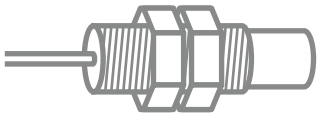
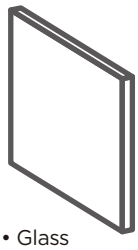
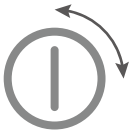
Capacitive Proximity Sensor
Metal Body Round
KCR(P) Series





- Glass
- Liquid
- Wood
- Plastic
- Paper
- Metal



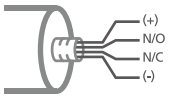
Convenient application setting with adjustable volume.



Primally, lineup M12, M18 and M30.



Every size is possible Metal & Plastic body.



A body has two output for variety applications. (N/O+N/C)



Durable metal body against external shock.



Enhanced waterproof design

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KCR : Capacitive Round		KCP : Capacitive Round Plastic	
❶	**Distance**	E : 2mm L : 10mm	G : 4mm P : 15mm	H : 5mm	K : 8mm
❷	**Size**	4 : Ø12	5 : Ø18	6 : Ø30	
❸	**Output**	1 : NPN N/O (3 wire) 5 : N/O (2 wire)	2 : NPN N/C (3 wire) 6 : N/C (2 wire)	3 : PNP N/O (3 wire) 7 : NPN N/O+N/C (4 wire)	4 : PNP N/C (3 wire) 8 : PNP N/O+N/C (4 wire)
❹	**Power**	1 : 10 ~ 30VDC	5 : 20 ~ 240VAC		
❺	**Cable Outlet**	Standard* : 2m Cable	3 : M12 connector		

* Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available					○	○		○				
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available				○		○	○		○	○		○
Sensing Distance	20mm	22mm	25mm	30mm	40mm	50mm	70mm					
Available												
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	○	○	○	○	○	○	○		○			
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	○						○					
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			○						○			

General Specification

Detectable Object	Conductive Material (Metal, Wood, Water...)
Differential Travel	4% to 20% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m Cable 3 : M12 connector
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −25 to 70°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Shock Resistance	Destruction : 500 m/s^2 10 times each in X, Y, and Z directions
Materials	KCR : Nickel copper plate KCS : Plastic
Degree of Protection	IP67

Characteristics

		DC 3/4 wire	AC 2 wire
Supply Voltage		1 : 10 ~ 30VDC	5 : 20 ~ 240VAC
Current Consumption		Max. 15mA	
Leakage Current		-	Max. 2.2mA
Voltage Drop		Residual voltage : Max. 2V Load current : Max. 200 mA	Load current : 5 to 300 mA
Operation Mode	3wire	1 : NPN N/O, 2 : NPN N/C, 3 : PNP N/O, 4 : PNP N/C	5 : N/O, 6 : N/C
	4wire	7 : NPN N/O+N/C, 8 : PNP N/O+N/C	
Dielectric Strength		1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case	4,000 VAC, 50/60 Hz for 1 minute between current carry parts and case
Maximum Switching Frequency		50Hz	15Hz

Capacitive Proximity Sensor
Metal Body Round
KCR(P) Series

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M12 Round Metal body 3-Wire(DC)	E : 2mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCR E411	50Hz
			2 : NPN N/C			KCR E421	
			3 : PNP N/O			KCR E431	
			4 : PNP N/C			KCR E441	
	G : 4mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCR G411	50Hz
			2 : NPN N/C			KCR G421	
			3 : PNP N/O			KCR G431	
			4 : PNP N/C			KCR G441	
	E : 2mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCR E411 3	50Hz
			2 : NPN N/C			KCR E421 3	
			3 : PNP N/O			KCR E431 3	
			4 : PNP N/C			KCR E441 3	
	G : 4mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCR G411 3	50Hz
			2 : NPN N/C			KCR G421 3	
			3 : PNP N/O			KCR G431 3	
			4 : PNP N/C			KCR G441 3	
M18 Round Metal body 3, 4-Wire(DC)	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCR H511	50Hz
			2 : NPN N/C			KCR H521	
			3 : PNP N/O			KCR H531	
			4 : PNP N/C			KCR H541	
			7 : NPN N/O+N/C			KCR H571	
			8 : PNP N/O+N/C			KCR H581	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCR K511	50Hz
			2 : NPN N/C			KCR K521	
			3 : PNP N/O			KCR K531	
			4 : PNP N/C			KCR K541	
			7 : NPN N/O+N/C			KCR K571	
			8 : PNP N/O+N/C			KCR K581	
	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCR H511 3	50Hz
			2 : NPN N/C			KCR H521 3	
			3 : PNP N/O			KCR H531 3	
			4 : PNP N/C			KCR H541 3	
			7 : NPN N/O+N/C			KCR H571 3	
			8 : PNP N/O+N/C			KCR H581 3	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCR K511 3	50Hz
			2 : NPN N/C			KCR K521 3	
			3 : PNP N/O			KCR K531 3	
			4 : PNP N/C			KCR K541 3	
			7 : NPN N/O+N/C			KCR K571 3	
			8 : PNP N/O+N/C			KCR K581 3	

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M30 Round Metal body 3, 4-Wire(DC)	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCR L611	50Hz
			2 : NPN N/C			KCR L621	
			3 : PNP N/O			KCR L631	
			4 : PNP N/C			KCR L641	
			7 : NPN N/O+N/C			KCR L671	
			8 : PNP N/O+N/C			KCR L681	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCR P611	50Hz
			2 : NPN N/C			KCR P621	
			3 : PNP N/O			KCR P631	
			4 : PNP N/C			KCR P641	
			7 : NPN N/O+N/C			KCR P671	
			8 : PNP N/O+N/C			KCR P681	
	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCR L611 3	50Hz
			2 : NPN N/C			KCR L621 3	
			3 : PNP N/O			KCR L631 3	
			4 : PNP N/C			KCR L641 3	
			7 : NPN N/O+N/C			KCR L671 3	
			8 : PNP N/O+N/C			KCR L681 3	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCR P611 3	50Hz
			2 : NPN N/C			KCR P621 3	
			3 : PNP N/O			KCR P631 3	
			4 : PNP N/C			KCR P641 3	
			7 : NPN N/O+N/C			KCR P671 3	
			8 : PNP N/O+N/C			KCR P681 3	
M18 Round Plastic body 3, 4-Wire(DC)	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCP H511	50Hz
			2 : NPN N/C			KCP H521	
			3 : PNP N/O			KCP H531	
			4 : PNP N/C			KCP H541	
			7 : NPN N/O+N/C			KCP H571	
			8 : PNP N/O+N/C			KCP H581	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCP K511	50Hz
			2 : NPN N/C			KCP K521	
			3 : PNP N/O			KCP K531	
			4 : PNP N/C			KCP K541	
			7 : NPN N/O+N/C			KCP K571	
			8 : PNP N/O+N/C			KCP K581	

Capacitive Proximity Sensor
Metal Body Round
KCR(P) Series

Product Selection

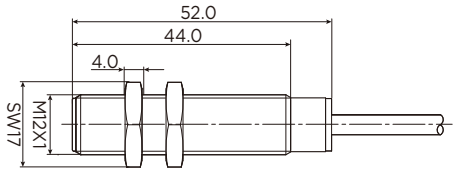
Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M18 Round Plastic body 3, 4-Wire(DC)	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCP H511 3	50Hz
			2 : NPN N/C			KCP H521 3	
			3 : PNP N/O			KCP H531 3	
			4 : PNP N/C			KCP H541 3	
			7 : NPN N/O+N/C			KCP H571 3	
			8 : PNP N/O+N/C			KCP H581 3	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCP K511 3	50Hz
			2 : NPN N/C			KCP K521 3	
			3 : PNP N/O			KCP K531 3	
			4 : PNP N/C			KCP K541 3	
			7 : NPN N/O+N/C			KCP K571 3	
			8 : PNP N/O+N/C			KCP K581 3	
M30 Round Metal body 3, 4-Wire(DC)	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCP L611	50Hz
			2 : NPN N/C			KCP L621	
			3 : PNP N/O			KCP L631	
			4 : PNP N/C			KCP L641	
			7 : NPN N/O+N/C			KCP L671	
			8 : PNP N/O+N/C			KCP L681	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCP P611	50Hz
			2 : NPN N/C			KCP P621	
			3 : PNP N/O			KCP P631	
			4 : PNP N/C			KCP P641	
			7 : NPN N/O+N/C			KCP P671	
			8 : PNP N/O+N/C			KCP P681	
	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCP L611 3	50Hz
			2 : NPN N/C			KCP L621 3	
			3 : PNP N/O			KCP L631 3	
			4 : PNP N/C			KCP L641 3	
			7 : NPN N/O+N/C			KCP L671 3	
			8 : PNP N/O+N/C			KCP L681 3	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KCP P611 3	50Hz
			2 : NPN N/C			KCP P621 3	
			3 : PNP N/O			KCP P631 3	
			4 : PNP N/C			KCP P641 3	
			7 : NPN N/O+N/C			KCP P671 3	
			8 : PNP N/O+N/C			KCP P681 3	

Dimension

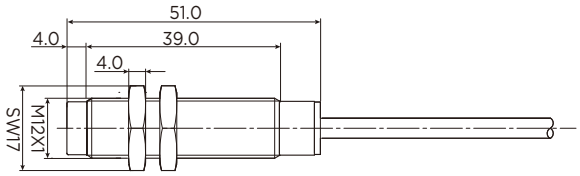
(mm)

KCR(P) Ø12

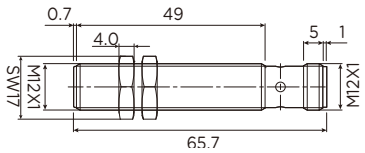
Flush



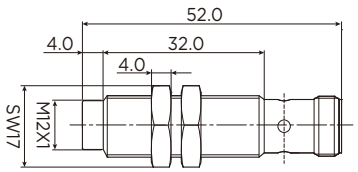
Non flush



M12 connector Flush

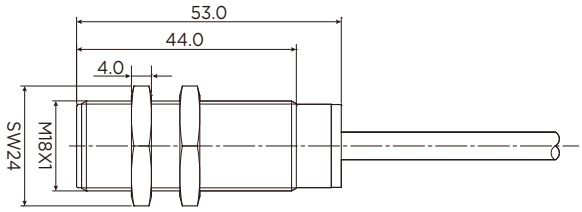


M12 connector Non flush

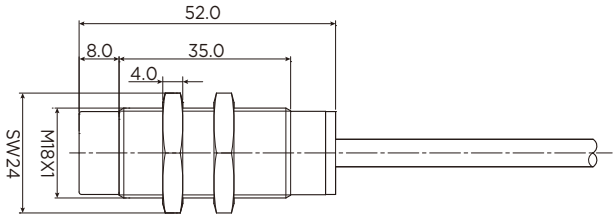


KCR(P) Ø18

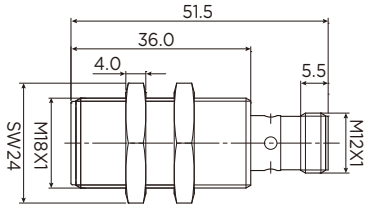
Flush



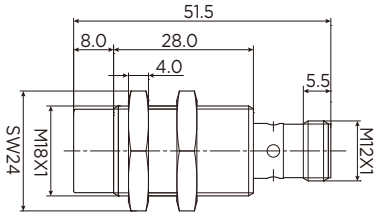
Non flush



M12 connector Flush



M12 connector Non flush



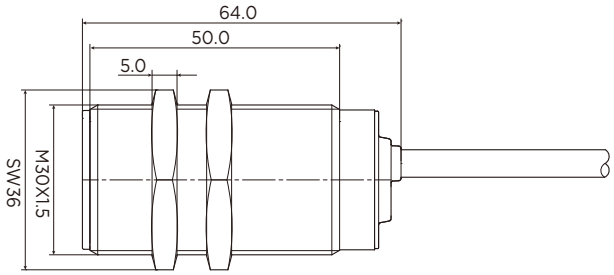
Capacitive Proximity Sensor
Metal Body Round
KCR(P) Series

Dimension

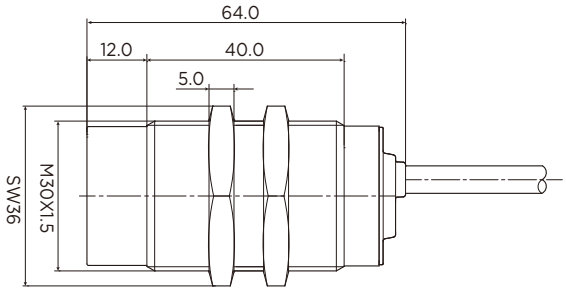
(mm)

KCR(P) Ø30

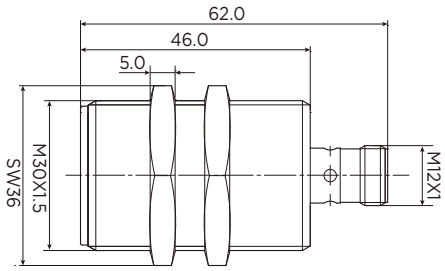
Flush



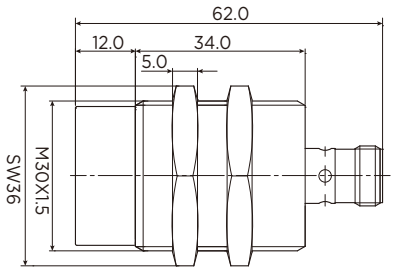
Non flush



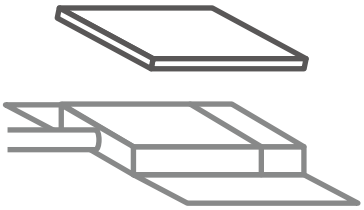
M12 connector Flush



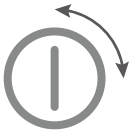
M12 connector Non flush



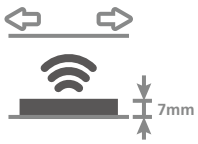
Capacitive Proximity Sensor
Square
KCS Series



- Glass
- Liquid
- Wood
- Plastic
- Paper
- Metal



Convenient Application setting with adjustable volume.



The best fit size for flat and narrow space with 7mm high.



It is possible to install on the metal surface.



Built-in Amplifier



Enhanced waterproof design

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KCS : Capacitive Square			
❶	**Distance**	L : 10mm			
❷	**Size**	F : 7 Rectangular*	G : 34 Rectangular		
❸	**Output**	1 : NPN N/O (3 wire)	2 : NPN N/C (3 wire)	3 : PNP N/O (3 wire)	4 : PNP N/C (3 wire)
❹	**Power**	1 : 10 ~ 30VDC			
❺	**Cable Outlet**	Standard** : 2m Cable			

* F : 7 Rectangular Model in under development
** Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available			□							□		
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available										○		
Sensing Distance	20mm	22mm	25mm	30mm	40mm	50mm	70mm					
Available												
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	○	○	○	○								
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	○											
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			○									

Capacitive Proximity Sensor
Square
KCS Series

General Specification

Detectable Object	Conductive Material (Metal, Wood, Water...)
Differential Travel	4% to 20% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m Cable
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −25 to 70°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Shock Resistance	Destruction : 500 m/s^2 10 times each in X, Y, and Z directions
Materials	Plastic
Degree of Protection	IP67

Characteristics

	DC 3wire			
Supply Voltage	1 : 10 ~ 30VDC			
Current Consumption	Max. 10mA			
Voltage Drop	Residual voltage : Max. 1.5 V Load current : Max. 200 mA.			
Operation Mode	1 : NPN N/O	2 : NPN N/C	3 : PNP N/O	4 : PNP N/C
Dielectric Strength	1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case			
Maximum Switching Frequency	30Hz			

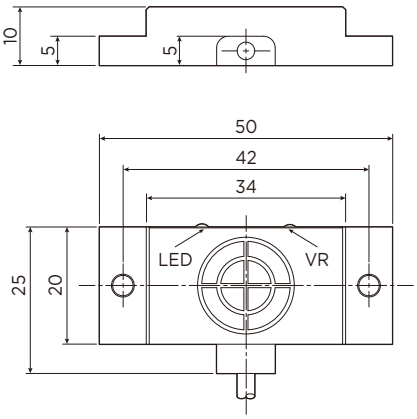
Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
34 Square 3-Wire(DC)	L : 10mm	G : 34 rectangular Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KCS LG11	30Hz
			2 : NPN N/C			KCS LG21	
			3 : PNP N/O			KCS LG31	
			4 : PNP N/C			KCS LG41	

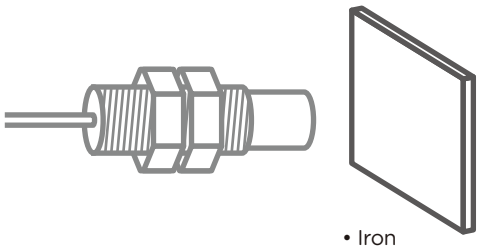
Dimension

(mm)

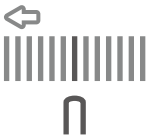
KCS LG



Inductive Proximity Sensor
Round-Standard Type
KPR Series



- Iron
- Aluminum
- Copper
- Stainless
- Brass



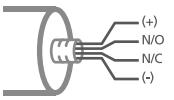
Never mind to install in flat and narrow space with M3, M5 size.



Durable M8, M12 connector against vibration and shock.



Enhanced waterproof design



A body has two output for variety applications. (N/O+N/C)



Wide power supply and combination AC/DC power.



High-speed Detection with a response frequency of 2.5kHz (M3 Size)

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KPR : Inductive proximity Round			
❶	**Distance**	A : 0.8mm G : 4mm P : 15mm	B : 1mm H : 5mm	E : 2mm K : 8mm	F : 3mm L : 10mm
❷	**Size**	1 : Ø3 4 : Ø12	2 : Ø5 5 : Ø18	3 : Ø8 6 : Ø30	
❸	**Output**	1 : NPN N/O (3 wire) 5 : N/O (2 wire)	2 : NPN N/C (3 wire) 6 : N/C (2 wire)	3 : PNP N/O (3 wire) 7 : NPN N/O+N/C (4 wire)	4 : PNP N/C (3 wire) 8 : PNP N/O+N/C (4 wire)
❹	**Power**	1 : 10 ~ 30VDC	2 : 7.7 ~ 9VDC*	5 : 20 ~ 240VAC	6 : 20 ~ 240VAC/DC
❺	**Cable Outlet**	Standard** : 2m Cable	2 : M8 connector	3 : M12 connector	

* NUMAR(7.7 ~ 9VDC) model is under development.
** Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available	O	O		O	O	O		O				
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available	O	O		O	O	O	O		O	O		O
Sensing Distance	20mm	22mm	25mm	30mm	40mm	50mm	70mm					
Available												
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	O	O	O	O	O	O	O		O			
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	O			O			O					
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			O						O		O	

General Specification

Detectable Object	Ferrous metal (The sensing distance decreases with non-ferrous metal.)
Differential Travel	Max. 15% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m Cable 2 : M8 connector 3 : M12 connector
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −25 to 70°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Shock Resistance	Destruction : 1,000 m/s^2 10 times each in X, Y, and Z directions
Case Material	Stainless(M3, M5 type only) / Nickel copper plated
Degree of Protection	IP67

Characteristics

<table>
<tr><th colspan="4"></th><th>DC 3/4 wire</th><th>DC 2 wire</th><th>AC/DC 2 wire</th><th>AC 2 wire</th></tr>
<tr><td colspan="4">Supply Voltage</td><td colspan="2">1 : 10 ~ 30VDC 3 : 15 ~ 30VDC</td><td>6 : 20 ~ 250VAC/DC</td><td>5 : 20 ~ 240VAC</td></tr>
<tr><td colspan="4">Current Consumption</td><td>Max. 10mA</td><td>Max. 0.8mA</td><td></td><td>-</td></tr>
<tr><td colspan="4">Leakage Current</td><td>-</td><td>-</td><td></td><td>Max. 1mA</td></tr>
<tr><td colspan="4">Voltage Drop</td><td>Residual voltage : Max. 2V
Load current : Max. 200 mA</td><td>Residual voltage :
Max. 4V
Load current :
3 to 100 mA</td><td>Residual voltage :
Max. 5V for DC power
Load current :
3 to 100 mA</td><td>Load current :
5 to 300 mA</td></tr>
<tr><td colspan="3" rowspan="2">Operation Mode</td><td>3wire</td><td>1 : NPN N/O, 2 : NPN N/C,
3 : PNP N/O, 4 : PNP N/C</td><td colspan="3" rowspan="2">5 : N/O, 6 : N/C</td></tr>
<tr><td>4wire</td><td>7 : NPN N/O+N/C, 8 : PNP N/O+N/C</td></tr>
<tr><td colspan="4">Dielectric Strength</td><td colspan="2">1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case</td><td colspan="2">4,000 VAC, 50/60 Hz for 1 minute between current carry parts and case</td></tr>
<tr><td rowspan="9">Maximum Switching Frequency</td><td>M3</td><td>Flush</td><td>2500Hz</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>M5</td><td>Flush</td><td>2500Hz</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">M8</td><td>Flush</td><td>2000Hz</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Non flush</td><td>1500Hz</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">M12</td><td>Flush</td><td>1500Hz</td><td>800Hz</td><td>-</td><td rowspan="2">20Hz</td></tr>
<tr><td>Non flush</td><td>1000Hz</td><td>500Hz</td><td>-</td></tr>
<tr><td rowspan="2">M18</td><td>Flush</td><td>1000Hz</td><td>500Hz</td><td rowspan="2">AC : 15Hz
DC : 50Hz</td><td rowspan="2">20Hz</td></tr>
<tr><td>Non flush</td><td>800Hz</td><td>300Hz</td></tr>
<tr><td rowspan="2">M30</td><td>Flush</td><td>500Hz</td><td>300Hz</td><td rowspan="2">AC : 15Hz
DC : 50Hz</td><td rowspan="2">20Hz</td></tr>
<tr><td>Non flush</td><td>300Hz</td><td>200Hz</td></tr>
</table>

Inductive Proximity Sensor
Round-Standard Type
KPR Series

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M3 Round 3-Wire(DC) 	A : 0.8mm	1 : M3 (Smooth Barrel) Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR A111	2,500Hz
			2 : NPN N/C			KPR A121	
			3 : PNP N/O			KPR A131	
			4 : PNP N/C			KPR A141	
M5 Round 3-Wire(DC) 	B : 1mm	2 : M5 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR B211	2,500Hz
			2 : NPN N/C			KPR B221	
			3 : PNP N/O			KPR B231	
			4 : PNP N/C			KPR B241	
	B : 1mm	2 : M5 Flush	1 : NPN N/O	1 : 10-30VDC	2 : M8 connector	KPR B211 2	2,500Hz
			2 : NPN N/C			KPR B221 2	
			3 : PNP N/O			KPR B231 2	
			4 : PNP N/C			KPR B241 2	
M8 Round 3-Wire(DC)	E : 2mm	3 : M8 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR E311	2,000Hz
			2 : NPN N/C			KPR E321	
			3 : PNP N/O			KPR E331	
			4 : PNP N/C			KPR E341	
	F : 3mm	3 : M8 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR F311	1,500Hz
			2 : NPN N/C			KPR F321	
			3 : PNP N/O			KPR F331	
			4 : PNP N/C			KPR F341	
	E : 2mm	3 : M8 Flush	1 : NPN N/O	1 : 10-30VDC	2 : M8 connector	KPR E311 2	2,000Hz
			2 : NPN N/C			KPR E321 2	
			3 : PNP N/O			KPR E331 2	
			4 : PNP N/C			KPR E341 2	
	F : 3mm	3 : M8 Non flush	1 : NPN N/O	1 : 10-30VDC	2 : M8 connector	KPR F311 2	1,500Hz
			2 : NPN N/C			KPR F321 2	
			3 : PNP N/O			KPR F331 2	
			4 : PNP N/C			KPR F341 2	
	E : 2mm	3 : M8 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR E311 3	2,000Hz
			2 : NPN N/C			KPR E321 3	
			3 : PNP N/O			KPR E331 3	
			4 : PNP N/C			KPR E341 3	
	F : 3mm	3 : M8 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR F311 3	1,500Hz
			2 : NPN N/C			KPR F321 3	
			3 : PNP N/O			KPR F331 3	
			4 : PNP N/C			KPR F341 3	

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M12 Round 3-Wire(DC)	E : 2mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR E411	1,500Hz
			2 : NPN N/C			KPR E421	
			3 : PNP N/O			KPR E431	
			4 : PNP N/C			KPR E441	
	G : 4mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR G411	1,000Hz
			2 : NPN N/C			KPR G421	
			3 : PNP N/O			KPR G431	
			4 : PNP N/C			KPR G441	
	H : 5mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR H411	800Hz
			2 : NPN N/C			KPR H421	
			3 : PNP N/O			KPR H431	
			4 : PNP N/C			KPR H441	
	E : 2mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR E411 3	1,500Hz
			2 : NPN N/C			KPR E421 3	
			3 : PNP N/O			KPR E431 3	
			4 : PNP N/C			KPR E441 3	
	G : 4mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR G411 3	1,000Hz
			2 : NPN N/C			KPR G421 3	
			3 : PNP N/O			KPR G431 3	
			4 : PNP N/C			KPR G441 3	
	H : 5mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR H411 3	400Hz
			2 : NPN N/C			KPR H421 3	
			3 : PNP N/O			KPR H431 3	
			4 : PNP N/C			KPR H441 3	



Inductive Proximity Sensor
Round-Standard Type
KPR Series

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M18 Round 3,4-Wire(DC)	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR H511	1,000Hz
			2 : NPN N/C			KPR H521	
			3 : PNP N/O			KPR H531	
			4 : PNP N/C			KPR H541	
			7 : NPN N/O+N/C			KPR H571	
			8 : PNP N/O+N/C			KPR H581	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR K511	800Hz
			2 : NPN N/C			KPR K521	
			3 : PNP N/O			KPR K531	
			4 : PNP N/C			KPR K541	
			7 : NPN N/O+N/C			KPR K571	
			8 : PNP N/O+N/C			KPR K581	
	L : 10mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR L511	500Hz
			2 : NPN N/C			KPR L521	
			3 : PNP N/O			KPR L531	
			4 : PNP N/C			KPR L541	
	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR H511 3	1,000Hz
			2 : NPN N/C			KPR H521 3	
			3 : PNP N/O			KPR H531 3	
			4 : PNP N/C			KPR H541 3	
			7 : NPN N/O+N/C			KPR H571 3	
			8 : PNP N/O+N/C			KPR H581 3	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR K511 3	800Hz
			2 : NPN N/C			KPR K521 3	
			3 : PNP N/O			KPR K531 3	
			4 : PNP N/C			KPR K541 3	
			7 : NPN N/O+N/C			KPR H571 3	
			8 : PNP N/O+N/C			KPR H581 3	
	L : 10mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR L511 3	500Hz
			2 : NPN N/C			KPR L521 3	
			3 : PNP N/O			KPR L531 3	
			4 : PNP N/C			KPR L541 3	









Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M30 Round 3, 4-Wire(DC)	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR L611	500Hz
			2 : NPN N/C			KPR L621	
			3 : PNP N/O			KPR L631	
			4 : PNP N/C			KPR L641	
			7 : NPN N/O+N/C			KPR L671	
			8 : PNP N/O+N/C			KPR L681	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPR P611	300Hz
			2 : NPN N/C			KPR P621	
			3 : PNP N/O			KPR P631	
			4 : PNP N/C			KPR P641	
			7 : NPN N/O+N/C			KPR P671	
			8 : PNP N/O+N/C			KPR P681	
	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR L611 3	500Hz
			2 : NPN N/C			KPR L621 3	
			3 : PNP N/O			KPR L631 3	
			4 : PNP N/C			KPR L641 3	
			7 : NPN N/O+N/C			KPR L671 3	
			8 : PNP N/O+N/C			KPR L681 3	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPR P611 3	300Hz
			2 : NPN N/C			KPR P621 3	
			3 : PNP N/O			KPR P631 3	
			4 : PNP N/C			KPR P641 3	
			7 : NPN N/O+N/C			KPR P671 3	
			8 : PNP N/O+N/C			KPR P681 3	

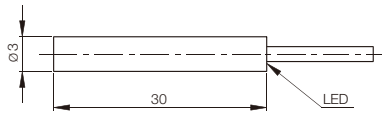
Inductive Proximity Sensor
Round-Standard Type
KPR Series

Dimension

(mm)

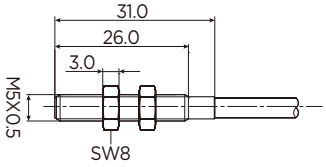
KPR Ø3

Flush

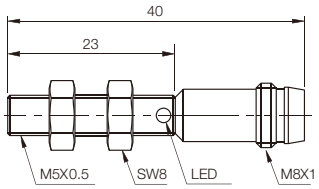


KPR Ø5

Flush

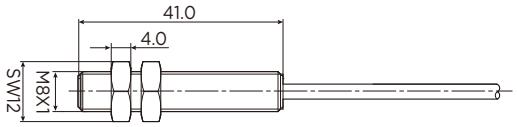


M8 connector Flush

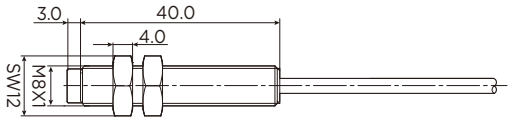


KPR Ø8

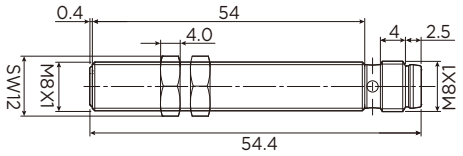
Flush



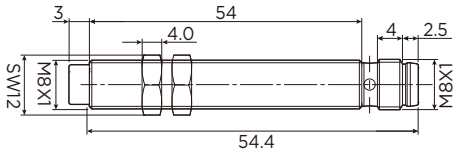
Non flush



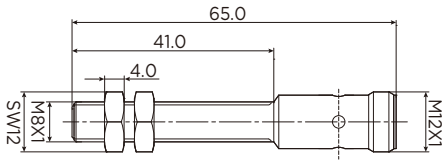
M8 connector Flush



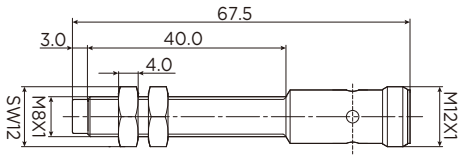
M8 connector Non flush



M12 connector Flush



M12 connector Non flush

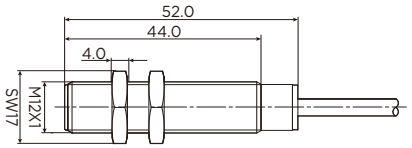


Dimension

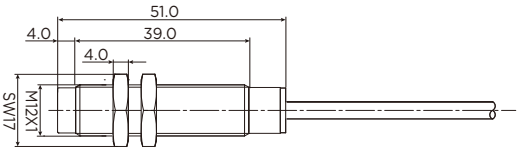
(mm)

KPR Ø12

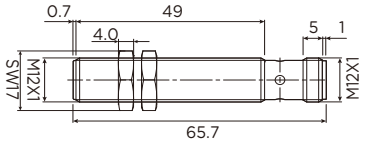
Flush



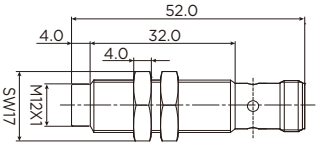
Non flush



M12 connector Flush

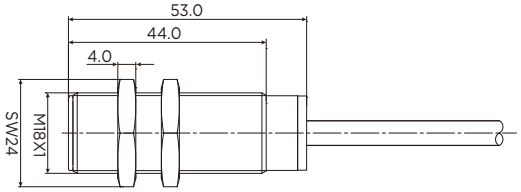


M12 connector Non flush

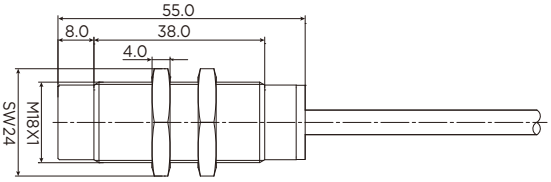


KPR Ø18

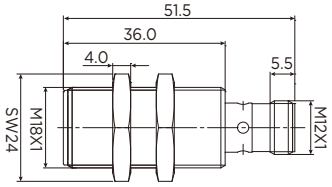
Flush



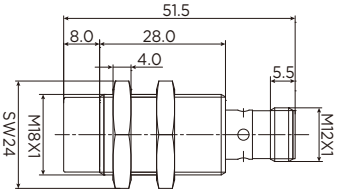
Non flush



M12 connector Flush

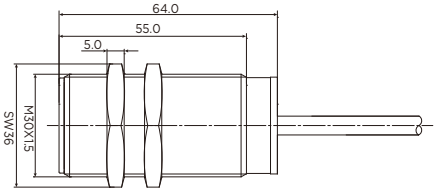


M12 connector Non flush

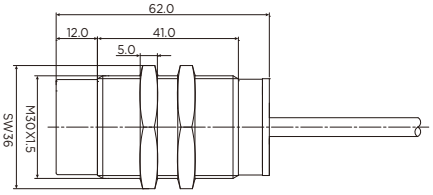


KPR Ø30

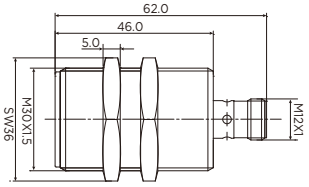
Flush



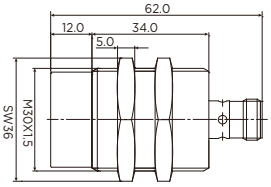
Non flush



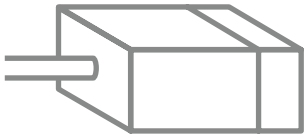
M12 connector Flush

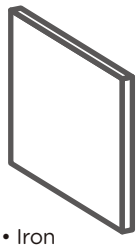


M12 connector Non flush



Inductive Proximity Sensor
Square-Standard Type
KPS Series

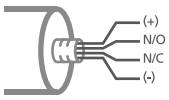




- Iron
- Aluminum
- Copper
- Stainless
- Brass



Variety connetor types help to easy install.



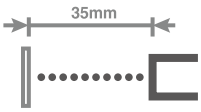
A body has two output for variety applications. (N/O+N/C)



Wide power supply and combination AC/DC power.



Enhanced waterproof design



Provides Long-distance Detection. (Maximum 35mm)

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KPS : Inductive Proximity Square		
❶	**Distance**	H : 5mm P : 15mm	J : 7mm Q : 20mm	K : 8mm S : 25mm	L : 10mm V : 35mm
❷	**Size**	A : 18 Square	B : 25 Square	C : 30 Square	D : 40 Square
❸	**Output**	1 : NPN N/O (3 wire) 5 : N/O (2 wire)	2 : NPN N/C (3 wire) 6 : N/C (2 wire)	3 : PNP N/O (3 wire) 7 : NPN N/O+N/C (4 wire)	4 : PNP N/C (3 wire) 8 : PNP N/O+N/C (4 wire)
❹	**Power**	1 : 10 ~ 30VDC	5 : 20 ~ 240VAC	6 : 20 ~ 240VAC/DC	
❺	**Cable Outlet**	Standard* : 2m Cable	3 : M12 connector		

* Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available						□	□	□			□	
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available							○	○	○	○		○
Sensing Distance	20mm	22mm	25mm	35mm	40mm	50mm	70mm					
Available	○		○	○								
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	○	○	○	○	○	○	○		○			
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	○						○					
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			○						○		○	

General Specification

Detectable Object	Ferrous metal (The sensing distance decreases with non-ferrous metal.)
Differential Travel	Max. 15% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m Cable 3 : M12 connector (KPS Q, KPS V only)
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −25 to 70°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Shock Resistance	Destruction : 1,000 m/s^2 10 times each in X, Y, and Z directions

Characteristics

			DC 3/4 wire	DC 2 wire	AC/DC 2 wire	AC 2 wire
Supply Voltage			1 : 10 ~ 30VDC 3 : 15 ~ 30VDC 4 : 10 ~ 60VDC		6 : 20 ~ 250VAC/DC	5 : 20 ~ 240VAC
Current Consumption			Max. 10mA	Max. 0.8mA		-
Leakage Current			-	-		Max. 1mA
Voltage Drop			Residual voltage : Max. 1V Load current : Max. 100 mA	Residual voltage : Max. 4V Load current : 3 to 100 mA	Residual voltage : Max. 5V for DC power Load current : 3 to 200 mA	Load current : 5 to 200 mA
Operation Mode		3wire	1 : NPN N/O, 2 : NPN N/C, 3 : PNP N/O, 4 : PNP N/C	5 : N/O, 6 : N/C		
		4wire	7 : NPN N/O+N/C, 8 : PNP N/O+N/C			
Dielectric Strength			1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case		4,000 VAC, 50/60 Hz for 1 minute between current carry parts and case	
Maximum Switching Frequency	**18sq**	**Flush**	1000Hz	800Hz	20Hz	20Hz
		Non flush				
	25sq	**Flush**	700Hz	600Hz	20Hz	20Hz
		Non flush				
	30sq	**Flush**	500Hz	500Hz	20Hz	20Hz
		Non flush				
	40sq	**Flush**	150Hz	150Hz	20Hz	20Hz
		Non flush				

Inductive Proximity Sensor
Square-Standard Type
KPS Series

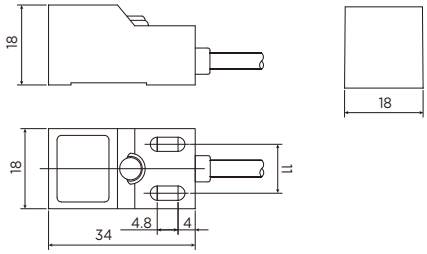
Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
18 Square 3-Wire(DC) 	H : 5mm	A : 18sq Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPS HA11	1,000Hz
			2 : NPN N/C			KPS HA21	
			3 : PNP N/O			KPS HA31	
			4 : PNP N/C			KPS HA41	
	K : 8mm	A : 18sq Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPS KA11	1,000Hz
			2 : NPN N/C			KPS KA21	
			3 : PNP N/O			KPS KA31	
			4 : PNP N/C			KPS KA41	
25 Square 3-Wire(DC) 	J : 7mm	B : 25sq Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPS JB11	700Hz
			2 : NPN N/C			KPS JB21	
			3 : PNP N/O			KPS JB31	
			4 : PNP N/C			KPS JB41	
	L : 10mm	B : 25sq Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPS LB11	700Hz
			2 : NPN N/C			KPS LB21	
			3 : PNP N/O			KPS LB31	
			4 : PNP N/C			KPS LB41	
30 Square 3-Wire(DC) 	L : 10mm	C : 30sq Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPS LC11	500Hz
			2 : NPN N/C			KPS LC21	
			3 : PNP N/O			KPS LC31	
			4 : PNP N/C			KPS LC41	
	P : 15mm	C : 30sq Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPS PC11	500Hz
			2 : NPN N/C			KPS PC21	
			3 : PNP N/O			KPS PC31	
			4 : PNP N/C			KPS PC41	
40 Square 3-Wire(DC) 	Q : 20mm	D : 40sq Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPS QD11 3	150Hz
			2 : NPN N/C			KPS QD21 3	
			3 : PNP N/O			KPS QD31 3	
			4 : PNP N/C			KPS QD41 3	
	V : 35mm	D : 40sq Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPS VD11 3	150Hz
			2 : NPN N/C			KPS VD21 3	
			3 : PNP N/O			KPS VD31 3	
			4 : PNP N/C			KPS VD41 3	

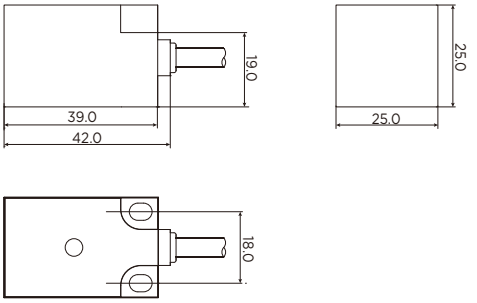
Dimension

(mm)

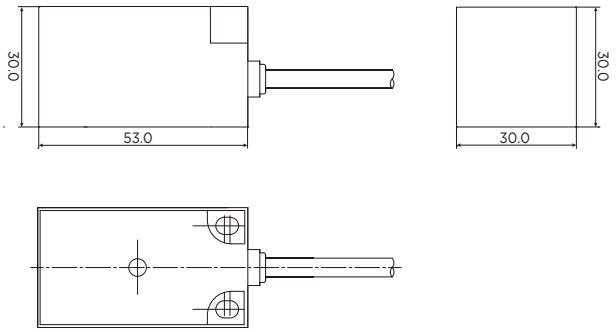
KPS 18sq



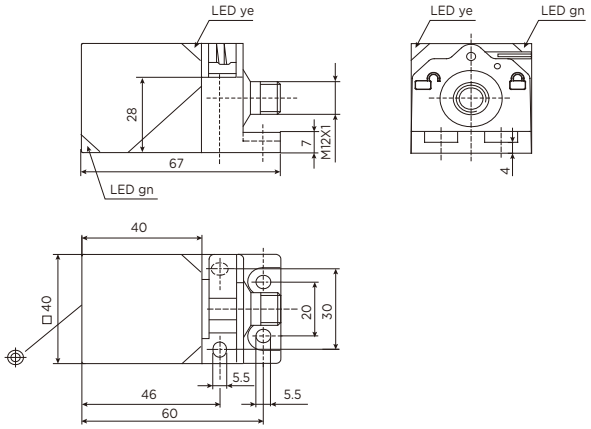
KPS 25sq



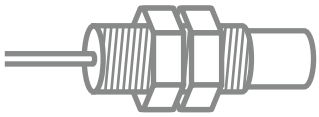
KPS 30sq

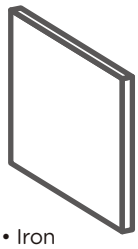


KPS 40sq



Inductive Proximity Sensor
Round-Long Distance
KPRD Series





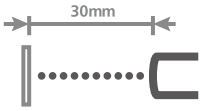
- Iron
- Aluminum
- Copper
- Stainless
- Brass



Enhanced waterproof design



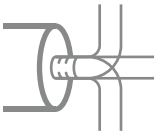
Durable M8, M12 connector against vibration and shock.



Long-distance Detection at up to 30 mm enables secure mounting with reduced problems due to workpiece collisions.



Twice or three times that of oil-resistant vinyl chloride



Approximately twice that of vinyl chloride.

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KPRD : Inductive Proximity Long sensing round		
❶	**Distance**	G : 4mm R : 22mm	K : 8mm V : 30mm	N : 12mm	P : 15mm
❷	**Size**	3 : Ø8	4 : Ø12	5 : Ø18	6 : Ø30
❸	**Output**	1 : NPN N/O (3 wire) 5 : N/O (2 wire)	2 : NPN N/C (3 wire) 6 : N/C (2 wire)	3 : PNP N/O (3 wire)	4 : PNP N/C (3 wire)
❹	**Power**	1 : 10 ~ 30VDC	2 : 7.7 ~ 9VDC*	6 : 20 ~ 240VAC/DC	
❺	**Cable Outlet**	Standard** : 2m Cable	3 : M12 connector		

* NUMAR(7.7 ~ 9VDC) model is under development.
** Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available				O	O	O		O				
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available						O			O		O	O
Sensing Distance	20mm	22mm	25mm	30mm	40mm	50mm	70mm					
Available		O		O								
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	O	O	O	O	O	O						
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	O			O			O					
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			O								O	

General Specification

Detectable Object	Ferrous metal (The sensing distance decreases with non-ferrous metal.)
Differential Travel	Max. 15% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m Cable 3 : M12 connector
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −25 to 70°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Case Material	Nickel copper plated
Shock Resistance	Destruction : 1,000 m/s^2 10 times each in X, Y, and Z directions

Characteristics

<table>
<tr><th colspan="4"></th><th>DC 3/4 wire</th><th>DC 2 wire</th><th>AC/DC 2 wire</th><th>AC 2 wire</th></tr>
<tr><td colspan="4">Supply Voltage</td><td colspan="2">1 : 10 ~ 30VDC 3 : 15 ~ 30VDC</td><td>6 : 20 ~ 250VAC/DC</td><td>5 : 20 ~ 240VAC</td></tr>
<tr><td colspan="4">Current Consumption</td><td>Max. 10mA</td><td>Max. 0.8mA</td><td></td><td>-</td></tr>
<tr><td colspan="4">Leakage Current</td><td>-</td><td>-</td><td></td><td>Max. 1mA</td></tr>
<tr><td colspan="4">Voltage Drop</td><td>Residual voltage : Max. 2V
Load current : Max. 200 mA</td><td>Residual voltage :
Max. 4V
Load current :
3 to 100 mA</td><td>Residual voltage :
Max. 5V for DC power
Load current :
3 to 100 mA</td><td>Load current :
5 to 300 mA</td></tr>
<tr><td colspan="3" rowspan="2">Operation Mode</td><td>3wire</td><td>1 : NPN N/O, 2 : NPN N/C,
3 : PNP N/O, 4 : PNP N/C</td><td colspan="3" rowspan="2">5 : N/O, 6 : N/C</td></tr>
<tr><td>4wire</td><td>7 : NPN N/O+N/C, 8 : PNP N/O+N/C</td></tr>
<tr><td colspan="4">Dielectric Strength</td><td colspan="2">1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case</td><td colspan="2">4,000 VAC, 50/60 Hz for 1 minute between current carry parts and case</td></tr>
<tr><td rowspan="7">Maximum Switching Frequency</td><td rowspan="2">M8</td><td>Non flush</td><td colspan="2">600Hz</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">M12</td><td>Flush</td><td colspan="2">800Hz</td><td>500Hz</td><td>-</td><td rowspan="2">20Hz</td></tr>
<tr><td>Non flush</td><td colspan="2">400Hz</td><td>200Hz</td><td>-</td></tr>
<tr><td rowspan="2">M18</td><td>Flush</td><td colspan="2">500Hz</td><td>300Hz</td><td rowspan="2">AC : 20Hz
DC : 50Hz</td><td rowspan="2">20Hz</td></tr>
<tr><td>Non flush</td><td colspan="2">300Hz</td><td>150Hz</td></tr>
<tr><td rowspan="2">M30</td><td>Flush</td><td colspan="2">400Hz</td><td>200Hz</td><td rowspan="2">AC : 20Hz
DC : 50Hz</td><td rowspan="2">20Hz</td></tr>
<tr><td>Non flush</td><td colspan="2">22mm : 200Hz
30mm : 75Hz</td><td>100Hz</td></tr>
</table>

Inductive Proximity Sensor
Round-Long Distance
KPRD Series

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M8 Round 3-Wire(DC) 	G : 4mm	3 : M8 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD G311	600Hz
			2 : NPN N/C			KPRD G321	
			3 : PNP N/O			KPRD G331	
			4 : PNP N/C			KPRD G341	
	G : 4mm	3 : M8 Non flush	1 : NPN N/O	1 : 10-30VDC	2 : M8 connector	KPRD G311 2	600Hz
			2 : NPN N/C			KPRD G321 2	
			3 : PNP N/O			KPRD G331 2	
			4 : PNP N/C			KPRD G341 2	
	G : 4mm	3 : M8 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD G311 3	600Hz
			2 : NPN N/C			KPRD G321 3	
			3 : PNP N/O			KPRD G331 3	
			4 : PNP N/C			KPRD G341 3	
M12 Round 3-Wire(DC) 	G : 4mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD G411	800Hz
			2 : NPN N/C			KPRD G421	
			3 : PNP N/O			KPRD G431	
			4 : PNP N/C			KPRD G441	
	K : 8mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD K411	400Hz
			2 : NPN N/C			KPRD K421	
			3 : PNP N/O			KPRD K431	
			4 : PNP N/C			KPRD K441	
	G : 4mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD G411 3	800Hz
			2 : NPN N/C			KPRD G421 3	
			3 : PNP N/O			KPRD G431 3	
			4 : PNP N/C			KPRD G441 3	
	K : 8mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD K411 3	400Hz
			2 : NPN N/C			KPRD K421 3	
			3 : PNP N/O			KPRD K431 3	
			4 : PNP N/C			KPRD K441 3	

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M18 Round 3-Wire(DC)	K : 8mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD K511	500Hz
			2 : NPN N/C			KPRD K521	
			3 : PNP N/O			KPRD K531	
			4 : PNP N/C			KPRD K541	
	N : 12mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD N511	300Hz
			2 : NPN N/C			KPRD N521	
			3 : PNP N/O			KPRD N531	
			4 : PNP N/C			KPRD N541	
	K : 8mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD K511 3	500Hz
			2 : NPN N/C			KPRD K521 3	
			3 : PNP N/O			KPRD K531 3	
			4 : PNP N/C			KPRD K541 3	
	N : 12mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD N511 3	300Hz
			2 : NPN N/C			KPRD N521 3	
			3 : PNP N/O			KPRD N531 3	
			4 : PNP N/C			KPRD N541 3	
M30 Round 3-Wire(DC)	P : 15mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD P611	400Hz
			2 : NPN N/C			KPRD P621	
			3 : PNP N/O			KPRD P631	
			4 : PNP N/C			KPRD P641	
	V : 30mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRD V611	200Hz
			2 : NPN N/C			KPRD V621	
			3 : PNP N/O			KPRD V631	
			4 : PNP N/C			KPRD V641	
	P : 15mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD P611 3	400Hz
			2 : NPN N/C			KPRD P621 3	
			3 : PNP N/O			KPRD P631 3	
			4 : PNP N/C			KPRD P641 3	
	V : 30mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRD V611 3	200Hz
			2 : NPN N/C			KPRD V621 3	
			3 : PNP N/O			KPRD V631 3	
			4 : PNP N/C			KPRD V641 3	

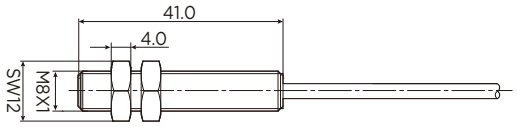
Inductive Proximity Sensor
Round-Long Distance
KPRD Series

Dimension

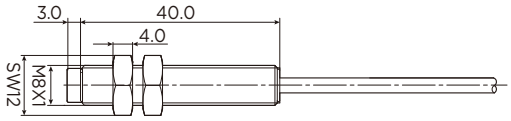
(mm)

KPRD Ø8

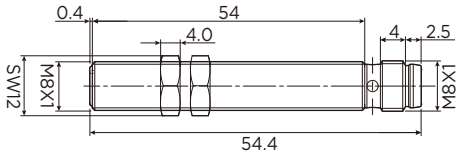
Flush



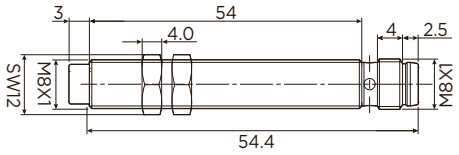
Non flush



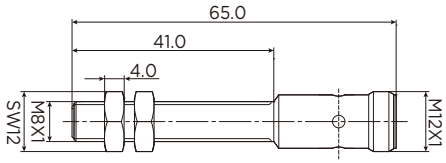
M8 connector Flush



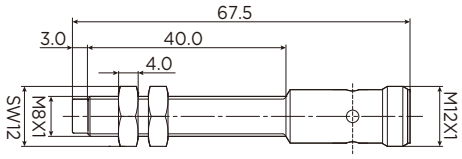
M8 connector Non flush



M12 connector Flush

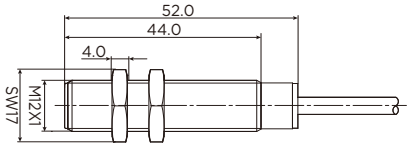


M12 connector Non flush

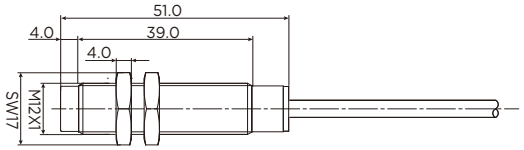


KPRD Ø12

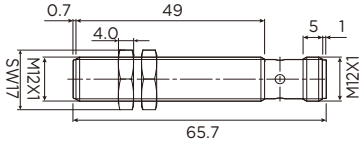
Flush



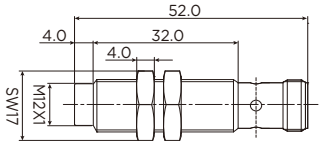
Non flush



M12 connector Flush



M12 connector Non flush

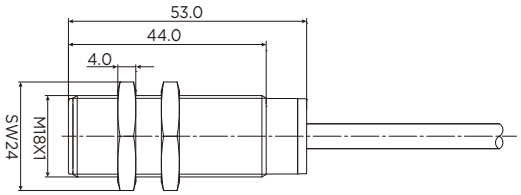


Dimension

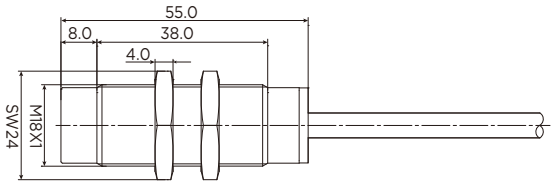
(mm)

KPRD Ø18

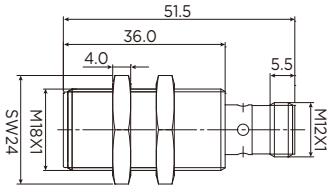
Flush



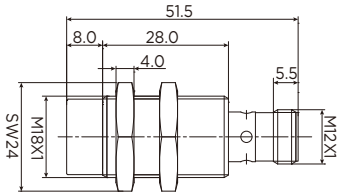
Non flush



M12 connector Flush

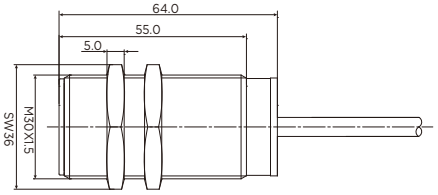


M12 connector Non flush

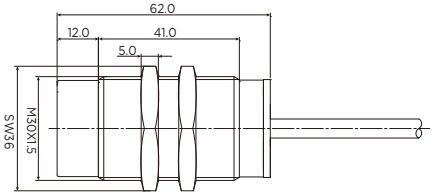


KPRD Ø30

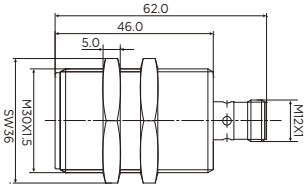
Flush



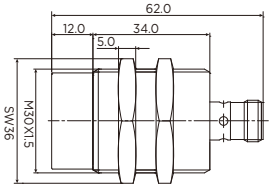
Non flush



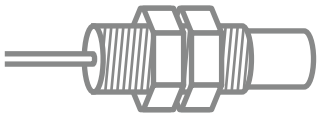
M12 connector Flush

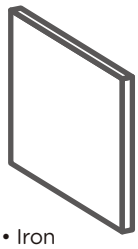


M12 connector Non flush



Inductive Proximity Sensor
Round-All Metal Body
KPRM Series

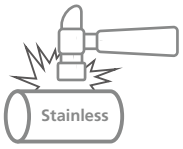




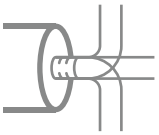
- Iron
- Aluminum
- Copper
- Stainless
- Brass



Allowing installation onto lines that require cleaning.



All Stainless body withstands cleaning agents at features high resistance to corrosion.



Approximately twice that of vinyl chloride.



Twice or three times that of oil-resistant vinyl chloride



Enhanced waterproof design

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KPRM : Inductive Proximity Metal head round			
❶	**Distance**	E : 2mm K : 8mm	G : 4mm L : 10mm	H : 5mm P : 15mm	
❷	**Size**	4 : Ø12	5 : Ø18	6 : Ø30	
❸	**Output**	1 : NPN N/O (3 wire)	2 : NPN N/C (3 wire)	3 : PNP N/O (3 wire)	4 : PNP N/C (3 wire)
❹	**Power**	1 : 10 ~ 30VDC			
❺	**Cable Outlet**	Standard* : 2m Cable	3 : M12 connector		

* Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available					O	O		O				
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available				O		O	O		O	O		O
Sensing Distance	20mm	22mm	25mm	30mm	40mm	50mm	70mm					
Available												
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	O	O	O	O								
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	O						O					
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			O									

General Specification

Detectable Object	Ferrous metal (The sensing distance decreases with non-ferrous metal.)
Differential Travel	Max. 15% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m PUR cable 3 : M12 connector
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −30 to 85°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Case Material	Stainless
Shock Resistance	Destruction : 1,000 m/s^2 10 times each in X, Y, and Z directions

Characteristics

	DC 3wire			
Supply Voltage	1 : 10 ~ 30VDC			
Current Consumption	Max. 10mA			
Voltage Drop	Residual voltage : Max. 2V Load current : Max. 200 mA			
Operation Mode	1 : NPN N/O	2 : NPN N/C	3 : PNP N/O	4 : PNP N/C
Dielectric Strength	1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case			
Maximum Switching Frequency	300Hz (KPRM Ø30 : 150Hz)			

Inductive Proximity Sensor
Round-All Metal Body
KPRM Series

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M12 Round 3-Wire(DC)	E : 2mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRM E411	300Hz
			2 : NPN N/C			KPRM E421	
			3 : PNP N/O			KPRM E431	
			4 : PNP N/C			KPRM E441	
	G : 4mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRM G411	300Hz
			2 : NPN N/C			KPRM G421	
			3 : PNP N/O			KPRM G431	
			4 : PNP N/C			KPRM G441	
	E : 2mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRM E411 3	300Hz
			2 : NPN N/C			KPRM E421 3	
			3 : PNP N/O			KPRM E431 3	
			4 : PNP N/C			KPRM E441 3	
	G : 4mm	4 : M12 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRM G411 3	300Hz
			2 : NPN N/C			KPRM G421 3	
			3 : PNP N/O			KPRM G431 3	
			4 : PNP N/C			KPRM G441 3	
M18 Round 3-Wire(DC)	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRM H511	300Hz
			2 : NPN N/C			KPRM H521	
			3 : PNP N/O			KPRM H531	
			4 : PNP N/C			KPRM H541	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRM K511	300Hz
			2 : NPN N/C			KPRM K521	
			3 : PNP N/O			KPRM K531	
			4 : PNP N/C			KPRM K541	
	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRM H511 3	300Hz
			2 : NPN N/C			KPRM H521 3	
			3 : PNP N/O			KPRM H531 3	
			4 : PNP N/C			KPRM H541 3	
	K : 8mm	5 : M18 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRM K511 3	300Hz
			2 : NPN N/C			KPRM K521 3	
			3 : PNP N/O			KPRM K531 3	
			4 : PNP N/C			KPRM K541 3	

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M30 Round 3-Wire(DC)	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRM L611	150Hz
			2 : NPN N/C			KPRM L621	
			3 : PNP N/O			KPRM L631	
			4 : PNP N/C			KPRM L641	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRM P611	150Hz
			2 : NPN N/C			KPRM P621	
			3 : PNP N/O			KPRM P631	
			4 : PNP N/C			KPRM P641	
	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRM L611 3	150Hz
			2 : NPN N/C			KPRM L621 3	
			3 : PNP N/O			KPRM L631 3	
			4 : PNP N/C			KPRM L641 3	
	P : 15mm	6 : M30 Non flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRM P611 3	150Hz
			2 : NPN N/C			KPRM P621 3	
			3 : PNP N/O			KPRM P631 3	
			4 : PNP N/C			KPRM P641 3	



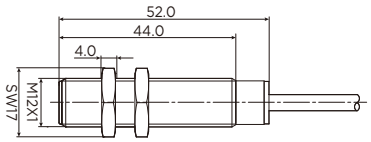
Inductive Proximity Sensor
Round-All Metal Body
KPRM Series

Dimension

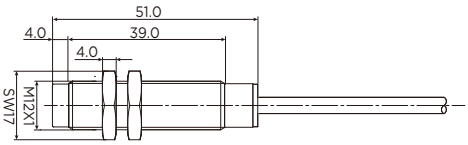
(mm)

KPRM Ø12

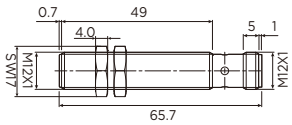
Flush



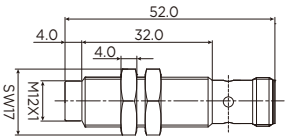
Non flush



M12 connector Flush

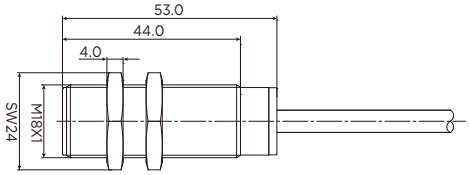


M12 connector Non flush



KPRM Ø18

Flush



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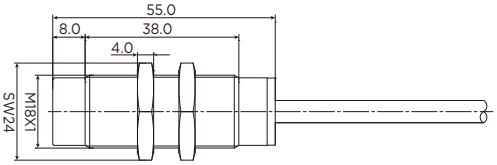
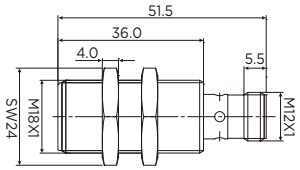
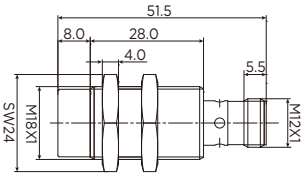


M12 connector Flush

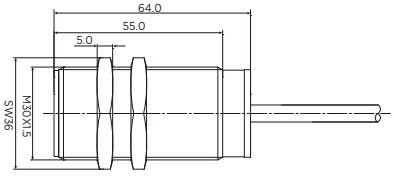


M12 connector Non flush

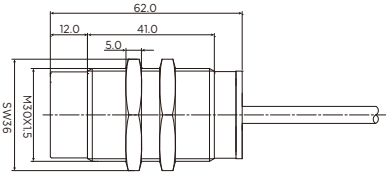


KPRM Ø30

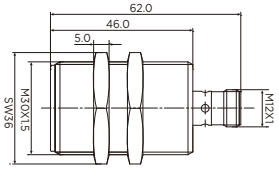
Flush



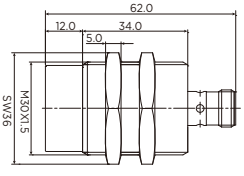
Non flush



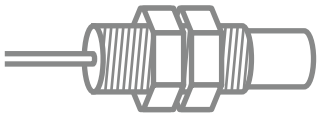
M12 connector Flush

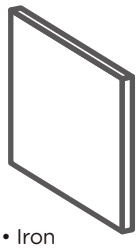


M12 connector Non flush



Inductive Proximity Sensor
Round-Tefron coated
KPRT Series





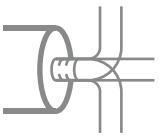
- Iron
- Aluminum
- Copper
- Stainless
- Brass



The best choice for the welding machine.



Enhanced waterproof design



Approximately twice that of vinyl chloride.



Twice or three times that of oil-resistant vinyl chloride

Part Number Description

SERIES ❶ ❷ ❸ ❹ ❺

	SERIES	KPRT : Inductive Proximity Tefron round			
❶	**Distance**	F : 3mm	H : 5mm	L : 10mm	
❷	**Size**	4 : Ø12	5 : Ø18	6 : Ø30	
❸	**Output**	1 : NPN N/O (3 wire)	2 : NPN N/C (3 wire)	3 : PNP N/O (3 wire)	4 : PNP N/C (3 wire)
❹	**Power**	1 : 10 ~ 30VDC			
❺	**Cable Outlet**	Standard* : 2m Cable	3 : M12 connector		

* Standard specification is not appeared in part number description

Guide to Selection

Size	●3	●5	■7	●8	●12	●■18	■25	●■30	●32	■34	■40	■80
Available					○	○		○				
Sensing Distance	0.8mm	1mm	1.5mm	2mm	3mm	4mm	5mm	7mm	8mm	10mm	12mm	15mm
Available					○		○			○		
Sensing Distance	20mm	22mm	25mm	30mm	40mm	50mm	70mm					
Available												
Output	NPN N/C	NPN N/O	PNP N/C	NPN N/O	N/C	N/O	NPN N/O+N/C		PNP N/O+N/C		Analog	NAMUR
Available	○	○	○	○								
Connector	2m Cable			M8 Connector			M12 Connector			Screw Terminal		
Available	○						○					
Power	7.7-9VDC		10-30VDC		15-30VDC		10-60VDC		20-240VAC		20-240VAC/DC	
Available			○									

Inductive Proximity Sensor
Round-Tefron coated
KPRT Series

General Specification

Detectable Object	Ferrous metal (The sensing distance decreases with non-ferrous metal.)
Differential Travel	Max. 15% of sensing distance
Indicators	LED
Cable Outlet	Standard : 2m PUR cable 3 : M12 connector
Protection Circuits	Load short-circuit protection, Surge suppressor, Reverse polarity protection
Ambient Temperature	Operating/Storage : −30 to 85°C (with no icing)
Ambient Humidity	Operating/Storage : 35% to 95% (with no icing)
Temperature Influence	Max. ±10% of sensing distance at 23°C in the temperature range of −25 to 70°C
Voltage Influence	Max. ±1% of sensing distance at rated voltage in the rated voltage ±15% range
Insulation Resistance	Min. 50 MΩ (at 500 VDC) between current-carrying parts and case
Vibration Resistance	Destruction : 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions
Shock Resistance	Destruction : 1,000 m/s^2 10 times each in X, Y, and Z directions

Characteristics

			DC 3wire			
Supply Voltage			1 : 10 ~ 30VDC			
Current Consumption			Max. 15mA			
Voltage Drop			Residual voltage : Max. 2V Load current : Max. 200 mA			
Operation Mode			1 : NPN N/O	2 : NPN N/C	3 : PNP N/O	4 : PNP N/C
Dielectric Strength			1,000 VAC, 50/60 Hz for 1 minute between current carry parts and case			
Maximum Switching Frequency	M12	Flush	800Hz			
	M18	Flush	800Hz			
	M30	Flush	500Hz			

Product Selection

Model	Sensing Distance	Shape	Output	Power	Cable Outlet	Part Number	Response Frequency
M12 Round Tefron coating 3-wire(DC) 	F : 3mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRT F411	800Hz
			2 : NPN N/C			KPRT F421	
			3 : PNP N/O			KPR TF431	
			4 : PNP N/C			KPRT F441	
	F : 3mm	4 : M12 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRT F411 3	800Hz
			2 : NPN N/C			KPRT F421 3	
			3 : PNP N/O			KPRT F431 3	
			4 : PNP N/C			KPRT F441 3	
M18 Round Tefron coating 3-wire(DC) 	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRT H511	1000Hz
			2 : NPN N/C			KPRT H521	
			3 : PNP N/O			KPRT H531	
			4 : PNP N/C			KPRT H541	
	H : 5mm	5 : M18 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRT H511 3	1000Hz
			2 : NPN N/C			KPRT H521 3	
			3 : PNP N/O			KPRT H531 3	
			4 : PNP N/C			KPRT H541 3	
M30 Round Tefron coating 3-wire(DC) 	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	Standard : 2m Cable	KPRT L611	500Hz
			2 : NPN N/C			KPRT L621	
			3 : PNP N/O			KPRT L631	
			4 : PNP N/C			KPRT L641	
	L : 10mm	6 : M30 Flush	1 : NPN N/O	1 : 10-30VDC	3 : M12 connector	KPRT L611 3	500Hz
			2 : NPN N/C			KPRT L621 3	
			3 : PNP N/O			KPRT L631 3	
			4 : PNP N/C			KPRT L641 3	

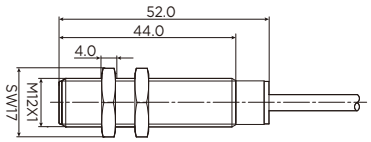
Inductive Proximity Sensor
Round-Tefron coated
KPRT Series

Dimension

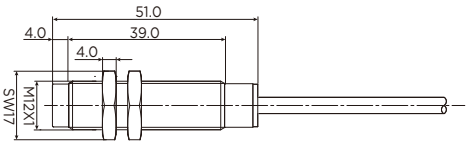
(mm)

KPRT Ø12

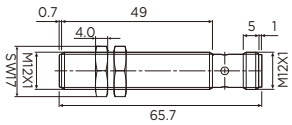
Flush



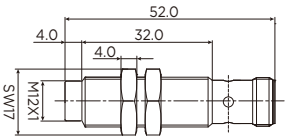
Non flush



M12 connector Flush

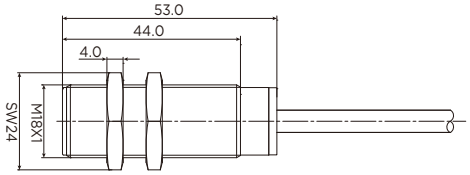


M12 connector Non flush

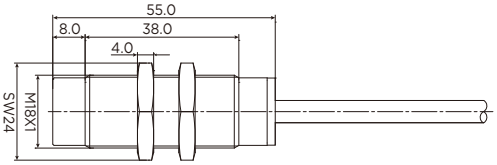


KPRT Ø18

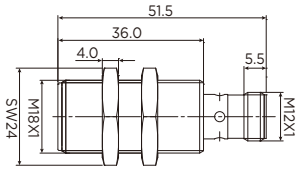
Flush



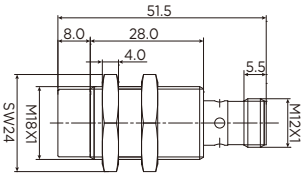
Non flush



M12 connector Flush

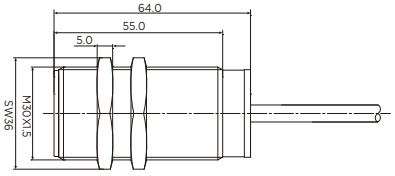


M12 connector Non flush

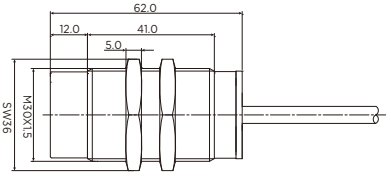


KPRT Ø30

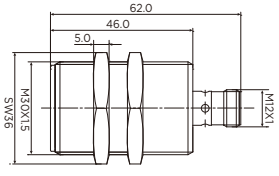
Flush



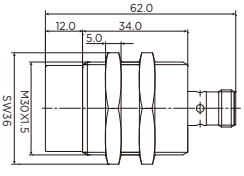
Non flush



M12 connector Flush



M12 connector Non flush



Technical Data
Proximity Sensor

Overview

Proximity Sensor includes all sensors that perform non-contact Detection in comparison to sensors, such as limit switches, that detect objects by physically contacting them. Proximity Sensors convert information on the movement or presence of an object into an electrical signal. There are three types of Detection systems that do this conversion : systems that use the eddy currents that are generated in metallic detectable objects by electromagnetic induction, systems that detect changes in electrical capacity when approaching the detectable object, and systems that use magnets and reed switches.

Features

(1) Proximity Sensors detect an object without touching it, and they therefore do not cause abrasion or damage to the object.
Devices such as limit switches detect an object by contacting it, but Proximity Sensors are able to detect the presence of the object electrically, without having to touch it.

(2) No contacts are used for output, so the Sensor has a longer service life (excluding sensors that use magnets).
Proximity Sensors use semiconductor outputs, so there are no contacts to affect the service life.

(3) Unlike optical Detection methods, Proximity Sensors are suitable for use in locations where water or oil is used.
Detection takes place with almost no effect from dirt, oil, or water on the object being detected.

(4) Proximity Sensors provide high-speed response, compared with switches that require physical contact.
For information on high-speed response, refer to Explanation of Terms on glossary page.

(5) Proximity Sensors are not affected by colors.
Proximity Sensors detect the physical changes of an object, so they are almost completely unaffected by the object's surface color.

(6) Unlike switches, which rely on physical contact, Proximity Sensors are affected by ambient temperatures, surrounding objects, and other Sensors. Both Inductive and Capacitive Proximity Sensors are affected by interaction with other Sensors. Because of this, care must be taken when installing them to prevent mutual interference Care must also be taken to prevent the effects of surrounding metallic objects on Inductive Proximity Sensors, and to prevent the effects of all surrounding objects on Capacitive Proximity Sensors.

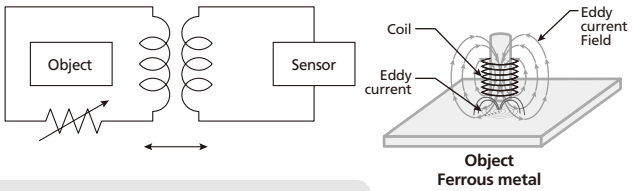
Operating Principles

Principle of Inductive Sensors

Inductive Proximity Sensors detect magnetic loss due to eddy currents that are generated on a conductive surface by an external magnetic field. An AC magnetic field is generated on the Detection coil, and changes in the impedance due to eddy currents generated on a metallic object are detected.

Other methods include Aluminum-detecting Sensors, which detect the phase component of the frequency, and All-metal Sensors, which use a working coil to detect only the changed component of the impedance. There are also Pulse-response Sensors, which generate an eddy current in pulses and detect the time change in the eddy current with the voltage induced in the coil.

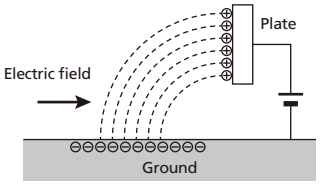
The detectable object and Sensor form what appears to be a transformer-like relationship.



The transformer-like coupling condition is replaced by impedance changes due to eddy-current losses

The impedance changes can be viewed as changes in the resistance that is inserted in series with the detectable object.

Principle of Capacitive Sensors



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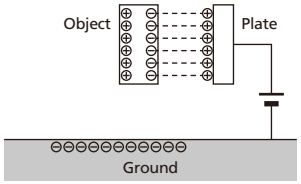


<Figures2>

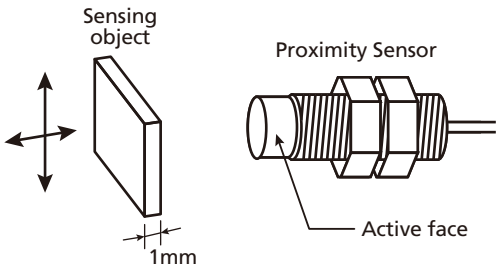
Capacitive Proximity Sensors detect changes in the capacitance between the detectable object and the Sensor. The amount of capacitance varies depending on the size and distance of the detectable object. An ordinary Capacitive Proximity Sensor is similar to a capacitor with two parallel plates, where the capacity of the two plates is detected. One of the plates is the object being measured (with an imaginary ground), and the other is the Sensor's sensing surface. The changes in the capacity generated between these two poles are detected.

The objects that can be detected depend on their dielectric constant, but they include resin and water in addition to metals.

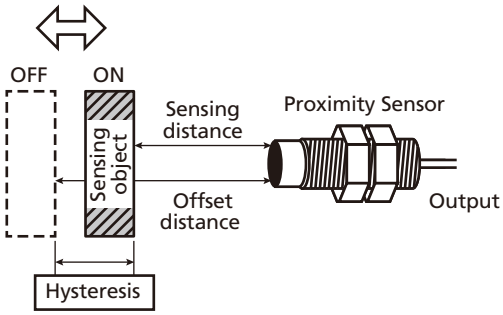
Technical Data
Proximity Sensor

Usage Guidance

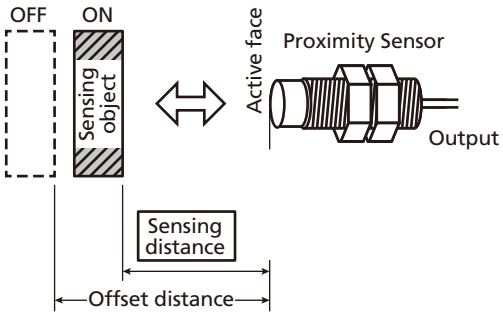
Standard Object
• A detectable object that serves as a reference for measuring basic performance, and that is made of specified materials and has a specified shape and dimensions.



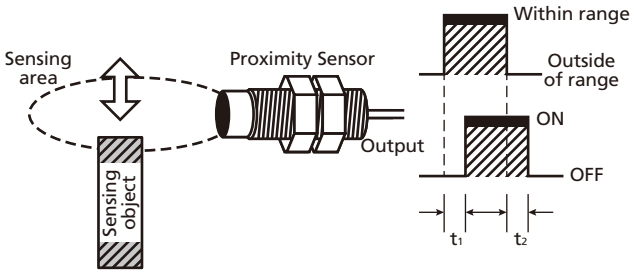
Differential Travel
• With respect to the distance between the standard detectable object and the Sensor, the difference between the distance at which the Sensor operates and the distance at which the Sensor resets.



Sensing Distance
• The distance from the reference position (reference surface) to the measured operation (reset) when the standard detectable object is moved by the specified method.

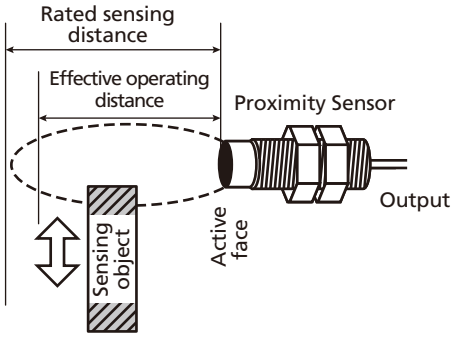


Response Time
• t1 : The interval from the point when the standard detectable object moves into the sensing area and the Sensor activates, to the point when the output turns ON.
• t2 : The interval from the point when the standard detectable object moves out of the Sensor sensing area to the point when the Sensor output turns OFF.



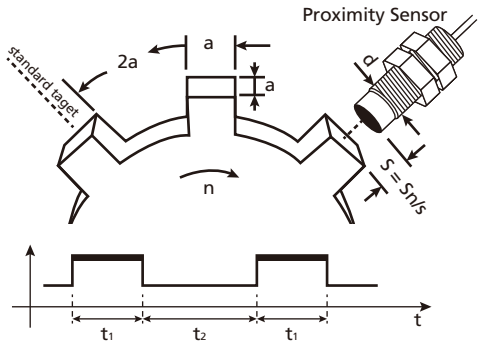
Effective Operating Distance
• The distance from the reference surface that allows stable use, including the effects of temperature and voltage, to the (standard)detectable object transit position.

• This is approximately 70% to 80% of the normal (rated) sensing distance.



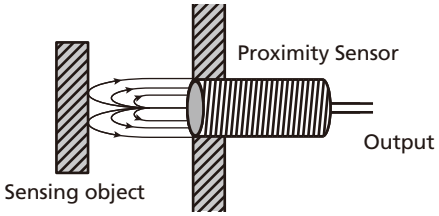
Response Frequency
• The number of Detection repetitions that can be output per second when the standard detectable object is repeatedly brought into proximity.

• See the accompanying diagram for the measuring method.



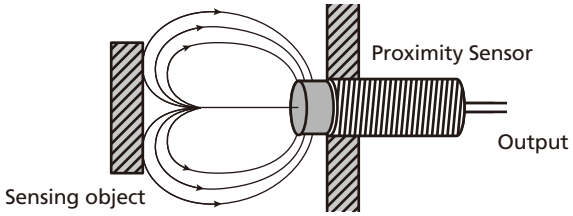
Flush

- With a FlushSensor, magnetic flux is concentrated in front of the Sensor and the sides of the Sensor coil are covered with metal.
- The Sensor can be mounted by embedding it into metal.



Non flush

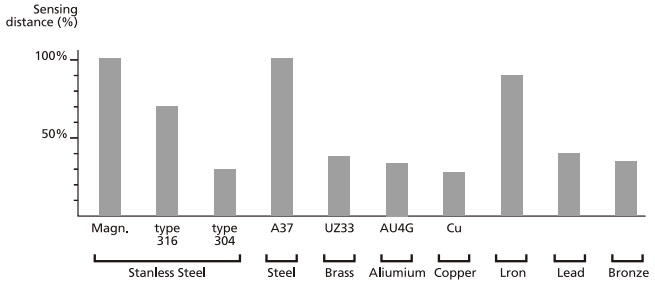
- With an Non flush Sensor, magnetic flux is spread widely in front of the Sensor and the sides of the Sensor coil are not covered with metal.
- This model is easily affected by surrounding metal objects (magnetic objects), so care must be taken in selecting the mounting location.



Interpreting Engineering Data

Effects of Detectable object Size and Material

Distance Table by Material



- It shows changes in the sensing distance due to material of the detectable object. Refer to this data when using the same Sensor to detect various different detectable objects

Leakage Current Characteristics

- In contrast with contact-type limit switches, which have physical contacts, leakage cur-rent in a 2-wire Proximity Sensor is related to an electrical switch that consists of transis-tors and other components. This graph indi-cates the leakage current characteristics caused by transistors in the output section of the Sensor.
- Generally speaking, the higher the voltage, the larger the leakage current. Because leak-age current flows to the load connected to the Proximity Sensor, care must be taken to select a load that will not cause the Sensor to operate from the leakage current.
- Be careful of this factor when replacing a limit switch, micro-switch, or other switch with a Proximity Sensor.

Residual Voltage Characteristics

- Similar to leakage current characteristics, re-sidual voltage is something that occurs due to electrical switches that are comprised of tran-sistors and other components. For example, whereas the voltage in a normally open switch should be 0 V in the ON state, and the same as the power supply voltage in the OFF state, residual voltage refers to a certain level of voltage remaining in the switch. Be careful of this factor when replacing a limit switch, micro-switch, or other switch with a Proximity Sensor.

General Precautions

For precautions on individual products, refer to the Safety Precautions in individual product information.

⚠ WARNING

- These products cannot be used in safety devices for presses or other safety devices used to protect human life.
- These products are designed for use in applications for sensing workpiecs and workers that do not affect safety.

Precautions for Safe use

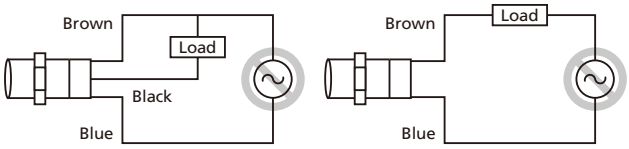
- To ensure safety, always observe the following precautions.

Wiring Instruction

Power Supply Voltage

Do not use a voltage that exceeds the operating voltage range. Applying a voltage that is higher than the operating voltage range, or using an AC power supply (100 VAC or higher) for a Sensor that requires a DC power supply may cause explosion or burning.

(1) DC 3-Wire NPN Output Sensors **(2) DC 2-Wire Sensors**



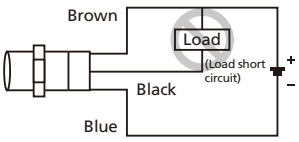
Technical Data
Proximity Sensor

Wiring Instruction

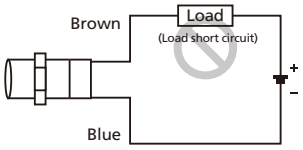
Load short-circuiting
• Do not short-circuit the load. Explosion or burning may result.

• The load short-circuit protection function operates when the power supply is connected with the correct polarity and the power is within the rated voltage range.

(1) DC 3-Wire NPN Output Sensors



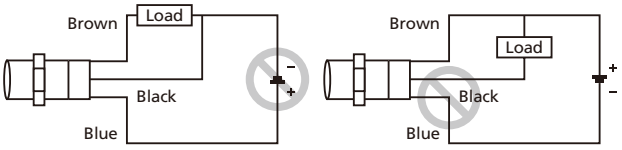
(2) DC 2-Wire Sensors



• Even with the load short-circuit protection function, protection will not be provided when a load short circuit occurs if the power supply polarity is not correct.

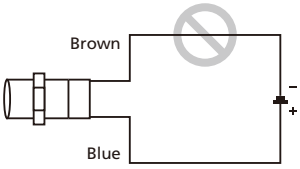
Incorrect Wiring
Be sure that the power supply polarity and other wiring is correct. Incorrect wiring may cause explosion or burning.

DC 3-Wire NPN Output Sensors

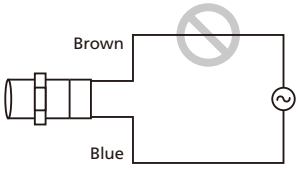


Cable outlet without a Load
If the power supply is connected directly without a load, the internal elements may explode or burn. Be sure to insert a load when connecting the power supply.

(1) DC 2-Wire Sensors



(2) AC 2-Wire Sensors



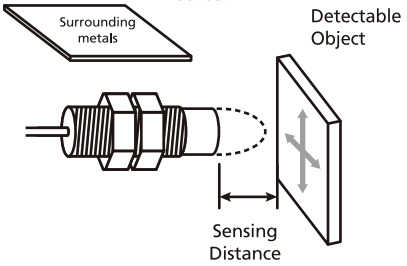
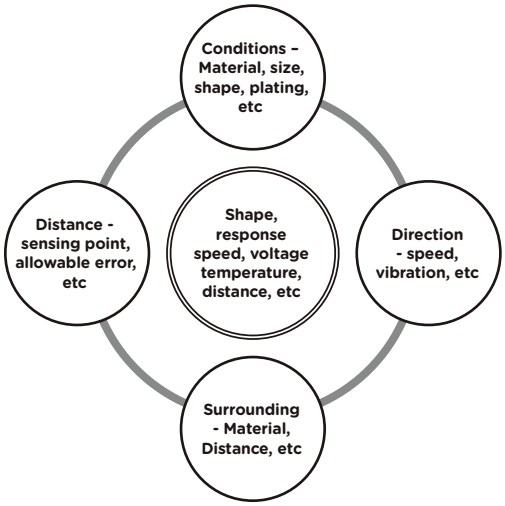
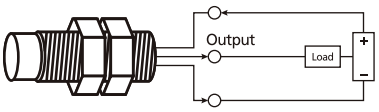
• Even with the load short-circuit protection function, protection will not be provided if both the power supply polarity is incorrect

Operating Environment
Do not use the Sensor in an environment where there are explosive or combustible gases.

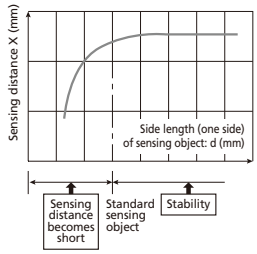
Precaution for Safe use

The following conditions must be considered to understand the conditions of the application and location as well as the relation to control equipment.

Model Selection

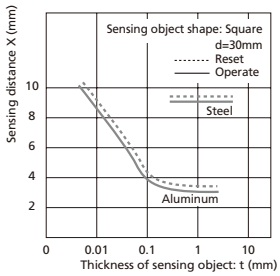
Item	Check points		
Detectable object and operating condition of Proximity Sensor	Check the relation between the detectable object and the Proximity Sensor  		
Electrical conditions	Verify the electrical conditions of the control system to be used and the electrical performance of the Proximity Sensor. 		
	Power supply	DC (voltage fluctuation, current capacity value) AC (voltage fluctuation, frequency, etc.)	- Selecting the power supply type [DC/DC/AC]
	Load	Resistive load - Non-contact control system Inductive load - Relay, solenoid, etc. • Steady-state current, inrush current • Operating, reset voltage (current) Lamp load • Steady-state current, inrush current Open/close frequency	- Selecting the power supply type [DC/DC/AC] - Control output Maximum current (voltage) - Leakage current - Residual load voltage

Size of Detectable object



In general, if the object is smaller than the standard detectable object, the sensing distance decreases.
Design the setup for an object size that is the same or greater than the standard detectable object size from the graphs showing the detectable object size and sensing distance.
When the size of the standard detectable object is the same or less than the size of the standard detectable object,select a sensing distance with sufficient leeway.

Thickness of Detectable object



The thickness of ferrous metals (iron, nickel, etc.) must be 1 mm or greater.
For non-magnetic metal, a sensing distance equivalent to a magnetic body can be obtained when the coating thickness is 0.01 mm or less.
When the coating is extremely thin and is not conductive, such as a vacuum deposited film, Detection is not possible.
Influence of Plating If the detectable object is plated, the sensing distance will change (see the table below).

Effect of Plating (Typical)

Thickness and base material of plating	Detectable performance (%)
Non plating steel(Fe)	100
Zn 5 to 15 μm	90 to 120
Cd 5 to 15 μm	100 to 110
Ag 5 to 15 μm	60 to 90
Cu 10 to 20 μm	70 to 95
Cu 5 to 15 μm	-
Cu (5 to 10 μm) + Ni (10 to 20 μm)	70 to 95
Cu (5 to 10 μm) + Ni (10 μm) + Cr (0.3 μm)	70 to 95

Mutual Interference

Mutual interference refers to a state where a Sensor is affected by magnetism (or static capacitance) from an adjacent Sensor and the output is unstable. One means of avoiding interference when mounting Proximity Sensors close together is to alternate Sensors with different frequencies. The model tables indicate whether different frequencies are available. Please refer to the tables. When Proximity Sensors with the same frequency are mounted together in a line or face-to-face, they must be separated by a minimum distance. For details, refer to Mutual Interference in the Safety Precautions for individual Sensors.

Power Reset Time

A Sensor is ready for Detection within 100 ms after turning ON the power. If the load and Sensor are connected to separate power supplies, design the system so that the Sensor power turns ON first.

Turning OFF the Power

An output pulse may be generated when the power is turned OFF, so design the system so that the load or load line power turns OFF first.

Influence of Surrounding Metal

The existence of a metal object other than the detectable object near the sensing surface of the Proximity Sensor will affect Detection performance,increase the apparent operating distance, degrade temperature characteristics, and cause reset failures. For details, refer to the influence of surrounding metal table in Safety Precautions for individual Sensors. Particularly the distance m that separates a metal surface that faces the Sensor's sensing surface will influence performance, such as shortening the sensing distance. The values in the table are for the nuts provided with the Sensors.Changing the nut material will change the influence of the surrounding metal.

Power Transformers

Be sure to use an insulated transformer for a DC power supply. Do not use an auto-transformer (single-coil transformer).

Precautions for AC 2-Wire/DC 2-Wire Sensors Surge Protection

Although the Proximity Sensor has a surge absorption circuit, if there is a device (motor, welder, etc.) that causes large surges near the Proximity Sensor, insert a surge absorber near the source of the surges.

Influence of Leakage Current

Even when the Proximity Sensor is OFF, a small amount of current runs through the circuit as leakage current.For this reason, a small current may remain in the load (residual voltage in the load) and cause load reset failures. Verify that this voltage is lower than the load reset voltage (the leakage current is less than the load reset current) before using the Sensor.

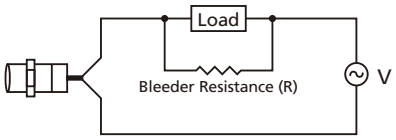
Using an Electronic Device as the Load for an AC 2-Wire Sensor

When using an electronic device, such as a Timer, some types of devices use AC half-wave rectification. When a Proximity Sensor is connected to a device using AC half-wave rectification, only AC halfwave power will be supplied to the Sensor. This will cause the Sensor operation to be unstable. Also, do not use a Proximity Sensor to turn the power supply ON and OFF for electronic devices that use DC halfwave rectification. In such a case, use a relay to turn the power supply ON and OFF, and check the system for operating stability after connecting it.

Countermeasures for Leakage Current (Examples)

AC 2-Wire Model

Connect a bleeder resistor to bypass the leakage current flowing in the load so that the current flowing through the load is less than the load reset current. When using an AC 2-Wire Sensor, connect a bleeder resistor so that the Proximity Sensor current is at least 10 mA, and the residual load voltage when the Proximity Sensor is OFF is less than the load reset voltage.



Calculate the bleeder resistance and allowable power using the following equation.

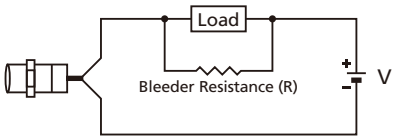
$$R \leq \frac{V}{10 - 1}(k\Omega) \qquad P > \frac{V^2}{R}(mW)$$

P : Watts of bleeder resistance (the actual number of watts used should be several times this number)
I : Load current (mA)

It is recommend that leeway be included in the actual values used.For 100 VAC, use 10 kΩ or less and 3 W (5 W) or higher, and for 200 VAC, use 20 kΩ or less and 10 W (20 W) or higher. If the effects of heat generation are a problem, use the number of watts in parentheses ( ) or higher.

DC 2-Wire Model

Connect a bleeder resistor to bypass the leakage current flowing in the load, and design the load current so that (leakage current) × (load input impedance) < reset voltage.



Calculate the bleeder resistance and allowable power using the following equation.

$$R \leq \frac{V}{iBR - iL}(k\Omega) \qquad P > \frac{V^2}{R}(mW)$$

P : Watts of bleeder resistance (the actual number of watts used should be several times this number)
iBR : Leakage current of Proximity Sensor (mA)
iL : Load reset current (mA)
It is recommend that leeway be included in the actual values used.For 12 VDC, use 15 kΩ or less and 450 mW or higher, and for 24 VDC, use 30 kΩ or less and 0.1 W or higher.