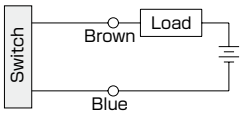
SWITCH

INDEX★

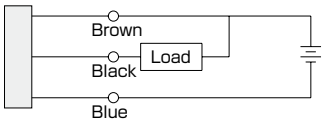
CIRCUIT FOR SWITCH

■Basic

●For 2 wires



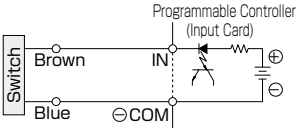
●For 3 wires



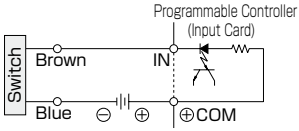
■Connection to Programmable Controller (Sequence Controller)

●For 2 wires

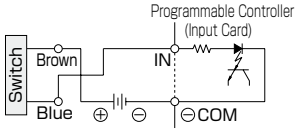
Sink Input
(Internal Power Source)



Sink Input
(External Power Source)

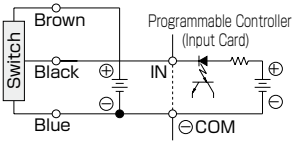


Source Input

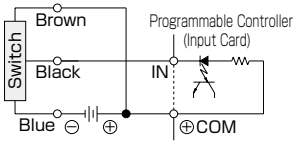


●For 3 wires: NPN t ype

Sink Input
(Internal Power Source)

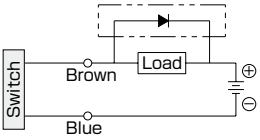


Sink Input
(External Power Source)

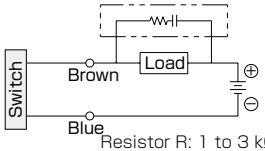


■Contact Protection Circuit (Load Surge Absorbing Circuit)

●Protection Circuit for DC Power Source

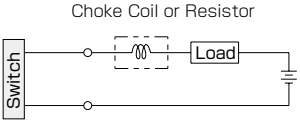


●Protection Circuit for AC Power Source



Resistor R: 1 to 3 kΩ
Capacitor C: 0.1 μF

■Cable Surge Absorbing Circuit



Choke Coil :12μH～3mH
Resistor: 10～200Ω

Notes on Switch

■ Notes on design

⚠ WARNING

Interlock

Switches are intended for detecting the activation position of actuators and not equipped with control functions aimed at ensuring safety such as an interlock.

Contact Protection Circuit (Measure against Surge Voltage)

A surge voltage is generated when an inductive load such as a relay and solenoid is connected. Provide a contact protection circuit. See "Switch Connection."

Parallel Connection and Leakage Current

For activating the internal circuit, a two-wire non-contact switch has a small current running as a leakage current even when it is turned off.
When the leakage current is larger than the operating current of the load, the load remains turned on.
With a programmable controller (sequence controller), make sure that the "off current value" of the input unit is larger than the leakage current value.
If the leakage current is larger, use a three-wire switch.
When switches are connected in parallel, the leakage current is the sum total of those of the respective switches.

Serial Connection and Voltage Drop

If switches with an indicator are connected serially, a voltage drop occurs due to the internal resistance of the LEDs, etc.
The voltage applied to the load side is the result of subtracting the sum total of the internal voltage drops of the respective switches from the power supply voltage value with the power supply internal resistance taken into account. There may be cases where the load does not operate even if the switches operate normally. Check the minimum operating voltage of the load.

Power Supply

When using a commercially-available switching regulator for the power supply, be sure to ground the frame ground (F.G.) terminal.
When using a transformer to convert AC to DC for use, be sure to use an insulation transformer.
Using an autotransformer may cause damage to the switch or power supply.
If any surge is generated in the power supply, connect a surge absorber to the source to absorb the surge.

Switch Wiring Length

Long switch wiring may cause an excessive current to flow in the contact due to the inrush current generated when the switch is turned on and it may remain turned on.
When the wiring length exceeds 10 m, provide a cable surge absorbing circuit. See "Switch Connection."

Position Detection in the Middle of Stroke

When a switch is used for detecting a position in the middle of a stroke, the switch may not be turned on if the actuator operating speed is too high.
Even when the switch is turned on, the relay is not turned on if the activation time of the switch is shorter than that of the relay.
With a programmable controller, any signal with the activation time shorter than the input time constant cannot be recognized as a signal.
In this case, reduce the actuator operating speed.

Actuator Installation Interval

A switch is activated by the magnet mounted on the actuator. If two or more actuators are brought too close to each other, the magnet of each of them may interfere to cause switch malfunction.

■ Notes on Operating Environment

⚠ DANGER

Use in Dangerous Atmosphere

Switches do not have an explosion-proof structure. Do not use them in places where explosive gas generates dangerous atmosphere or susceptible to explosion, combustion or ignition.

⚠ WARNING

Use in Strong Magnetic Field

Do not use in a strong magnetic field, which may cause malfunction or faulty operation of switches due to magnetic change of the integrated magnet or change of magnetic field distribution.

Adjacency of Magnetic Bodies

If any magnetic body such as iron is attached or brought in proximity to an actuator with a switch, the magnetic force of the integrated magnet may be lost or the magnetic field may change, rendering the switch non-functional. Take measures such as change to a nonmagnetic material. A similar condition may occur if iron powder such as chips, wear debris and welding spatters is accumulated during operation.

Operating Environment

The waterproofing property of switches conforms to the IEC IP66 (JIS C 0920 water tight type) or IP67 (JIS C 0920 immersion proof type) but environment subject to constant splashes of water may cause insulation failure. In addition, places subject to oil content of machining or other oils, acidic or alkaline liquids or organic solvents, or splashes or atmosphere of them or water vapor, may cause hardening or insulation failure of leads. Do not use in places subject to a large amount of dust.

Impact

If excessive impact is applied during operation, contact switches may malfunction.Use of non-contact switches instead can mitigate the problem but be sure to check the impact resistance value in the specification before use.

Vibration

Do not use switches in any environment subject to vibration, which may cause malfunction of or damage to switches or loosening of mounting brackets.If it is unavoidable, ensure that the vibration is not conducted.

Places subject to Surges

In and around an area subject to surges, the semiconductor devices in non-contact switches may be adversely affected. Take measures such as grounding the frame ground (F.G.) terminal of the device that generates surges.

Temperature Variation

Even within the operating temperature range, rapid variation of the ambient temperature may cause malfunction of or damage to switches.

■ Notes on Handling

⚠ WARNING

Handling of Switches

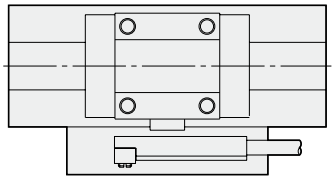
Impact applied to switches due to falling, etc. may damage the interior of switches.

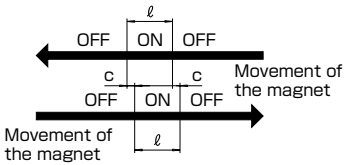
Handling of Leads

Applying excessive tension to leads may cause breaking of the leads inside the cables or damage to the interior of switches.

Switch Setting Position (Hysteresis and Operating Distance)

The distance between the point where the switch turns on by movement of the magnet and the point where it turns off by movement in the opposite direction is referred to as the hysteresis (c) and setting the switch in this range may make it susceptible to disturbance, causing unstable operation. The distance between the point where the switch turns on by movement of the magnet and the point where it turns off by further movement in the same direction is referred to as the operating distance (ℓ). The center position of these is referred to as the maximum sensitivity position and setting the switch at this position makes it resistant to disturbance, which achieves stable operation.The operating distances and hystereses provided on the pages corresponding to the respective series are reference values. Allow for variation of approximately ± 40% depending on the variation between products and operating conditions. The value may more greatly vary depending on the operating conditions.





Tightening Torque for securing Switches

Tightening switch securing screws or mounting brackets with torque larger than specified may cause damage to the switches or brackets. Insufficient torque may cause displacement during operation. Keep to the specified tightening torque for mounting.

■ Notes on Wiring

⚠ WARNING

Power Supply Voltage

Using outside the operating voltage range or connecting switches designed for DC use to AC power supply may cause rupture or burnout.

Wiring of Leads

Before wiring, make sure that the power supply is turned off. If any switch is mounted on a moving part, provide some looseness in the cable and ensure that it is not get caught in the moving part in order to prevent stressful bending and take measures such as connection that allows replacement of the cable.
When bundling together with air piping by using a spiral tube, provide some looseness in the wiring to prevent excessive force from being applied.

Connection of Load

Connecting a two-wire switch directly to power supply without connecting any load such as a relay or programmable controller for operation causes instant overcurrent, leading to rupture or burnout.

Load Short Circuit

Operating a switch with the load short-circuited causes overcurrent, leading to instant rupture or burnout.

Polarity

Switches designed for DC use have polarity. Be sure to wire correctly. The brown lead is positive (+) and the blue lead is negative (−). Wrong wiring may cause phenomena as shown below. Even if the switch is not damaged, avoid using with wrong wiring. Reverse-polarity wiring of a contact switch does not hinder switch operation but the LED is not illuminated. Reverse-polarity wiring of a non-contact switch does not damage the switch but the switch does not function. With a three-wire switch, reversing the power supply line (brown) and the output line (black) causes the switch to be damaged. Reversing the brown (positive) and blue (negative) power supply lines of a non-contact switch does not damage the switch but the switch does not function.

Insulation of Wiring

Make sure that the lead connections, extension cables and terminal block do not have insulation failure. Insulation failure may cause overcurrent in the switch, leading to rupture or burnout.

Adjacency of High-Voltage or Large-Current Cable

Do not wire in parallel with or in the same conduit as high-voltage cables or power lines.
It may cause induction, leading to malfunction of or damage to the control circuit including the switch.

■ Notes on Maintenance and Inspection

⚠ WARNING

Check for Loosening of Screws and Brackets

Loosening of switch mounting screws or brackets may cause displacement of the switch, causing unstable operation or malfunction.
Readjust the position and tighten with the specified torque.

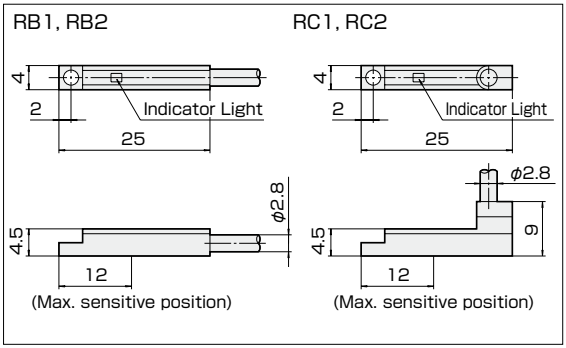
Check for Damage to Leads

Any damaged sheath of lead indicates the possibility of insulation failure or broken wire.
Replace the switch or repair the lead immediately.

CE Conforming to EN/IEC standard

RB(RC)1, 2／REED SWITCH

Dimensions



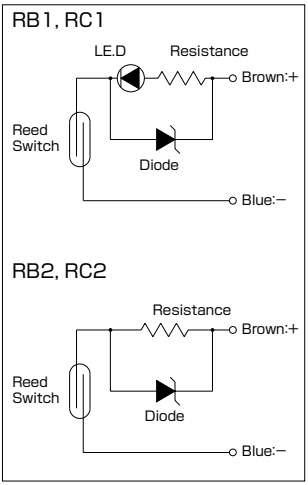
Notes: RB2 and RC2 have light windows for indicator but un-iluminative

SPECIFICATIONS

Type	2 Wires Reed Switch (with indicator light)		2 Wires Reed Switch (without indicator light)	
Model Type	RB1	RC1	RB2	RC2
Direction of Cable Outlet	Straight Outlet Cable	Angle Outlet Cable	Straight Outlet Cable	Angle Outlet Cable
Load Voltage	DC12～24V			
Load Current	3～24mA		40mA or less	
Average Response Time	1ms or less			
Opernting Tempature Range	5～60℃			
Shock Resistance	30G			
Cable	φ2.8, 0.15㎟, 2 Wire (+: Brown, −: Blue) oil-proof. bending-resistant vinyl cabtyre code			
Cable Length	Standard: 1m Switch model code LA suffixed: 3m			
Indicator Light	Red LED (lights up at ON status)		Without indicator light	
Application	※※Relay. Programmable controller			
Internal Voltage Drop	2.6V or less		0.2V or less	
Leakage Current	0			
Insulation Resistance	50MΩ or more at DC250V MEGGER (between lead wire and case)			
Dielectric Strength	AC500V for 1 minute (bet ween lead wire and case)			
Protective Structure	IP67			

Note. When induction load such as Relay is used, set up a load surge protection circuit.

INTERNAL CIRCUIT OF THE SWITCH



APPLICABLE MODEL

PPT, PPU, PRZ, PSL, PSU, PRD, PPTN
PRM, CTR, PST
FXTW
GXA
CTW(X), CZL

MODEL CODE OF FIXTURE

Example:BE (PPT)

Fill in ( ) as the series name after BE.
Fill in ( ) as CT for only CTW and CTX.
BE (CT)

Example:BF (PST)

For PPT6Y, CTR, PRM, PST, PRZ, the code of fixture is BF.

SWITCH + MODEL CODE OF FIXTURE

Example:RC1LA (PPT)

Fill in ( ) as the series name after BE.
Fill in ( ) as CT for only CTW and CTX.

Example:RC2 (CT)

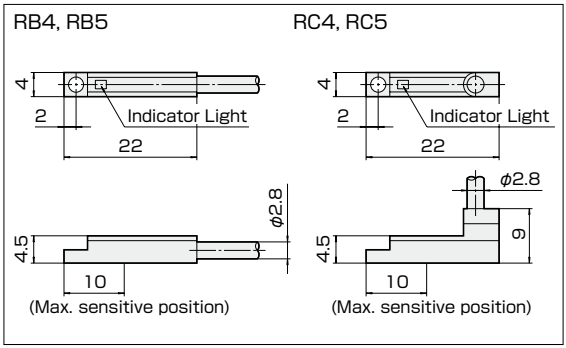
●Compatibility with RG switch

It can be installed to the product with conventional RG1, RG2 Switch.

Note1: Lead wire length of LA is changed from 5m to 3m
Note2: It is not compatible with metal bracket.

RB(RC)4, 5／SOLID STATE SWITCH

Dimensions



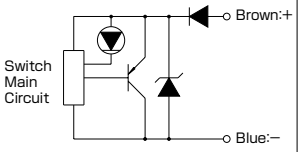
SPECIFICATIONS

Type	2 Wires Solid State Switch		3 Wires Solid State Switch	
Model Type	RB4	RC4	RB5	RC5
Direction of Cable Outlet	Straight Outlet Cable	Angle Outlet Cable	Straight Outlet Cable	Angle Outlet Cable
Load Voltage	DC12～24V		DC5～24V	
Load Current	5～40mA		50mA or less	
Consumption Current	———		10mA or less	
Output	———		NPN open collector	
Average Response Time	1ms or less			
Operating Tempature Range	5～60℃			
Shock Resistance	50G			
Cable	ϕ2.8, 0.15㎟, 2 Wire (+: Brown, −: Blue) oil-proof. bending-resistant vinyl cabtyre code		ϕ2.8, 0.15㎟, 3 Wire (+: Brown, Black, −: Blue) oil-proof. bending-resistant vinyl cabtyre code	
Cable Length	Standard: 1m Switch model code LA suffixed: 3m			
Indicator Light	Red LED (lights up at ON status)			
Application	**Relay. Programmable controller			
Internal Voltage Drop	3.5V or less		0.5V or less	
Leakage Current	1mA or less		0.5μA or less	
Insulation Resistance	50MΩ or more at DC250V MEGGER (between lead wire and case)			
Dielectric Strength	AC500V for 1 minute (bet ween lead wire and case)			
Protective Structure	IP67			

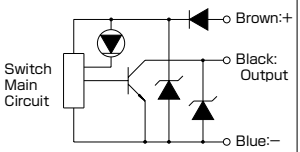
Note. When induction load such as Relay is used, set up a load surge protection circuit.

INTERNAL CIRCUIT OF THE SWITCH

RB4, RC4



RB5, RC5



APPLICABLE MODEL

PPT, PPU, PRZ, PSL, PSU, PRD, PPTN
PRM, CTR, PST, AFC
FXTW
GXA
CTW(X), CZL

MODEL CODE OF FIXTURE

Example:BE (PPT)

Fill in ( ) as the series name after BE.
Fill in ( ) as CT for only CTW and CTX.

Example:BF (PST)

For PPT6Y, CTR, PRM, PST, PRZ, the code of fixture is BF.

SWITCH + MODEL CODE OF FIXTURE

Example:RC5LA (PPT)

Fill in ( ) as the series name after switch code.
Fill in ( ) as CT for only CTW and CTX.

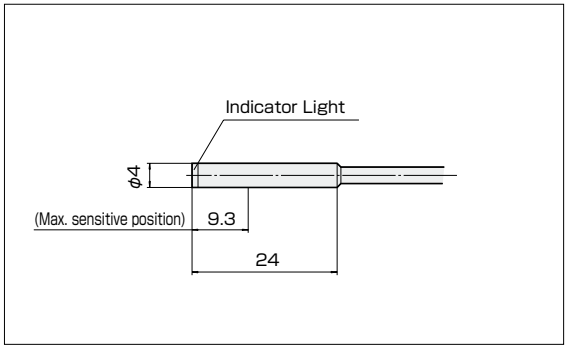
Example:RB4 (CT)

●Compatibility with RG switch

It can be installed to the product with conventional RG1, RG2 Switch.

Note1: Lead wire length of LA is changed from 5m to 3m
Note2: It is not compatible with metal bracket.

Dimensions

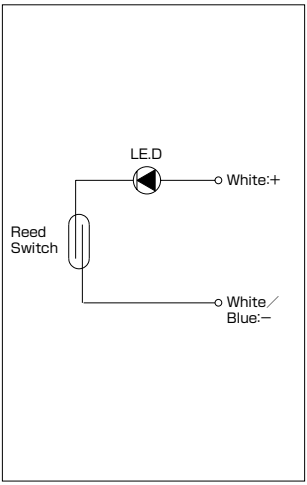


SPECIFICATIONS

Type	2 Wires Reed Switch
Model Type	RA1
Direction of Cable Outlet	Straight Outlet Cable
Load Voltage	DC24V
Load Current	1～8mA
Average Response Time	1ms or less
Operating Tempature Range	5～60℃
Shock Resistance	30G
Cable	0.13㎟, 2 Wire (+: White, −: White／Blue) Vinyl-covered Parallel Cords
Cable Length	Standard: 1m　Switch model code LA suffixed: 5m
Indicator Light	Red LED (lights up at ON status)
Application	**Relay. Programmable controller
Internal Voltage Drop	Approx. 2 V
Leakage Current	0
Insulation Resistance	100MΩ or more at DC500V MEGGER (between lead wire and case)
Dielectric Strength	AC1500V for 1 minute or AC1800V for 1 seconds (bet ween lead wire and case)
Protective Structure	IP66

Note. When induction load such as Relay is used, set up a load surge protection circuit.

INTERNAL CIRCUIT OF THE SWITCH



APPLICABLE MODEL

FMT

MODEL CODE OF FIXTURE

Example:BD (FMT)

Fill in ( ) as the series name after BD.

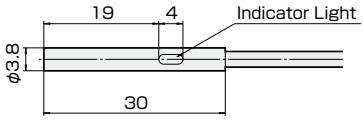
SWITCH + MODEL CODE OF FIXTURE

Example:RA1LA (FMT)

Fill in ( ) as the series name after switch code.

RX1／PROXIMITY SWITCH

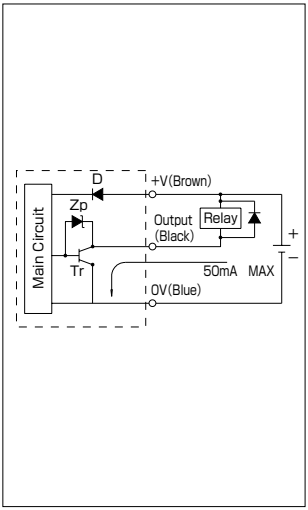
Dimensions



SPECIFICATIONS

Type	3 Wires Proximity Switch (No-contact with built-in Amplifier)
Model Type	RX1
Direction of Cable Outlet	Straight Outlet Cable
Load Voltage	DC12～24V
Load Current	5～50mA
Current Consumption	NPN open collector
Maximum Response Frequency	1000Hz
Opernting Tempature Range	5～60℃
Shock Resistance	20G
Cable	ϕ2.6, 0.08㎟, 3 Wire (+: Brown, Black, −: Blue) Oilproof Cabtyre Cable
Cable Length	3m
Indicator Light	Red LED (lights up at ON status)
Application	**Relay. Programmable controller
Internal Voltage Drop	0.4V or less
Leakage Current	0
Insulation Resistance	5MΩ or more at DC250V MEGGER
Dielectric Strength	AC500V for 1 minute
Protective Structure	IP67

INTERNAL CIRCUIT OF THE SWITCH

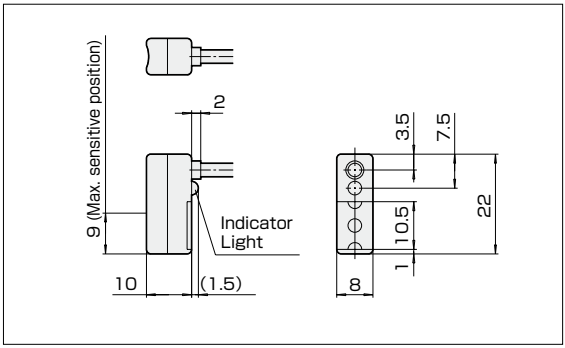


APPLICABLE MODEL

AFC

RP1, 5／REED SWITCH

Dimensions



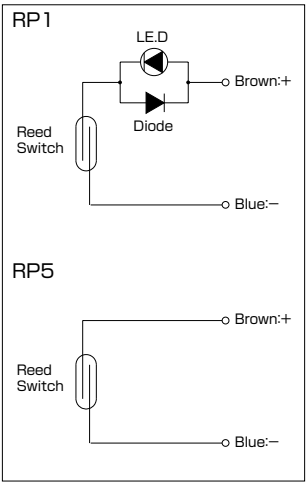
Note: RP5 has no indicator.

SPECIFICATIONS

Type	2 Wires Reed Switch	
Model Type	RP1	RP5
Direction of Cable Outlet	Angle Outlet Cable	
Load Voltage	AC100V／DC24V	
Load Current	(AC)3～20mA／(DC)3～40mA	
Average Response Time	1ms or less	
Operating Tempature Range	5～60℃	
Shock Resistance	30G	
Cable	φ3, 0.2㎟, 2 Wire (+: Brown, −: Blue) oil-proof. bending-resistant vinyl cabtyre code	
Cable Length	Standard: 1.5m Switch model code LA suffixed: 5m	
Indicator Light	Red LED (lights up at ON status)	Without indicator light
Application	**Relay. Programmable controller	
Internal Voltage Drop	Approx. 2 V	
Leakage Current	0	
Insulation Resistance	100MΩ or more at DC500V MEGGER (between lead wire and case)	
Dielectric Strength	AC1500V for 1 minute or AC1800V for 1 seconds (bet ween lead wire and case)	
Protective Structure	IP67	

Note. When induction load such as Relay is used, set up a load surge protection circuit.

INTERNAL CIRCUIT OF THE SWITCH



APPLICABLE MODEL

JKX、JKXB、JKXN

MODEL CODE OF FIXTURE

Example:BD (JKX12)

Fill in ( ) as the series name after BD.

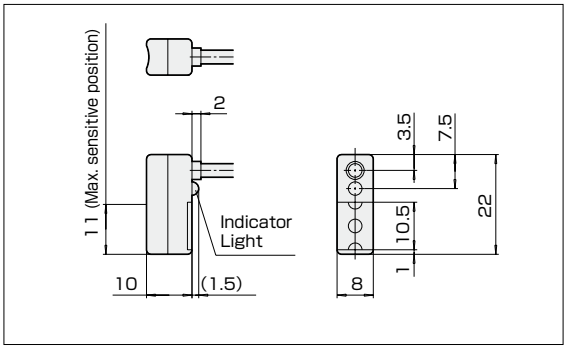
SWITCH + MODEL CODE OF FIXTURE

Example:RP1LA(JKX12)

Fill in ( ) as the series name and inner diameter after switch code.

RP4／SOLID STATE SWITCH

Dimensions

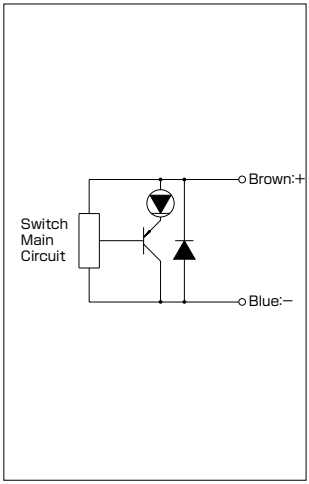


SPECIFICATIONS

Type	2 Wires Solid State Switch
Model Type	RP4
Direction of Cable Outlet	Angle Outlet Cable
Load Voltage	DC10～30V
Load Current	5～70mA
Average Response Time	1ms or less
Opernting Tempature Range	5～60℃
Shock Resistance	50G
Cable	φ3, 0.2㎟, 2 Wire (+: Brown, −: Blue) oil-proof. bending-resistant vinyl cabtyre code
Cable Length	Standard: 1.5m　Switch model code LA suffixed: 5m
Indicator Light	Red LED (lights up at ON status)
Application	**Relay. Programmable controller
Internal Voltage Drop	3V or less
Leakage Current	1mA or less
Insulation Resistance	100MΩ or more at DC500V MEGGER
Dielectric Strength	AC1500V for 1 minute
Protective Structure	IP66

Note. When induction load such as Relay is used, set up a load surge protection circuit.

INTERNAL CIRCUIT OF THE SWITCH



APPLICABLE MODEL

JKX、JKXB、JKXN

MODEL CODE OF FIXTURE

Example:BD (JKX12)

Fill in ( ) as the series name after BD.

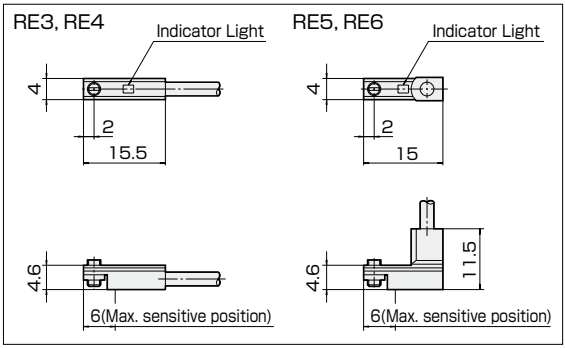
SWITCH + MODEL CODE OF FIXTURE

Example:RP4LA (JKX12)

Fill in ( ) as the series name and inner diameter after switch code.

RE(ZE)／SOLID STATE SWITCH

Dimensions



The overall length has become shorter.
There is no change to the model No. or specification other than the overall length.

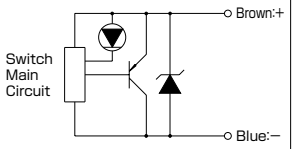
SPECIFICATIONS

Type	2 Wires Solid State Switch		3 Wires Solid State Switch	
Switch Code	RE3(LA)	RE5(LA)	RE4(LA)	RE6(LA)
Model Type	ZE135A(B)	ZE235A(B)	ZE155A(B)	ZE255A(B)
Direction of Cable Outlet	Straight Outlet Cable	Angle Outlet Cable	Straight Outlet Cable	Angle Outlet Cable
Load Voltage	DC12～24V		DC5～24V	
Load Current	4～20mA		50mA or less (between Black and Blue)	
Consumption Current	————		10mA or less at DC24V (between Brown and Blue)	
Output	————		NPN open collector	
Average Response Time	1ms or less			
Operating Tempature Range	5～60℃			
Shock Resistance	30G			
Cable	φ2.6, 0.2㎟, 2 Wire (+: Brown, −: Blue) oil-proof. bending-resistant vinyl cabtyre code		φ2.6, 0.15㎟, 3 Wire (+: Brown, Black, −: Blue) oil-proof. bending-resistant vinyl cabtyre code	
Cable Length	Standard: 1m For a 3-m model, replace the A at the end of the switch model No. with B.			
Indicator Light	Red LED (lights up at ON status)			
Application	**Relay. Programmable controller			
Internal Voltage Drop	4.5V or less		0.5V or less (DC10V or less at 20mA)	
Leakage Current	1mA or less at DC24V		50μA or less at DC24V	
Insulation Resistance	100MΩ or more at DC500V MEGGER (between lead wire and case)			
Dielectric Strength	AC500V for 1 minute (bet ween lead wire and case)			
Protective Structure	IP67			

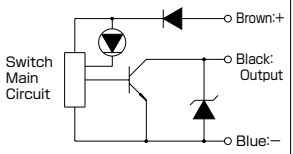
Note. When induction load such as Relay is used, set up a load surge protection circuit.

INTERNAL CIRCUIT OF THE SWITCH

RE3, RE5



RE4, RE6



APPLICABLE MODEL

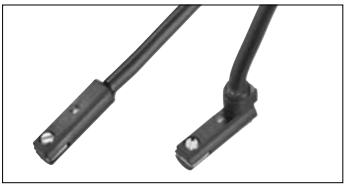
EHG

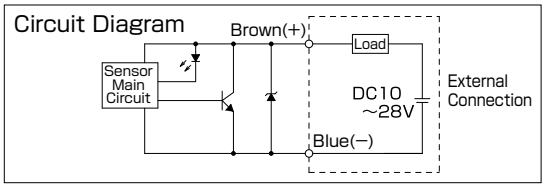
MODEL CODE OF FIXTURE

Example:ZE135B

Order by the model No. The mounting bracket is included.

RB6, RC6 SWITCH

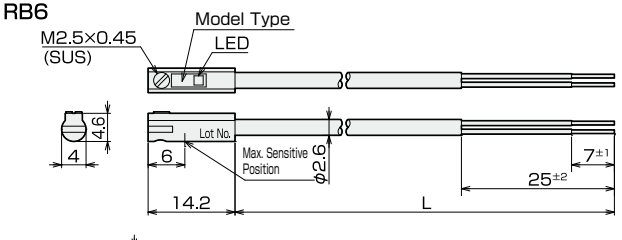




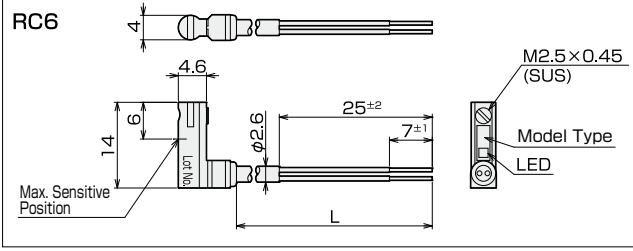
SPECIFICATIONS

	Product Specifications	
Item	RB6	RC6
Wiring Method	2 Wire System	
Direction of Cable Outlet	Straight Type	L-shaped
Load Voltage	DC10～28V	
Load Current	4～20mA	
Consumption Current at ON	——	
Internal Voltage Drop	3.5V max	
Leakage Current	0.8mA max	
Delay Time	1ms max	
Insulation Resistance	100MΩ min (DC500V)	
Withstand Voltage	AC1000V (50／60Hz) 1 minute	
Shock Resistance	50G	
Vibration Resistance	9G Double Amplitude 1.5mm	
Protective Structure	IEC529 IP67	
Operation Indicator	Red LED Indicator illuminates at ON	
Lead Wire	φ2.6 2 Wire PVC	
Opernting Tempature Range	−10～70℃	
Storage Tempature Range	−20～80℃	
Mass	12g (When the lead wire length is 1m), 31g (When the lead wire length is 3m)	

Dimensions



Model	L Dimension	L Tolerance
RB6	1000	±10
RB6LA	3000	±30



Model	L Dimension	L Tolerance
RC6	1000	±10
RC6LA	3000	±30

APPLICABLE MODEL

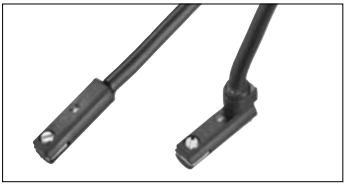
PPT-4

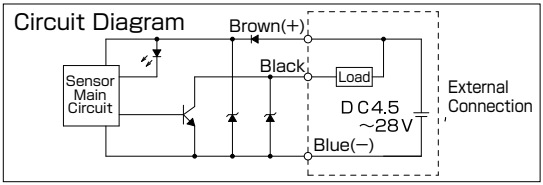
SWITCH + MODEL CODE OF FIXTURE

Example:RB6(PPT4) Fill in ( ) as the series name and inner diameter after switch code.

CE Conforming to EN/IEC standard

RB7, RC7 SWITCH

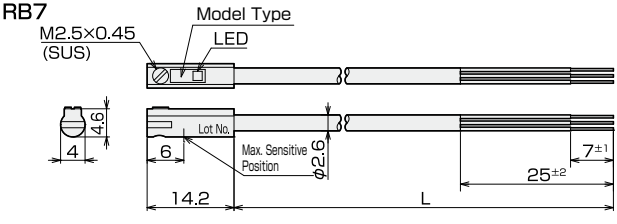




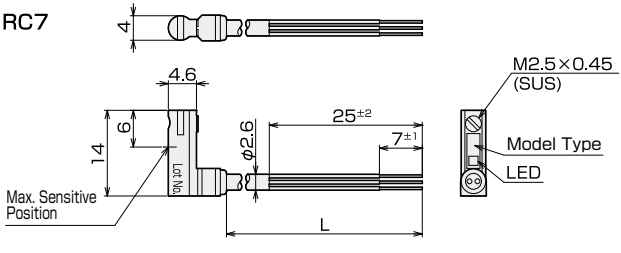
SPECIFICATIONS

	Product Specifications	
Item	RB7	RC7
Wiring Method	3 Wire System	
Direction of Cable Outlet	Straight Type	L-shaped
Load Voltage	DC4.5~28V	
Load Current	50mA max	
Consumption Current at ON	10mA max (DC24V)	
Internal Voltage Drop	0.5V max	
Leakage Current	0.01mA max	
Delay Time	1ms max	
Insulation Resistance	100MΩ min (DC500V)	
Withstand Voltage	AC1000V (50／60Hz) 1 minute	
Shock Resistance	50G	
Vibration Resistance	9G Double Amplitude 1.5mm	
Protective Structure	IEC529 IP67	
Operation Indicator	Red LED Indicator illuminates at ON	
Lead Wire	φ2.6 3 Wire PVC	
Opernting Tempature Range	−10~70℃	
Storage Tempature Range	−20~80℃	
Mass	12g (When the lead wire length is 1m), 31g (When the lead wire length is 3m)	

Dimensions



Model	L Dimension	L Tolerance
RB7	1000	±10
RB7LA	3000	±30



Model	L Dimension	L Tolerance
RC7	1000	±10
RC7LA	3000	±30

APPLICABLE MODEL

PPT-4

SWITCH + MODEL CODE OF FIXTURE

Example:RB7LA(PPT4) Fill in ( ) as the series name and inner diameter after switch code.