t 10kHz	1–5mm 18 x 18 x 1t 5kHz	2–10mm 30 x 30 x 1t 2kHz
Ambient temperature Degree of protection	–25 to +70°C IP67 (IEC)		
Mass (Includes a 3m prewired cable)	90g	120g	220g

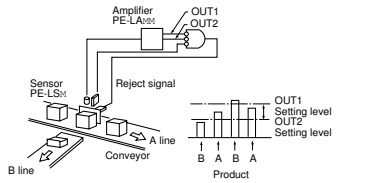
● Amplifier

Description			DC supply	AC supply
Supply voltage			12/24V DC	110, 220V AC, 50/60 Hz*
Power consumption			30mA max.	40mA max.
Analog output characteristic	Resolution Linearity		0.05% of full scale ±1.5% of full scale	
Switching output characteristic	Differential		1 to 5% of rated operating distance	
Adjustment function	Analog output voltage adjustment	1 Volt adj.	Adjustment for output voltage of 1 Volt at 20% of rated operating distance	
		5 Volts adj.	Adjustment for output voltage of 5 Volts at rated operating distance	
	Switching output adjustment	Output 1 adj.	Adjustment for operating position of ON/OFF output	
		Output 2 adj.		
Output	Analog output		1 to 5 Volts	
	Switching output	Output 1 Output 2	NPN transistor output 100mA max. (30V DC)	
Indicator			SPAN indicator, Switching output indicator	
Ambient temperature			–10 to +55°C	
Mass			100g	180g
Socket			TP28S, TP28X, ATX1NS (8-pin)	

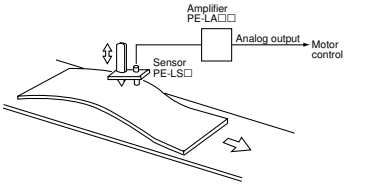
Note: * Operating voltage range 100V: 85-121V AC
200V: 170–242V AC

■ Application examples

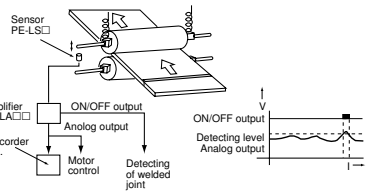
Detecting of height and thickness of product



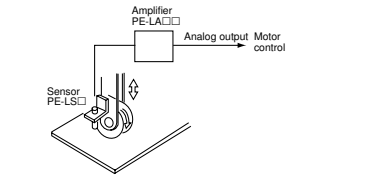
Position control for laser beam machine



Measuring of plate and welded joint thickness



Feed control for grinder wheel



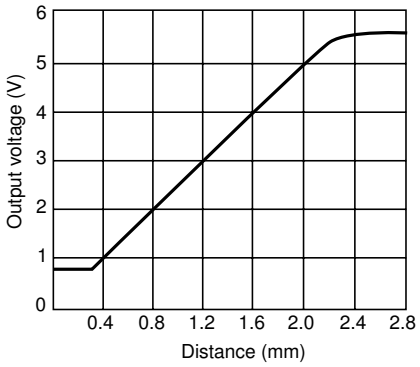
■ Ordering information

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

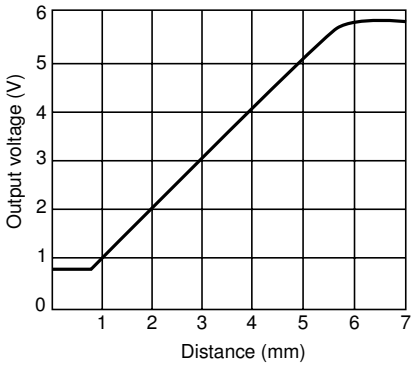
■ Typical characteristic data

Distance-output voltage

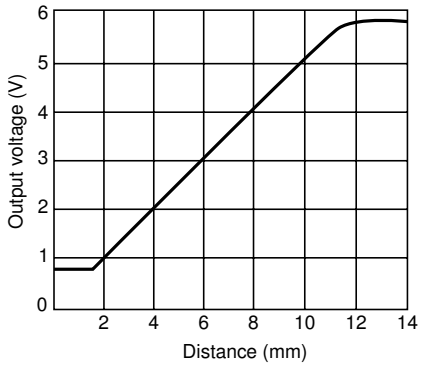
● PE-LS2



● PE-LS5

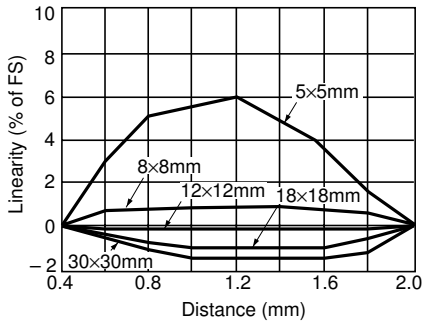


● PE-LS10

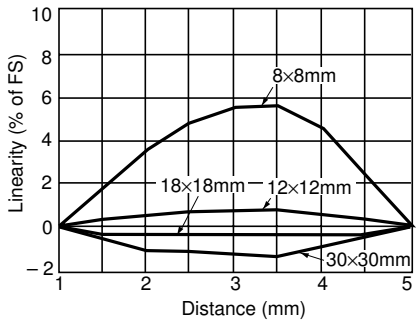


Size of target-Linearity

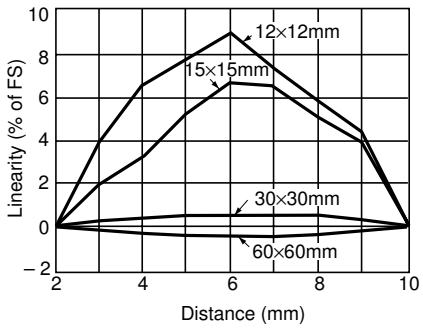
● PE-LS2



● PE-LS5

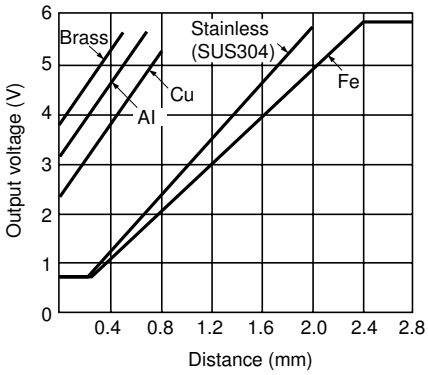


● PE-LS10

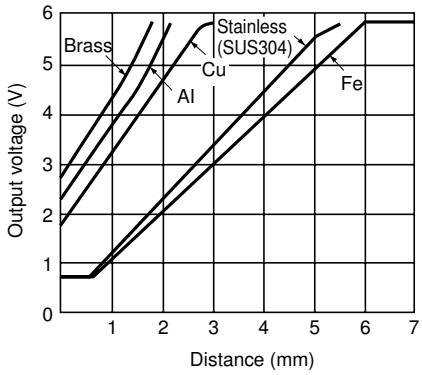


Material of target-Output voltage

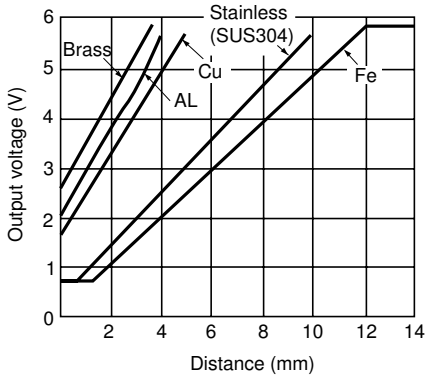
● PE-LS2



● PE-LS5

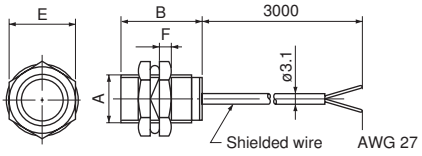


● PE-LS10



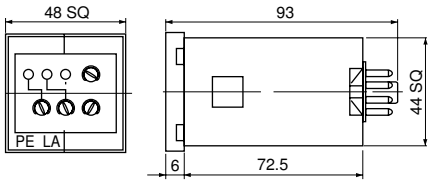
■ Dimensions, mm

● Sensor



Type	A	B	E	F
PE-LS2	M12×1	20	17	4
PE-LS5	M18×1	30	24	4
PE-LS10	M30×1.5	40	36	5

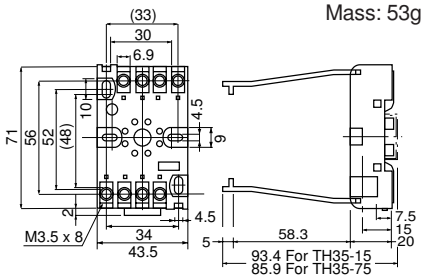
● Amplifier-unit



● Socket/Rail mounting

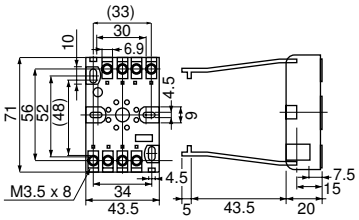
TP28X

Mass: 53g



● Socket/Surface mounting

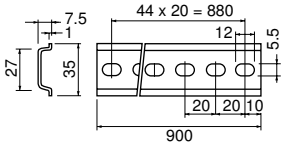
TP28S



Mass: 56g

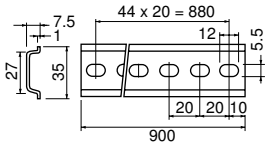
● Mounting rails

TH35-7.5 (Steel)



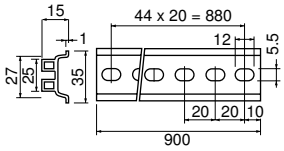
Mass: 290g

TH35-7.5AL (Aluminum)



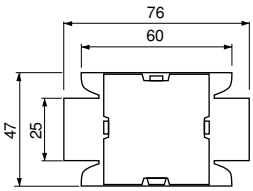
Mass: 140g

TH35-15AL (Aluminum)



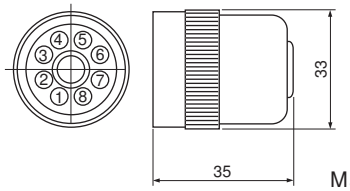
Mass: 220g

● Adaptor/Flush mounting



● Socket/Soldering terminal

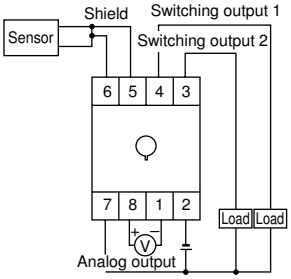
ATX1NS



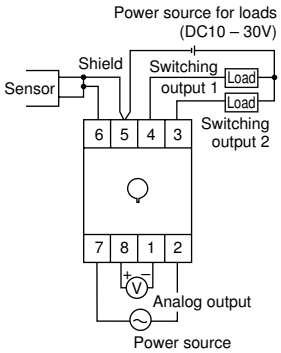
Mass: 18g

■ Wiring diagrams

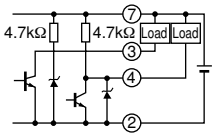
● DC



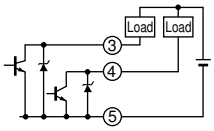
● AC



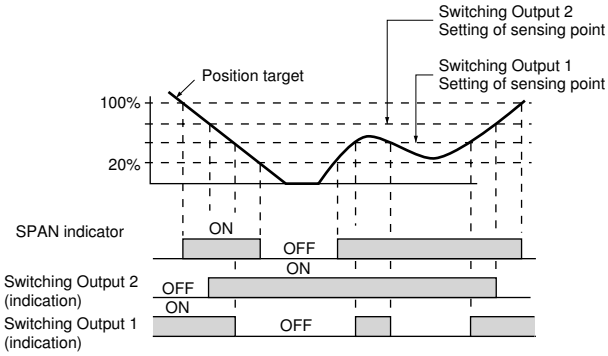
Internal circuit of output (DC)



Internal circuit of output (AC)



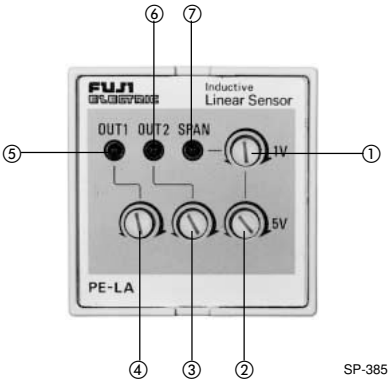
■ Timing diagrams



■ Handling of the amplifier unit

● Indicators and output adjusting dial

PE-LA



① 1V adjusting dial
Used to adjust the output voltage to 1V when the standard size target is positioned at a point 1/5th of the rated operating distance.

② 5V adjusting dial
Used to adjust the output voltage 5V when the standard size target is positioned at the rated operating distance.

③ Operating distance adjusting dial (For switching output 2)

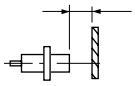
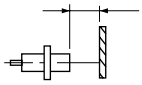
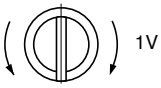
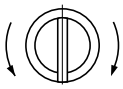
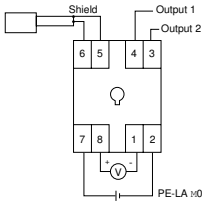
④ Operating distance adjusting dial (For switching output 1)

⑤ Operating indicator (Red)
This lamp is used to indicate the operating state of output 1. (Lights up when the output is ON. Goes out when the output is OFF)

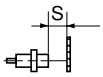
⑥ Operating indicator (Red)
This lamp is used to indicate the operating state of output 2. (Lights up when the output is ON. Goes out when the output is OFF)

⑦ SPAN indicator (Green)
Lights up when the linear output voltage is within the range from 1 to 5 Volts.

● Adjustment of analog output

Order	1	2	3
Position of target	–	1/5th of rated operating distance 	Rated operating distance 
Adjusting dial	–	 1V	 5V
Method of adjusting Method I	Connect voltmeter to terminal 1 and 8 	Position the standard size target to the position at a point 1/5th of the rated operating distance and turn the 1V adjusting dial clockwise slowly (to increase the output voltage) or counterclockwise so that the output voltage is 1V.	Position the standard size target to the position at the rated operating distance and turn the 5V adjusting dial clockwise slowly (to increase the output voltage) or counterclockwise so that the output voltage is 5V.
Method II	–	Position the standard size target at a point 1/5th of the rated operating distance and turn the 1V adjusting dial counterclockwise so that the SPAN indicator goes out, and then turn it clockwise slowly until the SPAN indicator lamp lights up.	Position the standard size target to the position at the rated operating distance and turn the 5V adjusting dial clockwise slowly so that the SPAN indicator goes out, and then turn it counterclockwise until the SPAN indicator lamp lights up.

● Adjustment of sensitivity

Position of target	
Adjusting dial	
Method of adjusting	Position the standard size target in position and turn the detecting distance adjusting dial clockwise slowly until the operation indicator lights up. Move the standard size target so as to check that it operates at the specified position.

Inductive proximity switches– Cylindrical type, PE2-C

The lineup of PE2-C series proximity switches has been augmented by the addition DC 3-wire system switches with NPN and PNP transistor outputs and 2-wire system switches usable for both AC and DC applications.

These new switches are characterized by:
- A stable operating indicator composed of a two-color (red and green) LED that enables easy and reliable setting of detection range
- Smaller dimensions and longer detecting distance due to incorporation of new IC
- Four ways to configure DC 2-wire systems, DC 3-wire systems (which provide NPN and PNP transistor outputs) and two-wire systems usable for both AC and DC applications. This wide choice of configurations makes it possible to choose appropriate switch for the circuit.

The DC 2-wire system
- Reduces wiring cost and labor
- Can be connected to such high impedance load as small relays, PLC, and NC equipment without risk of reset failure due to leakage currents of not exceeding 0.8mA and a residual voltage of 3V.
- Consumes very little current and places no burden on the power supply serving PLC.
  Make a power supply for the sensor unnecessary.
- Enables easy connection on site to load equipment having sink- and source-current input specifications.
- Has protective circuit to protect against short-circuit, reverse polarity, and surges.

The DC 3-wire system:
- Available in 16 types of units, shielded or unshielded, of varying diameter, and providing two types of output
- Also available with PNP output transistors for European machine tool applications.

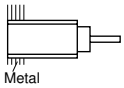
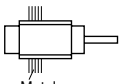
PE2-C AF91-505

- Has the same external dimensions as the PE1 series which is not equipped with stable operating indicator.

The 2-wire system switch usable for both AC and DC applications:
- Can be operated from sources from 20 to 250V DC and 40 to 250V AC.
- Reduces wiring cost and labor.
- Is unpolarized, eliminating hazard of reverse polarity connection.

05

■ Specifications

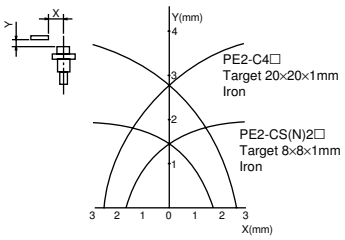
Description	Operating system	Operating distance (mm)	Target size (mm) (iron)	External diameter	Response frequency (Hz)	Supply voltage	Output	Type	Ordering code
Shielded  Metal	DC supply/2-wire, current output	2	8×8×1	M8	1500	12/24V DC Operating voltage range 10 to 30V DC	3 to 100mA 1NO	**PE2-CSN2S**	PE2S02-S
		3	12×12×1	M12	1000			**PE2-CS3S**	PE2S03-S
		7	18×18×1	M18	500			**PE2-CS7S**	PE2S07-S
		10	30×30×1	M30	400			**PE2-CS10S**	PE2S10-S
	DC supply/3-wire, NPN transistor output	2	8×8×1	M8	1500		200mA max. 1NO	**PE2-CS2D**	PE2S02-D
		3	12×12×1	M12	1000			**PE2-CS3D**	PE2S03-D
		7	18×18×1	M18	500			**PE2-CS7D**	PE2S07-D
		10	30×30×1	M30	400			**PE2-CS10D**	PE2S10-D
	DC supply/3-wire, PNP transistor output	2	8×8×1	M8	1500		200mA max. 1NO	**PE2-CS2Q**	PE2S02-Q
		3	12×12×1	M12	1000			**PE2-CS3Q**	PE2S03-Q
		7	18×18×1	M18	500			**PE2-CS7Q**	PE2S07-Q
		10	30×30×1	M30	400			**PE2-CS10Q**	PE2S10-Q
	AC/DC supply/2-wire, thyristor output	3	12×12×1	M12	1000 (DC) 25 (AC)	24/48/100/200V DC 48/100/200V AC Operating voltage range 20 to 250V DC 40 to 250V AC	5 to 100mA 1NO	**PE2-CS3W**	PE2S03-W
		7	18×18×1	M18	500 (DC) 25 (AC)			**PE2-CS7W**	PE2S07-W
		10	30×30×1	M30	400 (DC) 25 (AC)			**PE2-CS10W**	PE2S10-W
Non-shielded  Metal	DC supply/2-wire, current output	4	20×20×1	M8	1000	12/24V DC Operating voltage range 10 to 30V DC	3 to 100mA 1NO	**PE2-C4S**	PE2C04-S
		8	30×30×1	M12	800			**PE2-C8S**	PE2C08-S
		14	30×30×1	M18	400			**PE2-C14S**	PE2C14-S
		24	60×60×1	M30	100			**PE2-C24S**	PE2C20-S
	DC supply/3-wire, NPN transistor output	4	20×20×1	M8	1000		200mA max. 1NO	**PE2-C4D**	PE2C04-D
		8	30×30×1	M12	800			**PE2-C8D**	PE2C08-D
		14	30×30×1	M18	400			**PE2-C14D**	PE2C14-D
		24	60×60×1	M30	100			**PE2-C24D**	PE2C24-D
	DC supply/3-wire, PNP transistor output	4	20×20×1	M8	1000		200mA max. 1NO	**PE2-C4Q**	PE2C04-Q
		8	30×30×1	M12	800			**PE2-C8Q**	PE2C08-Q
		14	30×30×1	M18	400			**PE2-C14Q**	PE2C14-Q
		24	60×60×1	M30	100			**PE2-C24Q**	PE2C24-Q

■ Specifications

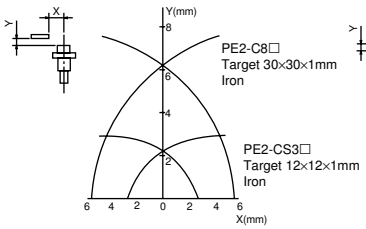
Type	**PE2-C□S** (DC supply/2-wire)	**PE2-C□D** (DC supply/3-wire)	**PE2-C□Q**	**PE2-C□W** (AC/DC supply/2-wire)
Output	Tranisistor output	NPN transistor, open collector output	PNP transistor, open collector output	Thyristor output
Ambient temperature	–25 to 80°C (no icing)			
Differential distance	Max. ±10% of operating distance			
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within a temperature range of –25 to 70°C			
Variation due to voltage fluctuation	Max. ±2% of operating distance at rated voltage when operated within ±15% of power supply voltage			
Current consumption	—	25mA max. (at 24V DC)		—
Leakage current	0.8mA max. (at 24V DC)	—		0.8mA max. (at 24V DC), 1.3mA max. (at 240V AC)
Residual voltage	3V max. (at 100mA)	1.5V max. (at 24V DC, 200mA)		6V max. (DC), 10V max. (AC)
Dielectric strength	1000V AC, 1 minute			
Insulation resistance	50MΩ or more (500V DC megger)			
Degree of protection	IP67 (IEC Standards)			
Vibration	10–55Hz, 1.5mm double amplitude (in X, Y, Z direction respectively for 2 hours)			
Shock	500m/s²			
Circuit protection	Short-circuit, reverse polarity, surge voltage			Surge voltage

■ Response curve for iron (Typical)

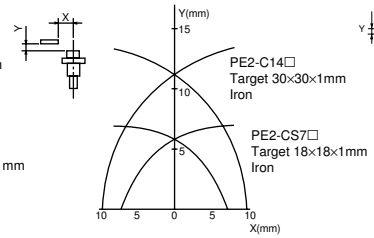
PE2-CS(N)2□
PE2-C4□



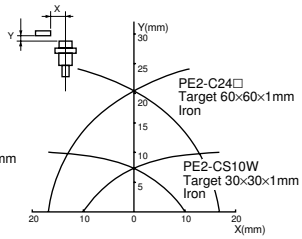
PE2-CS3□
PE2-C8□



PE2-CS7□
PE2-C14□

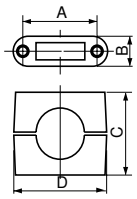


PE2-CS10W
PE2-C24□



■ Accessories (optional)

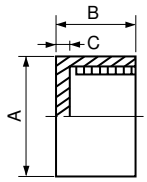
● Mounting bracket



Type (Ordering code)	A (mm)	B (mm)	C (mm)	D (mm)	Screw	Used with
PX1-P8 (PE1Z0037)	18	10	18	28	M4×20	PE2-CS(N)2□ PE2-C4□
PX1-P12 (PE1Z0033)	24	12.5	20	37	M4×25	PE2-CS3□ PE2-C8□
PX1-P18 (PE1Z0034)	32	17	30	47	M5×32	PE2-CS7□ PE2-C14□
PX1-P30 (PE1Z0035)	45	17	50	60	M5×50	PE2-CS10W PE2-C24□

● Sensor surface cover

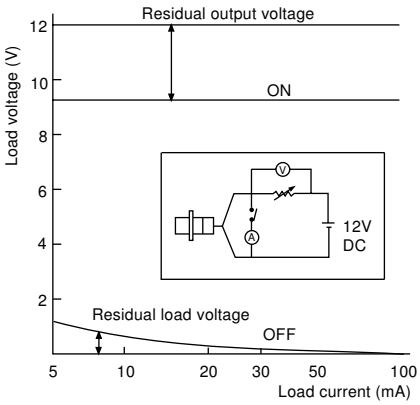
KK02-301A



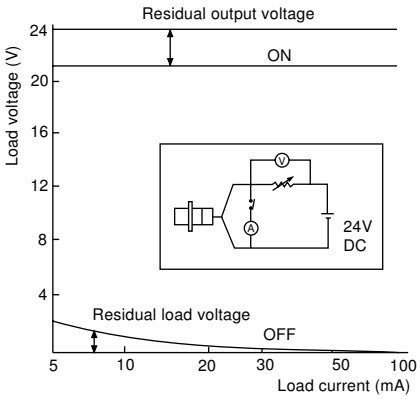
Type (Ordering code)	A (mm)	B (mm)	C (mm)	Used with
PX1-C12S (PE1Z0030)	ϕ15	5	0.6	PE2-CS3□
PX1-C18S (PE1Z0031)	ϕ22.5	8	1.1	PE2-CS7□
PX1-C30S (PE1Z0032)	ϕ35	12	1.6	PE2-CS10W

■ Residual voltage characteristics

PE2-CS□S, C□S, 12V DC

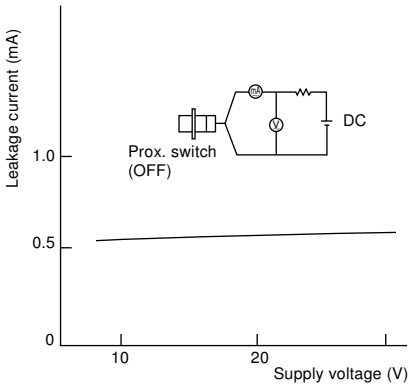


PE2-CS□S, C□S, 24V DC

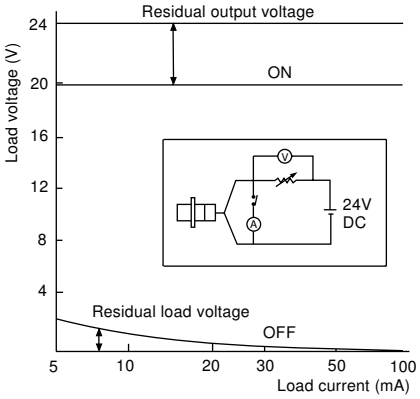


■ Leakage current characteristics

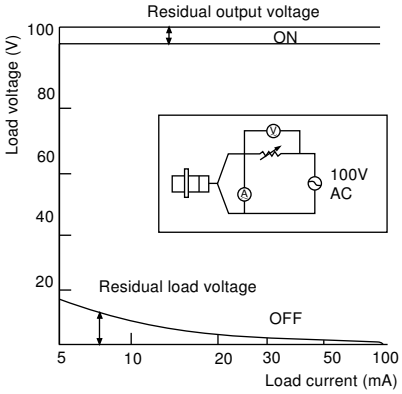
PE2-CS□S, C□S



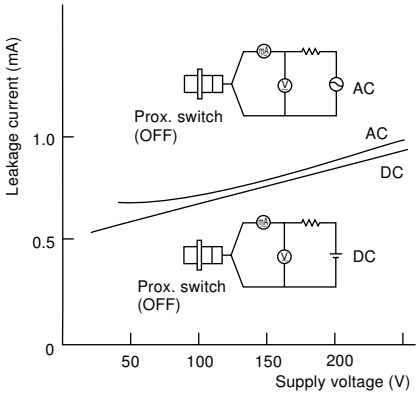
PE2-CS□W, 24V DC



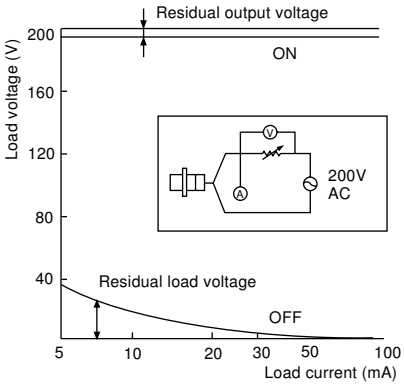
PE2-CS□W, 100V AC



PE2-CS□W



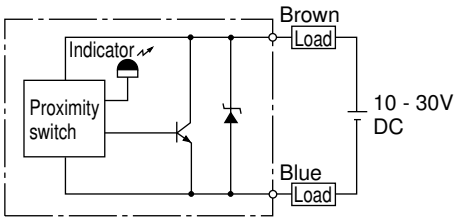
PE2-CS□W, 200V AC



■ Wiring diagrams

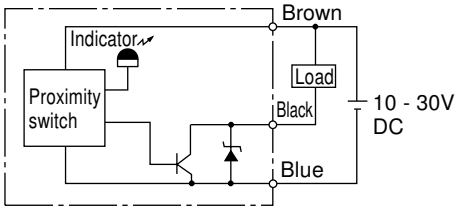
● DC supply/2-wire system

PE-C□S



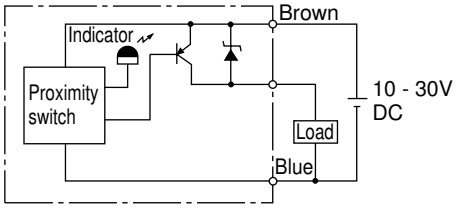
● DC supply/3-wire system

PE2-C□N NPN output



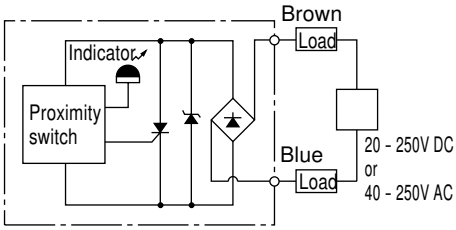
● DC supply/3-wire system

PE2-C□P PNP output



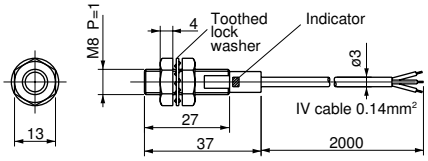
● AC/DC supply/2-wire system

PE2-C□W



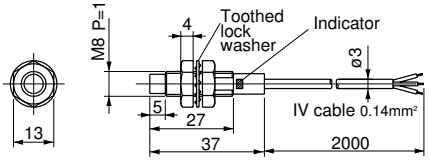
■ Dimensions, mm

PE2-CSN2S, PE2-CS2□



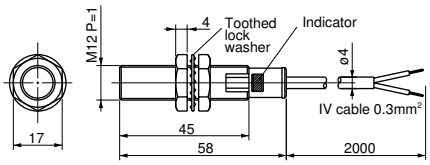
Mass: 40g

PE2-C4□



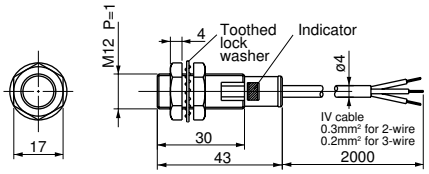
Mass: 40g

PE2-CS3W



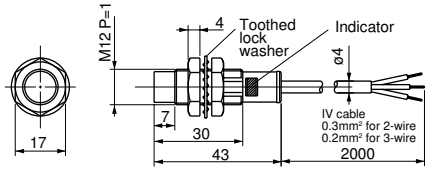
Mass: 100g

PE2-CS3□



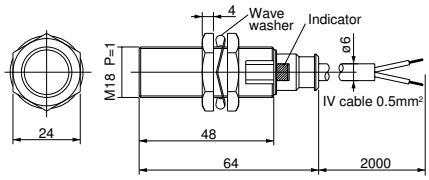
Mass: 70g

PE2-C8□



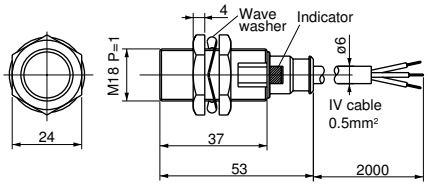
Mass: 70g

PE2-CS7W



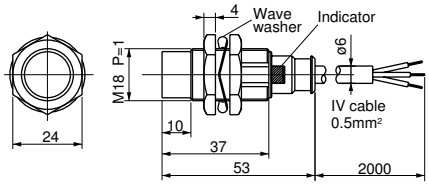
Mass: 170g

PE2-CS7□



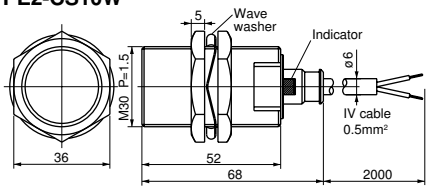
Mass: 160g

PE2-C14□



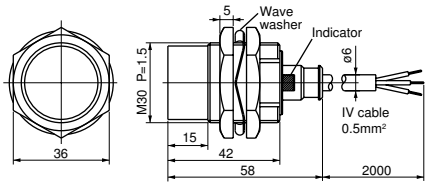
Mass: 160g

PE2-CS10W



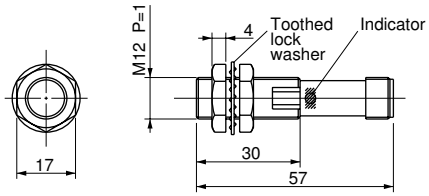
Mass: 340g

PE2-C24□



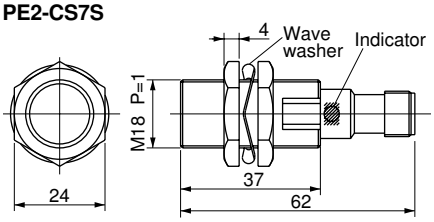
Mass: 280g

PE2-CS3S



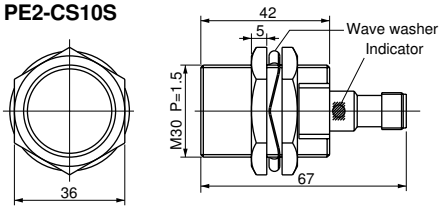
Mass: 30g

PE2-CS7S



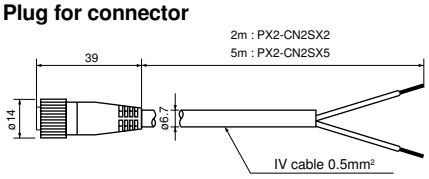
Mass: 60g

PE2-CS10S



Mass: 170g

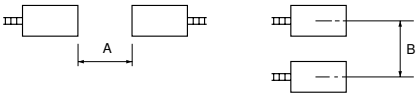
Plug for connector



Note: A mark band is attached when the oscillation frequency differs from that of standard products.

■ Mutual interference:

Be sure to space two switches at a distance greater than that shown in the table at right to prevent mutual interference.



Type	A (mm)	B (mm)
PE2-CS(N)2□	20	15
PE2-CS3□	30 (15)	20 (12)
PE2-CS7□	50 (25)	35 (18)
PE2-CS10W	100 (50)	70 (35)
PE2-C4□	80	60
PE2-C8□	120 (60)	80 (40)
PE2-C14□	200 (100)	120 (60)
PE2-C24□	350 (175)	250 (125)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

■ Ordering information

Specify the following:

1. Type number or ordering code

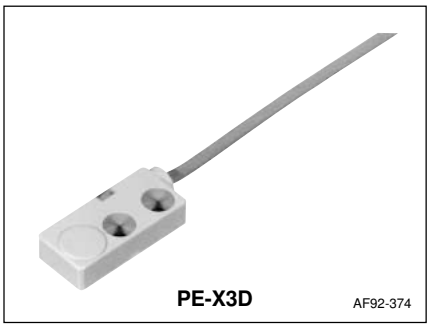
Inductive proximity switches–Flat type, PE-X3D

Easy-to-mount thin inductive type proximity switches

Operating system:
DC supply/3-wire system
Operating distance: 3mm

■ Features

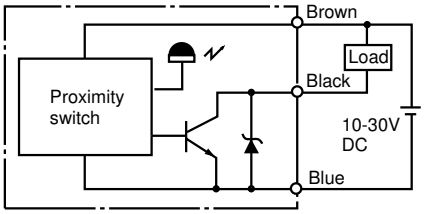
- A mere 7mm height
- Only two screws are needed to affix each switch, eliminating the need for exclusive mounting brackets
- Incorporates a stable operating level indicator
- Equipped with surge suppression circuits and protection circuits against reverse polarity



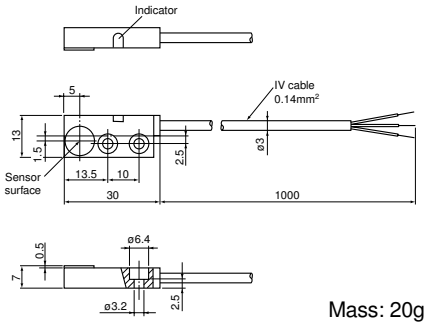
■ Specifications

Type (Ordering code)	**PE-X3D** (PE1X03-D)
Operating system	DC supply/3-wire
Output	NPN transistor, current output, 1NO
Operating distance	3mm ±10%
Target size	12 × 12 × 1mm (iron)
Differential distance	Max. ±10% of operating distance
Power supply voltage	12/24V DC
Operating voltage range	10 to 30V DC
Current consumption	15mA max. at 24V DC
Switching capacity	100mA max.
Residual voltage	1.5V max. at 24V DC 100mA
Response frequency	50Hz or more
Ambient temperature	–25 to +70°C (no icing)
Humidity	35 to 95% RH
Circuit protection	Surge voltage, reverse polarity
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within temperature range of –25 to +70°C
Variation due to voltage fluctuation	Max. ±1% of operating distance at 12/24V DC when operated within 85% to 115% of power supply voltage
Dielectric strength	1000V AC, 1 min.
Insulation resistance	50MΩ (500V DC)
Degree of protection	IP66 (IEC Standard)
Vibration	10–55Hz, 1.5mm double amplitude
Shock	500m/s²

■ Wiring diagram

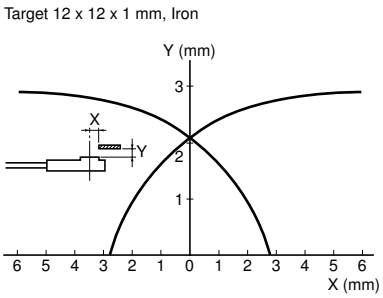


■ Dimensions, mm

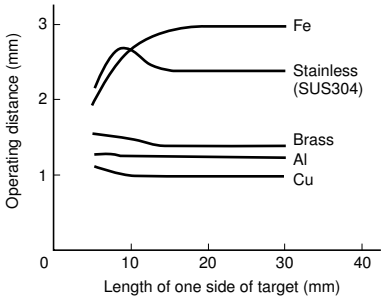


Mass: 20g

■ Response curve for iron

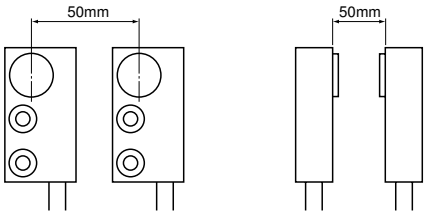


■ Material of target–Operating distance



■ Mutual interference

Be sure to space two switches at a distance greater than that shown in the figure below to prevent mutual interference.



■ Ordering information

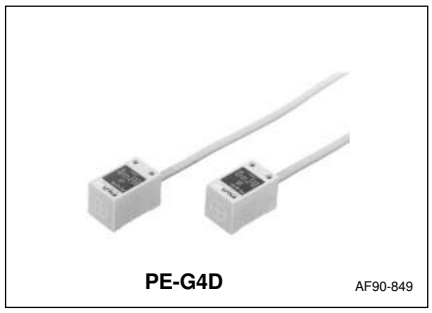
Specify the following:
1. Type number or ordering code

Inductive proximity switches– Square type, PE-G4D

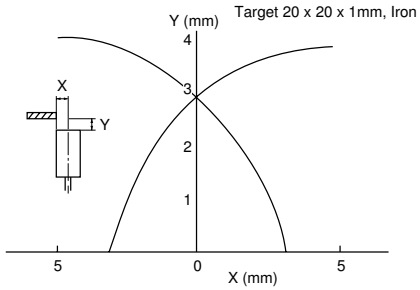
Operating system:
DC supply/3-wire system
Supply voltage range: 10 to 30V DC
Operating distance: 4mm

■ Features

- Degree of protection meets the requirements of IEC IP67, thus permitting operations in unfavorable environment.
- Only two screws are needed to affix each switch, eliminating the need for exclusive mounting brackets.
- Incorporates surge suppression circuits and protection circuits against reverse polarity and short-circuits.



■ Response curve for iron

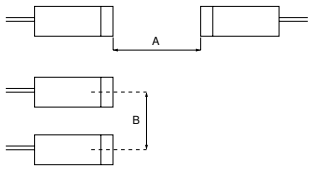


■ Specifications

Type (Ordering code)	**PE-G4D (PE1G04-D)**
Operating system	DC supply/3-wire
Output	1NO
Operating distance	4mm ±10%
Target size (iron)	20×20×1mm
Differential distance	Max. ±10% of operating distance
Rated voltage	12/24V DC (10 to 30V DC)
Switching capacity	50mA max.
Current consumption	15mA max. at 24V DC
Residual voltage	1.5V max. at 50mA
Response frequency	200Hz
Variation due to voltage fluctuation	Max. ±1% of operating distance at 12/24V DC when operated within 10 to 30V DC
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within temperature range of –25 to +70°C
Dielectric strength	2000V AC, 1min.
Insulation resistance	50MΩ or more (500V DC)
Degree of protection	IP67 (IEC)
Ambient temperature	–25 to +70°C (no icing)
Humidity	35 to 95% RH
Vibration	10–55Hz, 1.5mm double amplitude
Shock	500m/s²

■ Mutual interference

Be sure to space two switches at a distance greater than that shown in the figure below to prevent mutual interference.

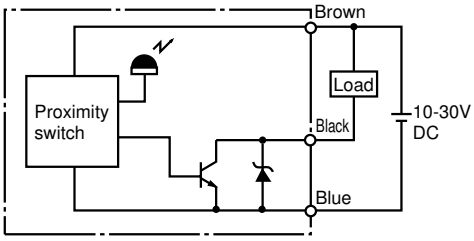


Type	A (mm)	B (mm)
PE-G4D	60	60

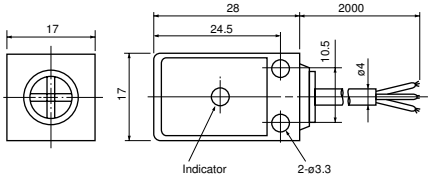
■ Ordering information

Specify the following:
1. Type number or ordering code

■ Wiring diagrams



■ Dimensions, mm



Mass: 40g

Magnetically operated reed switches, PM
Standard type

Operating distance: Maximum 35, 70, 120mm
Reed switch: 1NO, 2 Amps

■ Features

- Power source not required
- Comprises sensing magnetic element and reed switch
- Resin molded construction
- Water- and dust-tight, shock-resistant
- Breaking capacity: 0.5Amps at 220V AC
- Operating distance is longer than oscillating type.
- Economically priced
- 1 meter color-coded lead wires

■ Ordering information

Specify the following:

1. Type number or ordering code (Specify reed switch and magnet separately.)

PM-4M **PM-10M** **PM-2S**

■ Specifications

Magnet (standard type)

Type	PM-2M	PM-4M	PM-10M
Operating distance	25 – 40mm	50 – 70mm	80 – 120mm
Differential	5 – 15mm	5 – 20mm	15 – 40mm
Ambient temperature	–10° to +65°C	–10° to +65°C	–10° to +65°C

Magnet (High temperature using type)

Type	PM-2MH	PM-4MH	PM-10MH
Operating distance	25 – 40mm	40 – 70mm	100 – 140mm
Differential	5 – 15mm	5 – 20mm	15 – 40mm
Ambient temperature	–20° to +130°C	–20° to +130°C	–20° to +130°C

PM2S, PM-2SH read switches

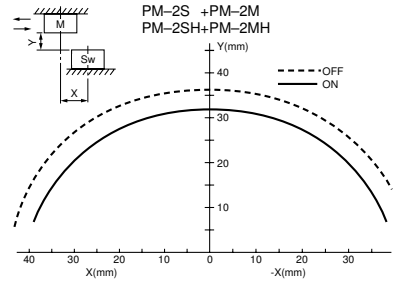
Rated operating voltage: 220V AC, DC (Max.)
Rated operating current: 0.5A (Max.)
Make and break capacity: 50W DC, 50VA AC (Max.)

Mechanical: durability 100 million operations
Electrical: 2 million operations at 200V AC 0.125A
1.4 million operations at 100V AC 0.25A
Insulation resistance: Over 100MΩ at 500V DC
Dielectric strength: 700V AC rms. 1 minute (Contact to contact)
Ambient temperature: –10 to +65°C (For 130°C use is also available)
1 meter lead wires are normally provided.

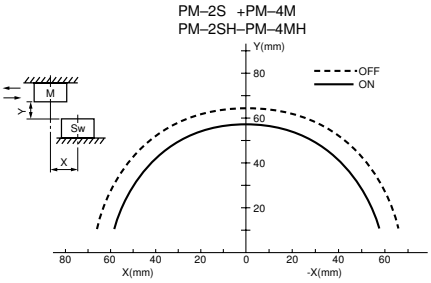
05

■ Response curves, typical

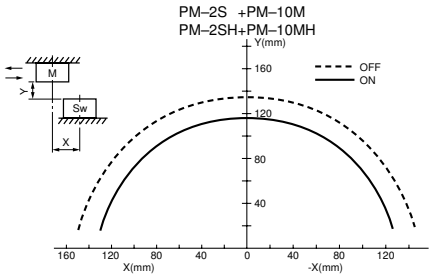
Short axis
M: Magnet
Sw: Reed switch



PM-2S



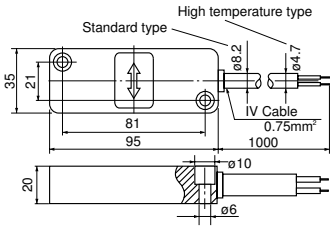
PM-2S



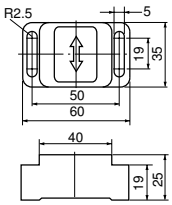
PM-2S

■ Dimensions, mm

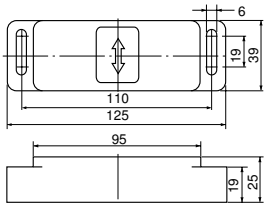
PM-2S Mass: 210g
PM-2SH



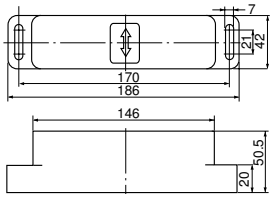
PM-2M Mass: 170g
PM-2MH



PM-4M Mass: 440g
PM-4MH



PM-10M Mass: 1300g
PM-10MH



Notes: • Reed switch and magnetic element are mounted on anti-magnetic material. The operating distance will be decreased when mounted on magnetized materials.
• Both reed switch and magnetic element cannot be used in over 5-gauss magnetic fields.

Magnetically operated reed switches–Slot type PM1U

■ Features

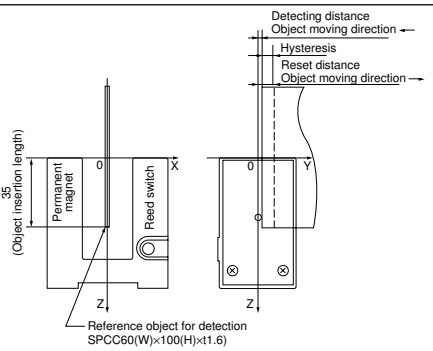
- Stable switch operation is ensured by inserting the object for detection 35mm into the switch slot.
  Ideal for detecting the position of a ferromagnetic-material plate passing in the switch slot.
- Magnetically operated switch using a sealed contact is never affected by electrical noise, ensuring highly reliable detection.
- The built-in permanent magnet enables switching of both AC and DC signals without using a power supply.
- Models with an output indicator are also available.
- Our advanced design assures superior environmental protection complying with IP67 (IEC).

PM1U KK02-304A

■ Ordering information

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

■ Specifications

Operating slot width	Detecting distance*	Hysteresis	Contact arrangement	Output indicator	Type (=Ordering code)	Measurement conditions for an operating position and hysteresis
25mm	+4 ±6mm	10mm (Max.)	1NO (ON: Detected)	Not provided	**PM1U-25ALF**	
				Provided	**PM1U-25ALF2**	
	–4 ±6mm	7mm (Max.)	1NC (OFF: Detected)	Not provided	**PM1U25BLF**	
				Provided	**PM1U-25BLF2**	

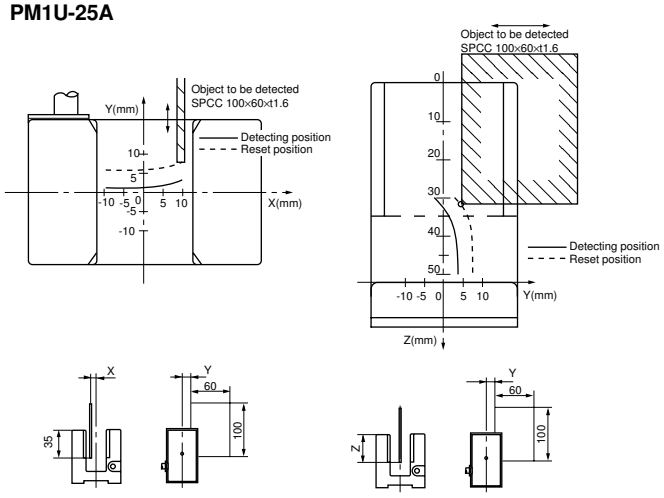
Note *: The detecting distance and hysteresis are defined in the standard detecting conditions shown above.

Type	**PM1U-25ALF**	**PM1U-25ALF2**	**PM1U-25BLF**	**PM1U-25BLF2**
Output indicator	Not provided	Provided	Not provided	Povided
Operating slot width	25mm			
Object insertion length	35mm (Min.)			
Rated operating voltage	220V AC, DC (Max.)			
Rated operating current	0.2A (Max.)			
Make and break current	0.2A (Max.)			
OFF → ON response time	2ms (Max.)			
ON → OFF response time	0.5ms (Max.)			
Life expectancy (Mechanical)	1×10^7 operations (Min.)			
Life expectancy (Electrical)	2×10^6 operations (Min.) Load: Miniature control relay HH54P 220V AC/7mA			
	3×10^6 operations (Min.) Load: Miniature control relay HH54P 100V AC/14mA			
	2×10^6 operations (Min.) Load: Resistance (24V DC/0.2A)			
	1×10^7 operations (Min.) Load: Resistance (12V DC/0.2A)			
Ambient temperature	–10 to +65°C			
Humidity	45 to 95%HR			
Vibration resistance	10 to 55Hz, 1.5mm peak-to peak amplitude, 2-hour for each of X, Y, and Z axes			
Shock resistance	300m/s², three-time for each of X, Y, and Z axis			
Output resistance at ON	6Ω (Max.)	–	6Ω (Max.)	–
Switch residual voltage at ON	–	4V (Max.)	–	4V (Max.)
Insulation resistance	100MΩ (Min.)			
Degree of protection	IP67 (IEC standard)			
Maximum signal cable length	300m			

Note: The LED indicator becomes dark when the load current is 10mA or less. (Switches with an output indicator)
1 meter lead wire is provided.

■ Object detection area (Examples)

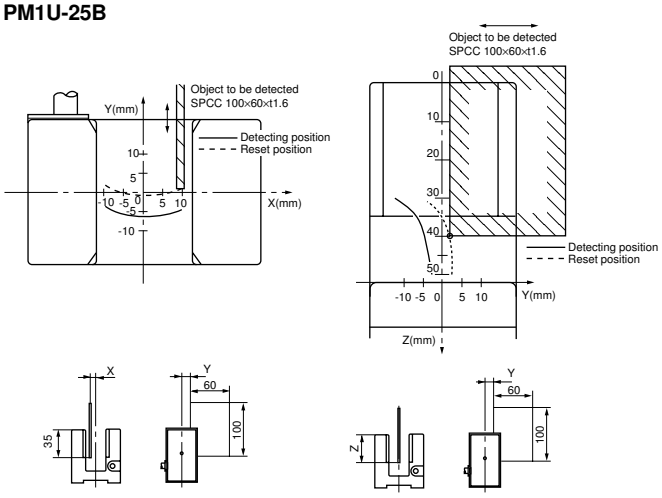
PM1U-25A



Note: The X - Y characteristics are symmetrical to the X axis.

Note: The Y - Z characteristics are symmetrical to the Z axis.

PM1U-25B

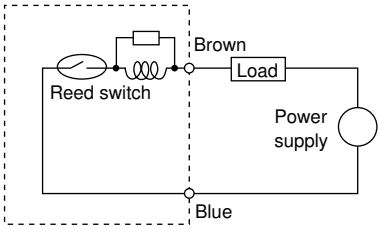


Note: The X - Y characteristics are symmetrical to the X axis.

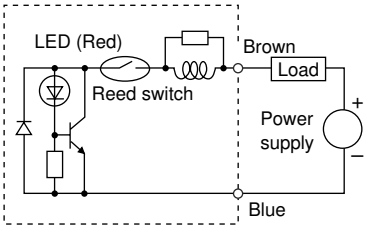
Note: The Y - Z characteristics are symmetrical to the Z axis.

■ Wiring diagrams

Switch with no output indicators



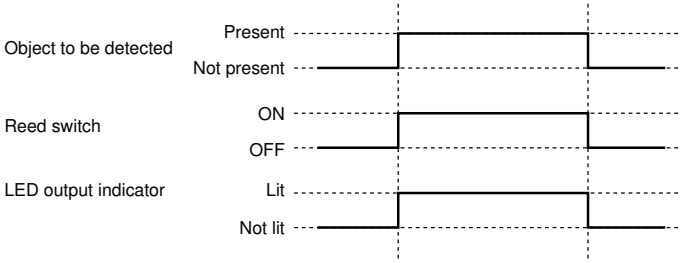
Switch with an output indicator



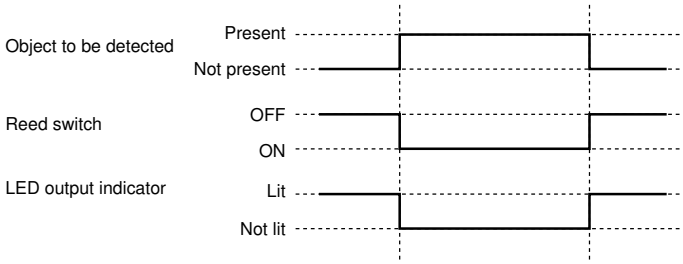
Note: When using a DC power supply, connect the brown terminal to (+) and blue terminal to (0V). Otherwise, the indicator will not go on.

■ Operation chart

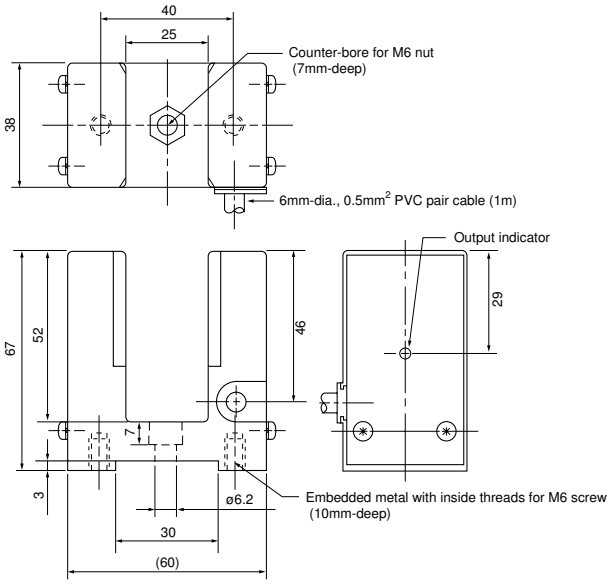
PM1U-25A□



PM1U-25B□



■ Dimensions, mm



Magnetically operated reed switches
AES

MSA CONTROL - (11) 3961-1171 - comercial@msacontrol.com.br

Magnetically operated reed switches AES

Small size

Operating distance: Max. 20, 27mm
Reed switch: 1NO
Rated thermal current: 2.5A (AES402)
2.5A (AES502)

■ Features

- Power source is not required.
  AES402 is small size, soldering terminal.
  AES502 is provided with lead wire.
- Epoxy resin molded, shock-resistant.
- Make and break capacity:
  Max. 50VA, 50W (AES402)
  Max. 50VA, 50W (AES502)
- Operating voltage:
  Max. 220V AC, DC (AES402)
  Max. 220V AC, DC (AES502)

■ Ordering information

Specify the following:
1. Type number or ordering code

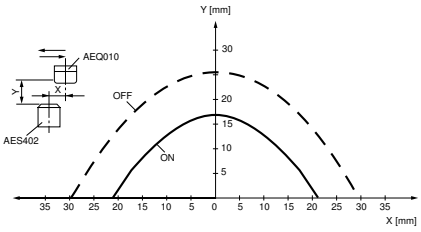
■ Specifications

Type		Contact Magnet	AES402B-1A AEQ010-1A	AES502L-3A AEQ020-1T
Ordering code		Contact Magnet	PM2B PM34	PM2D PM35
Contact			1NO	
Operating distance Differential			14–20mm 1–12mm	20–27mm 1–14mm
Repeat accuracy			0.5mm or less	
Ambient temperature			–20°C to +80°C	
Dielectric strength Between open contacts Terminal to ground			700V AC, 1 min. 1500V AC, 1 min.	350V AC, 1 min. 1500V AC, 1 min.
Insulation resistance			100MΩ or more at 500V DC	100MΩ or more at 500V DC
Life expectancy	Mechanical		10 million operations	
	Electrical		2 million operations at 100V AC 3.3VA	2 million operations at 100V AC 3.3VA

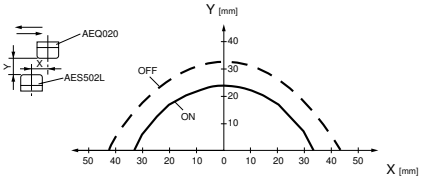
■ Response curves

Short axis

Contact: AES402B-1A
Magnet AEQ010-1A

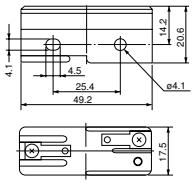


Contact: AES502L-3A
Magnet AEQ020-1T

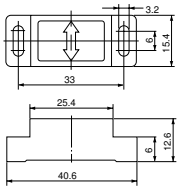


■ Dimensions, mm

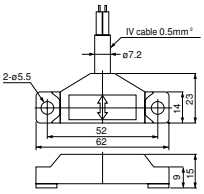
AES402B-1A



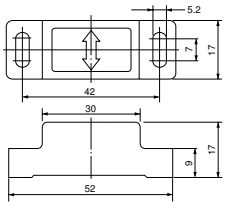
AEQ010-1A



AES502L-3A



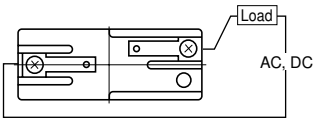
AEQ020-1T



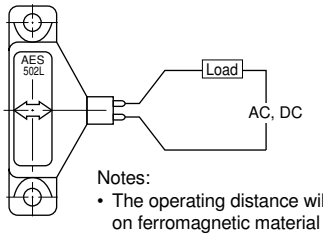
Mass:
AES402B-1A: 20g
AES502L-3A: 85g
AEQ010-1A: 20g
AEQ020-1T: 25g

■ Wiring

AES402B-1A



AES502L-3A



Notes:
- The operating distance will be decreased when mounted on ferromagnetic material such as iron.
- Both reed switch and magnetic elements can not be used in over 5-Gauss magnetic fields.

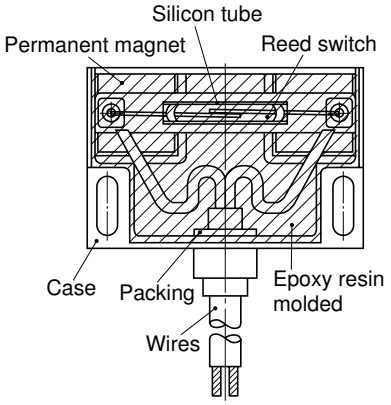
Magnetically operated reed switches AER

Operating distance: 4.0–5.5mm (at 1NO)
Reed switch: 1NO or 1NC
Rated thermal current: 2.5A

■ Features

- Sensing magnetic element and reed switch element are integrated in an epoxy molded housing.
- Power source is not required.
- Travelling direction of the metal object is not limited.
- Make and break capacity: Max. 50VA AC, 50W DC
- Operating voltage: Max. 220V AC, DC
- Water- and dust-tight

■ Construction



Notes:
- The operating distance will be decreased when mounted on ferromagnetic material such as iron.
- This switch cannot be used in over 5-Gauss magnetic fields.
- Keep a distance of over 100mm from other limit switches.

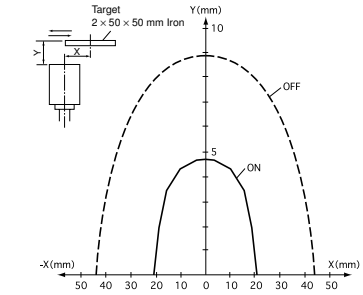
■ Specifications

Type (Ordering code)		**AER201L-1A** (PM1A)	**AER211L-1A** (PM1B)
Contact arrangement		1NO	1NC
Rated voltage AC, DC		220 max.	220V max.
Rated thermal current		2.5A	2.5A
Make and break current		Max. 0.5A AC, DC	Max. 0.5A AC, DC
Operating distance		4.0–5.5mm	3.5–5.0mm
Differential		1–5.5mm	1–5.5mm
Repeat accuracy		Less than 0.5mm	Less than 0.5mm
Ambient temperature		–20° to +80°C	–20° to +80°C
Dielectric strength		350V AC rms. 1 minute (Between open contacts)	
		1500V AC rms. 1 minute (Terminal to ground)	
Insulation resistance		Over 100MΩ at 500V DC	
Life expectancy	Mechanical	10 million operations	
	Electrical	2 million operations at 100V AC 3.3VA (Inductive)	
		2 million operations at 100V DC 1.6W (Inductive)	
		10 million operations at 12V DC 6W (Resistive)	

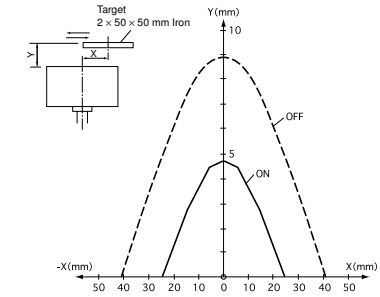
Notes:
- 1 meter lead wires are normally provided.
- The standard detected object is iron plate of 50 × 50 × 2 (mm). If the object is smaller, the operating distance is reduced.

■ Response curves

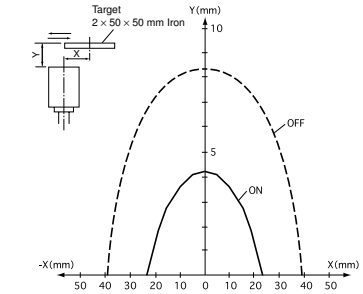
AER20 Short axis



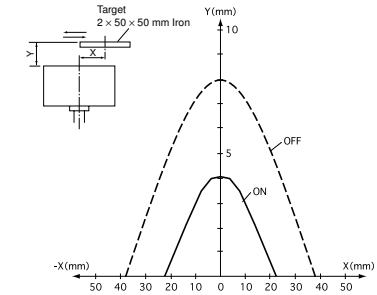
AER20 Long axis



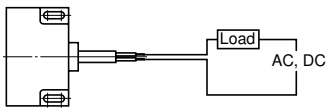
AER21 Short axis



AER21 Long axis



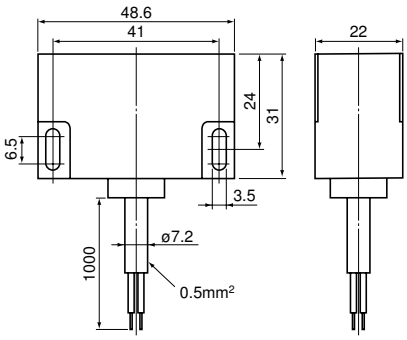
■ Wiring



■ Ordering information

Specify the following:
1. Type number or ordering code

■ Dimensions, mm

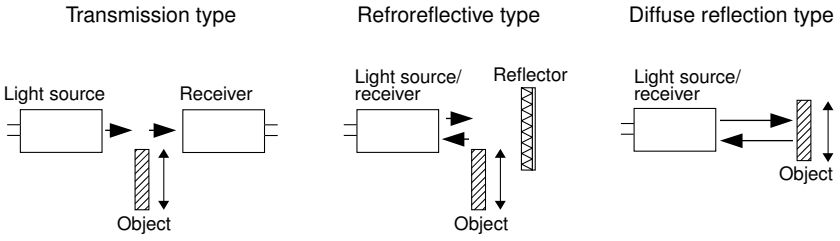


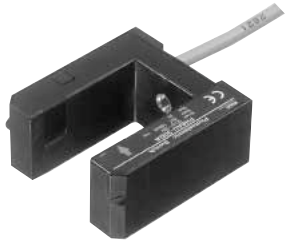
Mass: 100g

Selection guide

Basic type	**PH1C**	
Photo	 XX03-013A	
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 ± 10% (ripple ± 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°C Storage: –40 to +70°C	
Degree of protection	IP67 (IEC)	
Page	*05/56*	

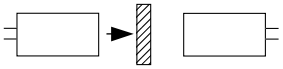
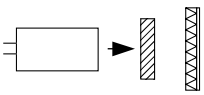
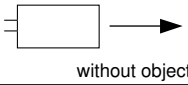
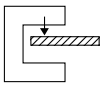
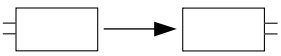
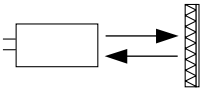
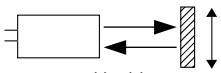
■ Detecting method



Basic type	**PH4C**	**PH8AU**
Photo	 XX03-002A	 KK02-303A
Description	AC/DC dual supply voltage. Highly compact with dimensions of 18 x 50 x 50mm. Retroreflective type equipped with mirror surface rejeciton 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 with built-in amplifier PH1C

XX03-014A,15A — **Transmission type PH1CT**

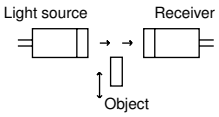
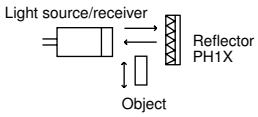
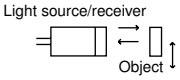
XX03-013A — **Retroreflective type PH1CR**, **Diffuse reflection type PH1CD**

XX03-007A — **Reflector PH1X**

■ 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 (±2.5˚) 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
					PH1CT-M1DCR	Receiver	2m
					PH1CT-M1DCRLN		5m
					PH1CT-M1DCT	Light source	2m
					PH1CT-M1DCTLN		5m
Retroreflective type (with mirror surface rejection) 	0.1 to 3m (using PH1X-R1) 0.1 to 4m (using PH1X-R1S)	Red LED			**PH1CR-3MDC**	Light source/ receiver	2m
					PH1CR-3MDCLN		5m
Diffuse reflection type 	1m	Infrared LED			**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	Orange LED
	Stability level indicator	Green LED (Receiver)	Green LED	Green LED
Connection		Attached cable (2m, 0.2mm²)		
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/s² (2 hours for each X, Y, Z direction)		
Shock		500m/s² (3 times for each X, Y, Z direction)		
Material	Casing	Polybutylene terephthalate resin (PBT)		
	Lens	Polyarylate resin (PAR)	Methacrylic resin (PMMA)	Polyarylate resin (PAR)
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

PH 1C T-M1 D C □ □

Basic type
PH : Photoelectric switch

Series
1C : With built-in amplifier

Detecting method
T : Transmission type
R : Retroreflective type
D : Diffuse reflection type

Detecting distance
1M : 1m
3M : 3m
M1 : 10m

Output
D : NPN transistor, open collector output

Output operatoin mode
C : Dark-ON, Light-ON selectable

Supplied item
Blank : Light source and receiver, (PH1CR, PH1CD)
T : Light source
R : Receiver

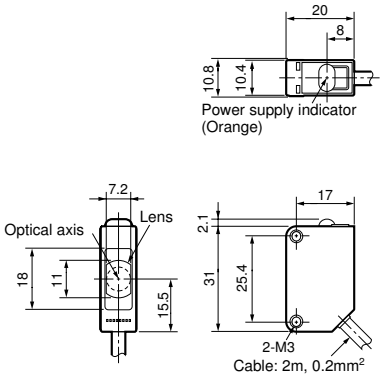
Cable length
Blank : 2m
LL : 3m
LN : 5m
SN : 5m (PH1CT-M1DC)
ST : 10m (PH1CT-M1DC)

● Ordering information
Specify the following
1. Type number

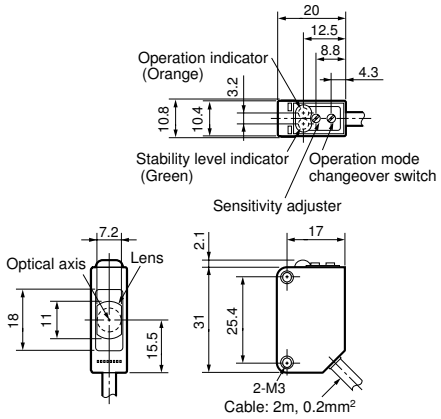
■ Dimensions, mm

● PH1CT-M1DC

Light source

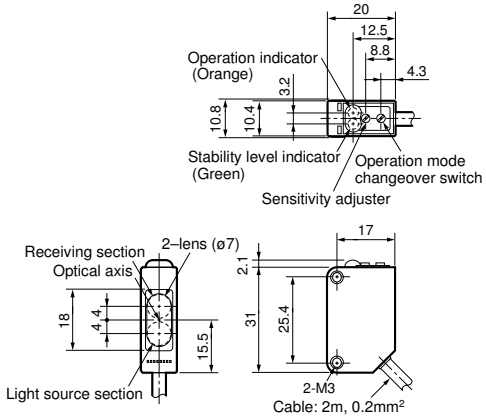


Receiver



● PH1CR-3MDC, PH1CD-1MDC

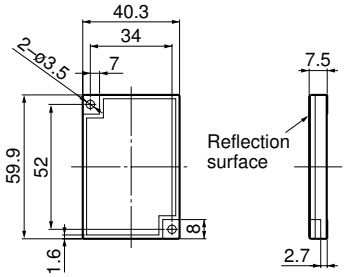
Light source/receiver



■ Dimensions, mm (sold separately)

● Reflector

PH1X-R1, PH1X-R1S

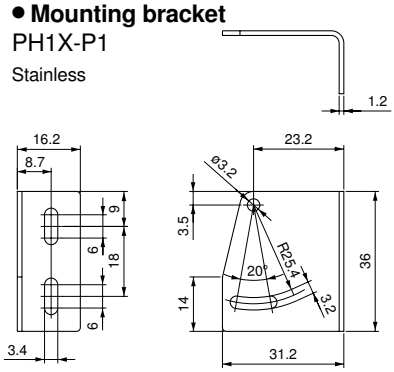


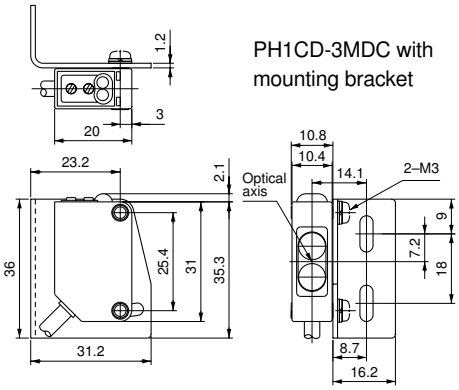
Reflection surface: Methacrylic resin (PMMA)
Reverse side: Acrylonitrile butadiene styrene resin (ABS)

● Mounting bracket

PH1X-P1

Stainless



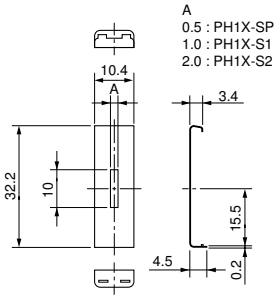


PH1CD-3MDC with mounting bracket

● Slit

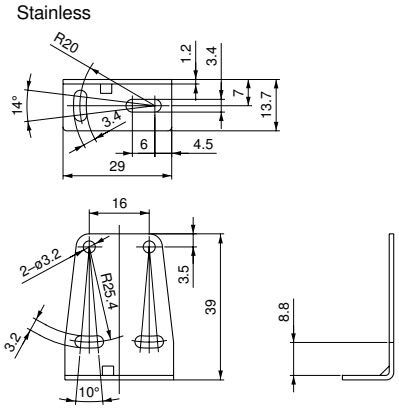
PH1X-SP, PH1X-S1, PH1X-S2

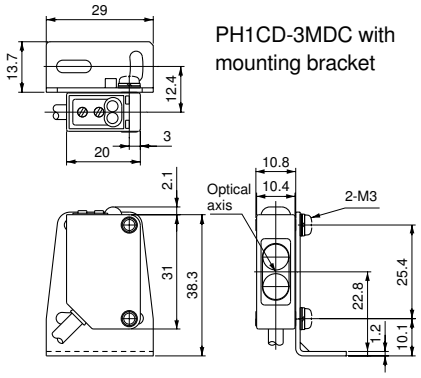
Stainless



PH1X-P2

Stainless





PH1CD-3MDC with mounting bracket

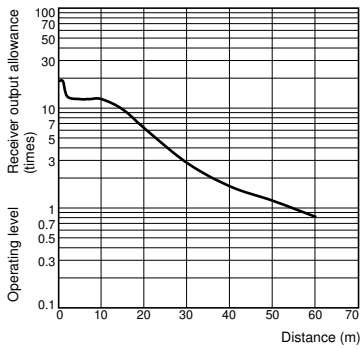
● Detection characteristics using PH1X slit

Photoelective 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

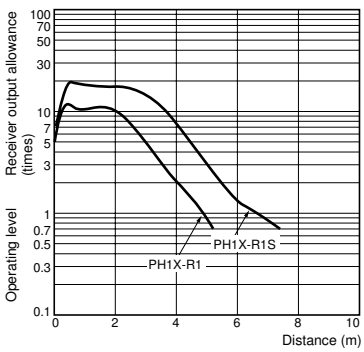
■ Characteristic curve, typical

● Receiver output-Distance

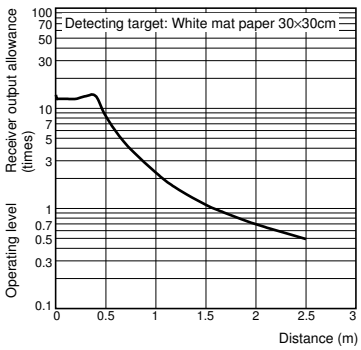
PH1CT-M1DC



PH1CR-3MDC + Reflector

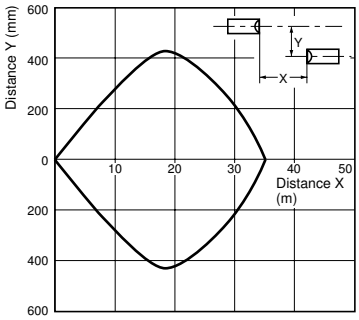


PH1CD-1MDC

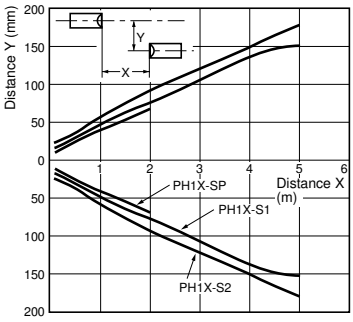


● Setting range of light source and receiver head

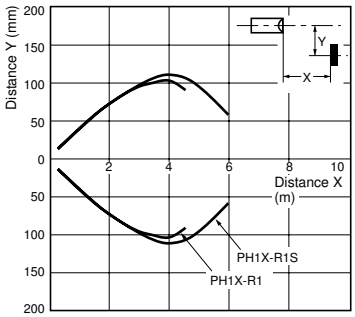
PH1CT-M1DC



PH1CT-M1DC + Slit

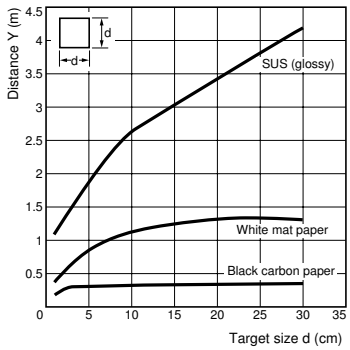


PH1CR-3MDC + Reflector



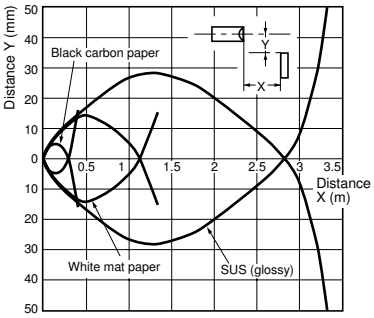
● Size of detecting target - Distance

PH1CD-1MDC



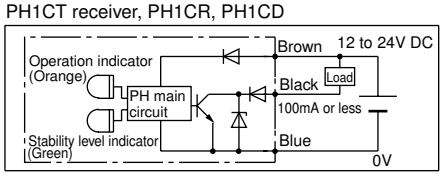
● Operating range

PH1CD-1MDC

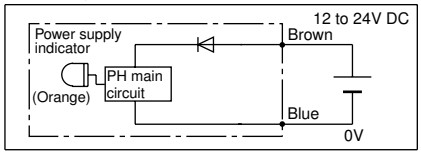


■ Wiring diagrams

PH1CT receiver, PH1CR, PH1CD

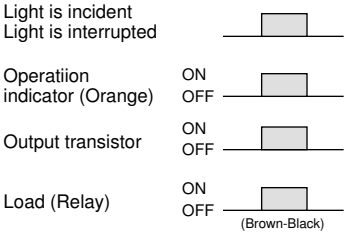


PH1CT light source

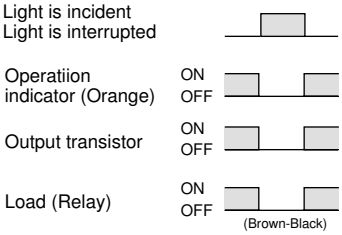


■ Timing diagrams

● "Light-ON" mode (switch: L side)



● "Dark-ON" mode (switch: D side)



■ 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**	**Ope**	Allowance
Light-ON	Dark-ON		(green)	(orange)	
Stable incident	Stable shade		ON	ON	Operation level ×1.11
Unstable incident	Unstable shade		OFF	ON	Operation level
Unstable shade	Unstable incident		OFF	OFF	Operation level ×0.86
Stable shade	Stable incident		ON	OFF	

■ Optical axis adjustment

● Transmission type

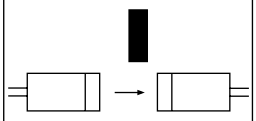
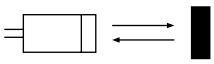
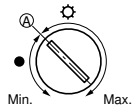
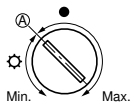
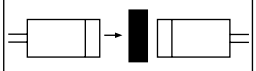
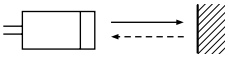
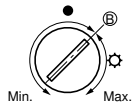
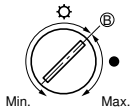
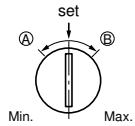
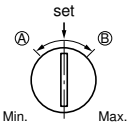
Swinging the light source and receiver up and down and right and left when no objects exist, set and fix the light source and receiver to the center within the range where the operation indicator (orange) is lit or is turned off (Dark-ON). At the same time make sure that the stability level indicator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

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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

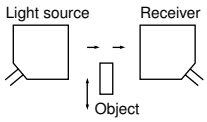
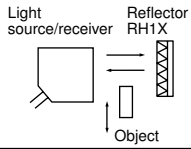
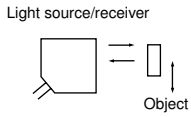

XX03-003A
Transmission type PH4CT


XX03-002A
Retroreflective type PH4CR


XX03-001A
Diffuse reflection type PH4CD


XX03-007A
Reflector PH1X-R1S

■ 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 Dark-ON	**PH4CR-4MRA** **PH4CR-4MRB**	Light source/ receiver	2m
	With mirror surface rejection	0.1 to 2.5m (0.1 to 3.5m)*			Light-ON Dark-ON	**PH4CR-2HRA** **PH4CR-2HRB**	Light source/ receiver	2m
Diffuse reflection type 		30cm	Infrared LED		Light-ON Dark-ON	**PH4CD-3CRA** **PH4CD-3CRB**	Light source/ receiver	2m

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

■ Ratings and specifications

Detection method		Transmission type	Retroreflective type Without mirror surface rejection	With mirror surface rejection	Diffuse reflection type
Type	Light-ON	**PH4CT-5MRA**	**PH4CR-4MRA**	**PH4CR-2HRA**	**PH4CD-3CRA**
	Dark-ON	**PH4CT-5MRB**	**PH4CR-4MRB**	**PH4CR-2HRB**	**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 5m (using PH1X-R1S) *	0.1 to 2.5m (usingPH1X-R1) * 0.1 to 3.5m (using PH1X-R1S) *	30cm (white mat paper 10x10cm)
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 ø =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, 0.3mm²)			
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/s² (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

PH 4C T-5M R A

Basic type
PH : Photoelectric switch

Series
4C : with AC/DC supply voltage

Detecting method
T : Transmission type
R : Retroreflective type
D : Diffuse reflection type

Detecting distance
3C : 30cm
2H : 2.5m
4M : 4m
5M : 5m

Operatoin mode
A : Light-ON
B : Dark-ON

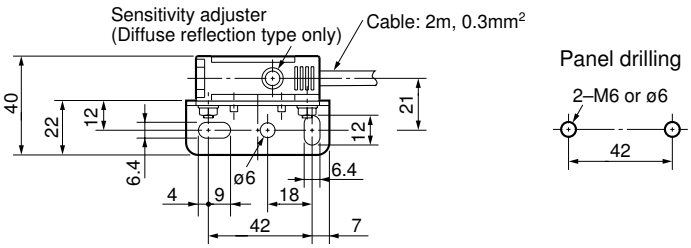
Output
R : Relay output

● Ordering information

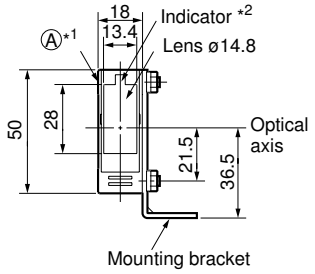
Specify the following
1. Type number

■ Dimensions, mm

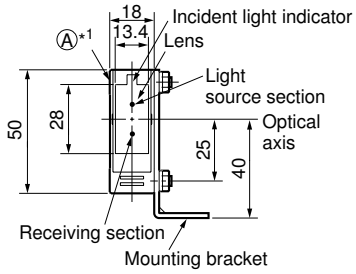
● PH4CT, PH4CR, PH4CD

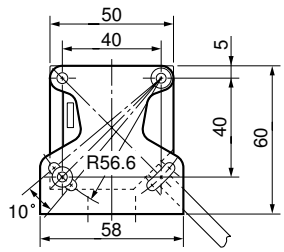


PH4CT



PH4CR, PH4CD

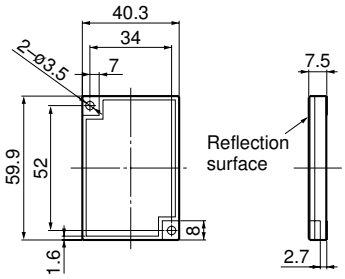




*1 Mounting bracket can be fit on the side "A" too.
*2 Power supply indicator for light source, incident light indicator for receiver

● Reflector for PH4CR

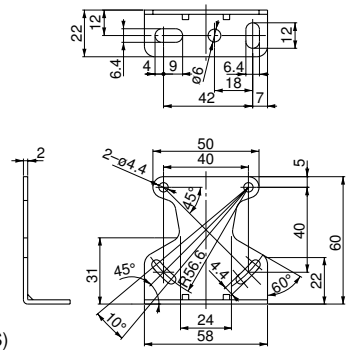
PH1X-R1 (supplied)
PH1X-R1S (optional)



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

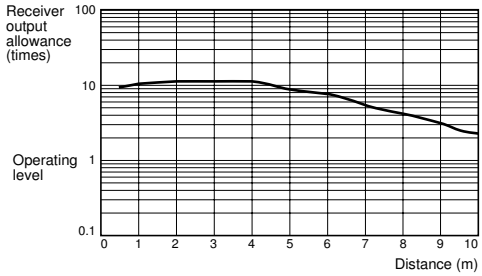
● Mounting bracket

PH4X-P1

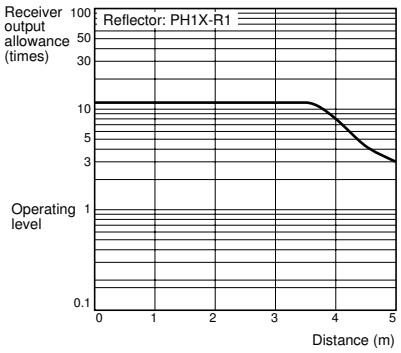


■ Characteristic curve, typical

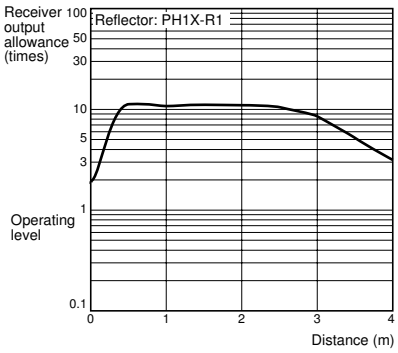
Receiver output - Distance
PH4CT-5MR



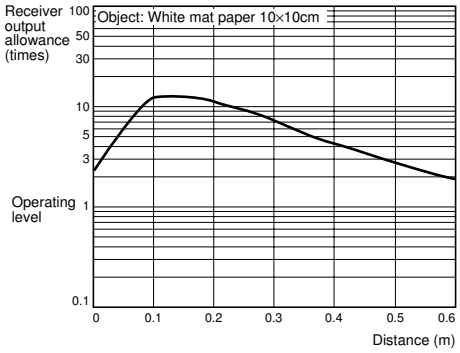
PH4CR-4MR + PH1X-R1 (supplied)



PH4CR-2HR + PH1X-R1 (supplied)



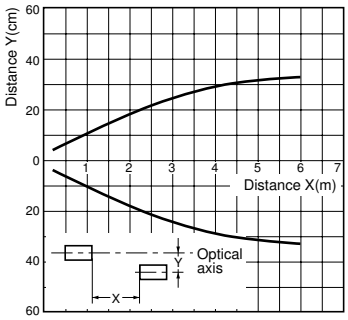
PH4CD-3CR



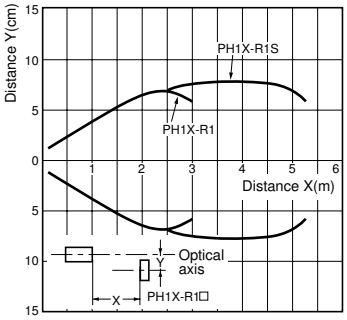
■ Characteristic curve, typical

● Setting range of light source and receiver head

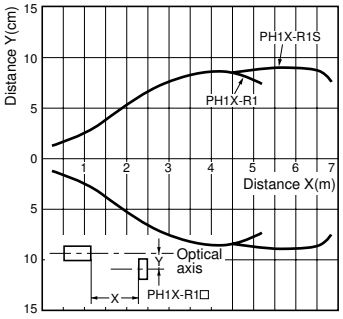
PH4CT-5MR



PH4CR-2HR + Reflector

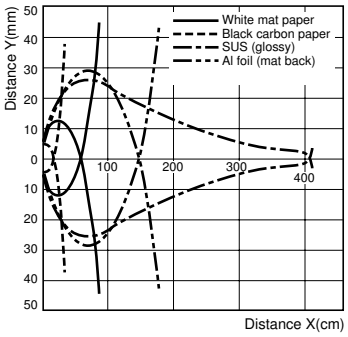


PH4CR-4MR + Reflector



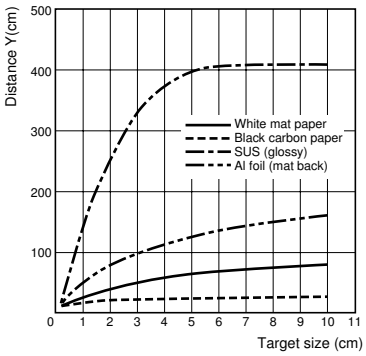
● Operating range

PH4CD-3CR



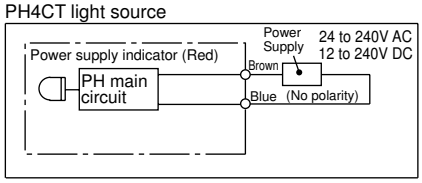
● Size of detecting target - Distance

PH4CD-3CR

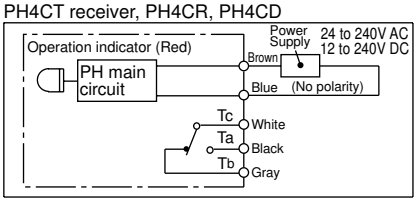


■ Wiring diagrams

PH4CT light source



PH4CT receiver, PH4CR, PH4CD



■ Timing chart

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

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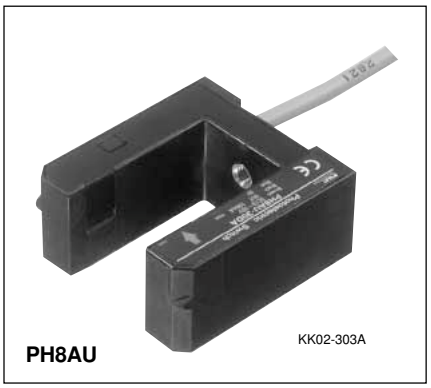
Slot-type photoelectric switches PH8AU

■ 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 magnefically 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.

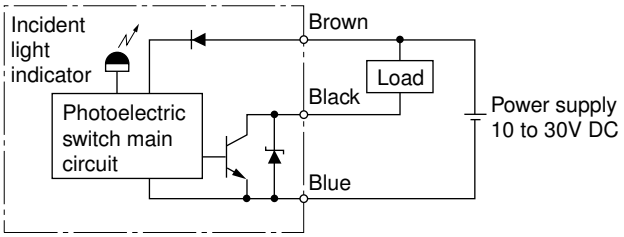


PH8AU

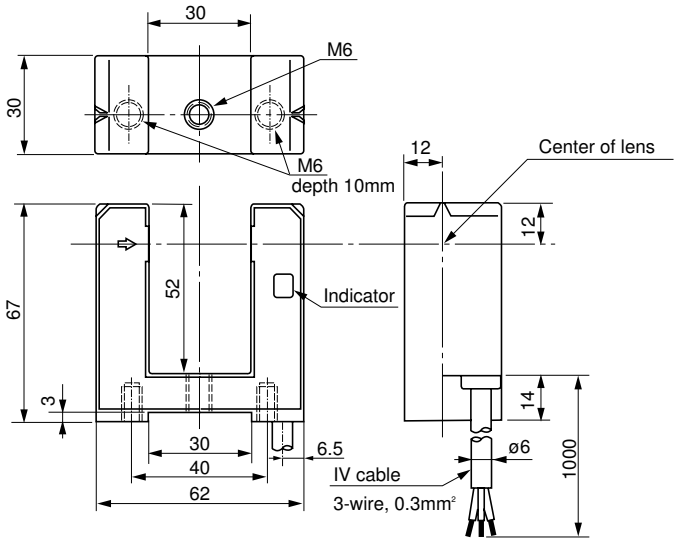
■ Specifications

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/s² three times for each of three directions X, Y and Z	
Protection circuit		Reverse connection and surge voltage	
Material	Lens	PC	
	Casing	PPS	

■ Wiring diagrams



■ Dimensions, mm



Mass 150g

■ Type number nomenclature

PH8A U-30 D A LF

Basic type

Detecting method
U: Slot type

Detecting distance
30: 30mm

Power supply and output
D: DC supply, NPN transistor open collector output

Operation
A: Dark-ON
B: Light-ON

Cable length
LF: 1m

■ Ordering information

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

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- Follow the regulations of industrial wastes when the product is to be discarded.
- The products covered in this catalogs have not been designed or manufactured for use in equipment or systems which, in the event of failure, can lead to loss of human life.
- If you intend to use the products covered in this catalog for special applications, such as for nuclear energy control, aerospace, medical, or transportation, please consult our Fuji Electric FA agent.
- Be sure to provide protective measures when using the product covered in these catalogs in equipment which, in the event of failure, may lead to loss of human life or other grave results.
- Follow the directions of the operating instructions when mounting the product.