Capacitive type proximity sensor

CUP series

INSTRUCTION MANUAL

Thank you for purchasing HANYOUNG product.
Please check whether the product is the exactly same as you ordered.
Before using the product, please read this instruction manual carefully.
Please keep this manual where you can view at any time

HANYOUNG NUX

• 18R • 18RP • 30R • 30RP

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Safety information

Alerts declared in the manual are classified to Danger, Warning and Caution by their criticality

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury

⚠ Warning

- Since this product is not designed as a safely used device the user must install double safety equipment when this product is used for equipment with possible fatal accident or large property damage.

⚠ Caution

- Pay attention that it is possible to damage a proximity sensor by a short circuit when wiring load.
- Wiring to an applicable device shall be certainly connected by using compressing terminals or soldering.
- Do not use PNP type or NPN type indiscriminately.
- Please wire after ensuring whether input conditions are accepted to an applicable device.
- When there is a power or high voltage line close to the cord of the proximity sensor, wire the cord with shielding such as an independent metal conduit to prevent against proximity sensor's damage or malfunction.
- Although the proximity sensor has a surge absorption circuit, if there is any machine that has a large surging one (e.g., a motor, welding machine, etc) near the proximity sensor, connect a varistor, surge absorber, noise filter to a surge generating area.
- Effect of Consumption Current : When AC type of proximity sensor is OFF, the proximity sensor has little consumption current for an operation of the circuit. Because of this fact, the little voltage left in the load may be a cause of load reset defective, so please make sure this voltage is less than the load reset voltage before using.
- In case of a load current is small : When a loaded current of AC type of proximity sensor is less than 5 ㎃, wire a bleeder resistor with the load in parallel so that make the residual voltage of the proximity sensor be less than the loaded reset voltage.
- Make the ripple content of the rated voltage which supplied into DC (NPN, PNP) type of proximity sensor be less than the maximum ± 10 % of the ripple content.
- In case of using a condenser as a load, wire a current-limiting resistor in series so that set the peak current shall be within the loaded current of the proximity sensor.
- In case of an inductive load (e.g., a motor, relay, magnet, etc), connect the load with surge bsorbing diode in parallel.
- Pay attention at a position of attachment, divergence, slack and distortion of a sensing surface or proximity sensor.
- In the place of possibly occurring metal particles, make sure whether a sensing distance is properly working since it can be affected if metal particles stick to the sensing surface.
- Pay attention on using or storing the proximity sensor outdoors.
- Do not use the proximity sensor in an environment with chemical, solvent or corrosive.
- Please avoid as much as possible to put the proximity sensor in hot water or to use them in a place where generates high pressure steam.
- The contents of this manual may be changed without prior notification.
- The maximum cable extension length shall be within 200 m.

※ **If you do not follow the contents described in the safety information then it is possible to be a cause of the product's malfunction so please follow them.**

Suffix code

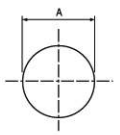
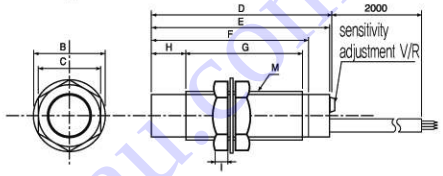
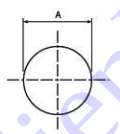
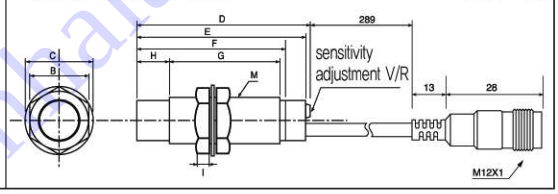
Model	Code							Information
CUP	□	□	□	□	□	□	□	Capacitive type proximity sensor
Sensing area size	18							Sensing area diameter (㎜)
Type		R						Round type (Brass chrome plating case)
		RP						Round type (Plastic case)
Sensing Distance			8					Sensing distance (㎜)
Power Supply and Output				N				D.C NPN output
				P				D.C PNP output
				F				A.C/D.C 2 wire type (dual usage)(Polarity, No polarity)
Output Type					A			Normal open (NO)
					C			Normal close (NC)
Cable structure							*	No indication (Cable type)
							CR	Relay connector type

Specification

■ D.C NPN/PNP Type, A.C/D.C 2 Wire Type

TYPE	D.C 3 Wire Type		A.C/D.C 2 Wire Type	
Model	CUP-18R-8□□ CUP-18RP-8□□ CUP-18R-8□□-CR CUP-18RP-8□□-CR	CUP-30R-15□□ CUP-30RP-15□□ CUP-30R-15□□-CR CUP-30RP-15□□-CR	CUP-18R-8F□ CUP-18RP-8F□ CUP-18R-8F□-CR CUP-18RP-8F□-CR	CUP-30R-15F□ CUP-30RP-15F□ CUP-30R-15F□-CR CUP-30RP-15F□-CR
Sensing distance	8 ㎜ (Volume variation)	15 ㎜ (Volume variation)	8 ㎜ (Volume variation)	15 ㎜ (Volume variation)
Setting distance	0 - 6.4 ㎜	0 - 12 ㎜	0 - 6.4 ㎜	0 - 12 ㎜
Response frequency	50 Hz		d.c : 40 Hz, a.c : 20 Hz	
Hysteresis	Less than 20 % of Sensing distance			
Standard sensing object (㎜)	Iron 50 ㎜ × 50 ㎜ × 1 ㎜ (Grounded〈earthed〉 state)			
Power supply voltage	12 V - 24 V d.c (10 - 30 V d.c)		20 V - 240 V a.c/d.c (18 - 250 V a.c/d.c)	
Control output	Resistive load : 200 ㎃ Max.		Resistive load : 5 - 250 ㎃	
Residual voltage	max 1.5 V		max a.c/d.c 7 V	
Current consumption	Current consumption : max 10 ㎃		Leakage current : max a.c/d.c 2 ㎃	
Operation indication	Red LED			
Protective circuit	Power reversely connected protective circuit, surge protective circuit and over current protective circuit are built in.		surge protective circuit built in.	
Ambient temperature	-25 ~ 70 ℃ (Less than ±10 % of sensing distance at temperature 20 ℃)			
Ambient humidity	35 ~ 85 % R.H.			
Degree of protection	IP67 (IEC standard)			
Vibration resistance	10 - 55 Hz (cycle 1 min, Double amplitude : 1.5 mm 2 hours for each of X, Y and Z directions)			
Dielectric strength	For 1 min at 2000 V a.c 50/60 Hz (between the recharging part and case)			
Shock resistance	500 ㎨ 3 times to each of X, Y and Z directions			
Insulation resistance	min 50 ㏁ (500 V d.c mega standard)			
Material	CUP-18R, 30R TYPE-CASE : Brass (Chrome plating), surface : PBT resin CUP-18RP, 30RP TYPE-CASE : Case and sensing surface one body type : PBT resin			

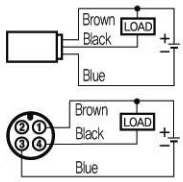
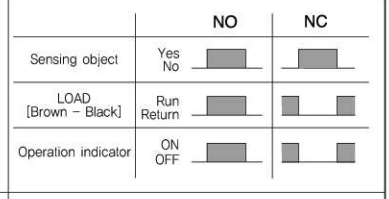
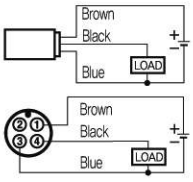
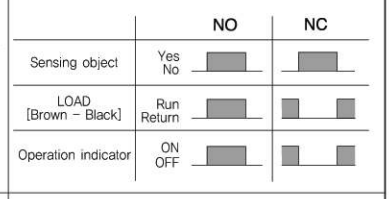
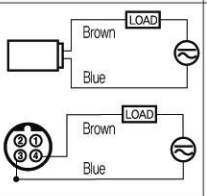
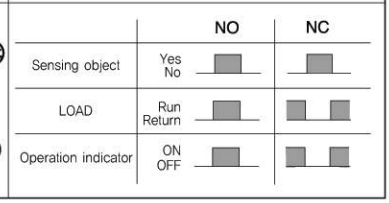
Dimension

Installation hole panel cutout	Dimension
	■ Cable type [Unit : ㎜] 
	■ Relay connector type [Unit : ㎜] 

[Unit : ㎜]

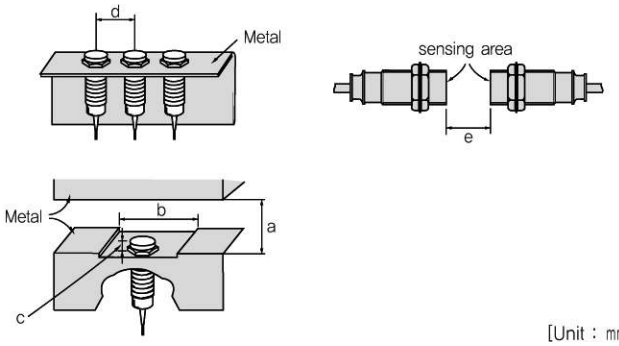
Model	M	A	B	C	D	E	F	G	H	I
CUP-18R-8□□ CUP-18R-8□□-CR	M18×1	19	23	29	75.5	74.5	-	52	10	4
CUP-18RP-8□□ CUP-18RP-8□□-CR	M18×1	19	24.1	-	75.5	74.5	62	44.3	13	6
CUP-30R-15□□ CUP-30R-15□□-CR	M30×1.5	31	35	41	73	72.5	-	49	10	5
CUP-30RP-15□□ CUP-30RP-15□□-CR	M30×1.5	31	36.1	-	73.5	73	60	47	10	7.9

Connection diagram

Type		Connection method	Output state
D.C open / close	NPN		
	PNP		
D.C and A.C open/close			

Mutual interference and effects of surrounding metals

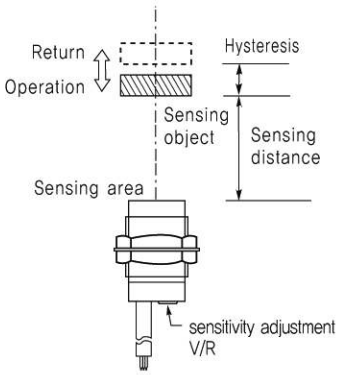
- When attaching more than 1 proximity sensors in parallel direction or facing each other, it can cause the malfunction. When there are metals around the proximity sensor, it can cause malfunctions such as abnormal return due to the existence of metals around the proximity sensor. In order to avoid the malfunction which caused by surrounding metals, please install it with sufficient gap from each other. (Wider than the values written in below chart)



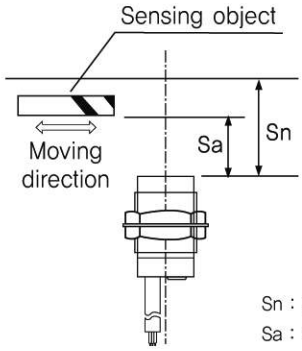
[Unit : mm]

Model \ List	a	b	c	d	e
CUP-18	24	54	20	54	48
CUP-30	45	90	10	90	90

How to set the distance



- The operation distance of proximity sensor is referring to the distance between the sensing surface and sensing object when proximity sensor is being operated.
- When setting the distance, please measure the maximum sensing distance of sensing object in vertical direction and make the installation within 80% of distance.
- Setting distance of each proximity sensor is based on the standard sensing object (iron 50 mm x 50 mm x 1 mm grounded (earthed)) so the sensing distance may vary depending on the shape and material of object so please keep in mind about this issue.



- Turn the sensitivity adjusting volume (V/R) to the left side (1~2rotation) to set the distance when abnormal return occurs.
- If abnormal return still occurs even with 2 rotations, please check for the distance between sensor and surrounding objects.

Sn : Sensing distance
Sa : Setting distance (80 % of Sn)

- Setting distance (Sa) calculation :
  Setting distance (Sa) = Sensing distance (Sn) × 80 %
  Example) Setting distance (Sa) = 10 ㎜ × 0.8 = 8 ㎜

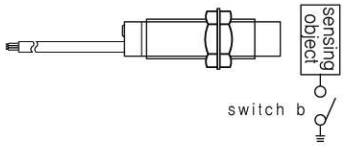
※ How to set the proximity distance

- "15 rotational" sensitivity adjusting V/R (volume) is installed on the back side of capacitive proximity sensor.
- Install the proximity sensor and check for the most suitable proximity state by turning the sensitivity adjusting V/R (volume) to left and right.
- Turning to right side will make sensing distance as maximum and turning to left will make it minimum. Also, continuously turning to one side will not break the V/R (volume).

Regarding the ground (earth)

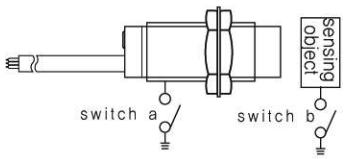
- CUP-18R Series

Ground condition switch b	ON	OFF
Operation distance(㎜)	8	4



- CUP-30R Series

Ground condition	switch a	ON	OFF	ON	OFF
	switch b	ON	ON	OFF	OFF
Operation distance(㎜)		15	18	6	6



※ Sensing distance varies depending on the model type of capacitive proximity sensor and ground state of sensing object so please be cautious

Regarding the dielectric coefficient

- Non-permittivity

It is referring to the ratio of permittivity of object (ε) and permittivity of whole (ε_0) and the larger the value of non-permittivity (ε_s), longer the sensing distance become.

$$\varepsilon_s = \frac{\varepsilon}{\varepsilon_0}$$

Also, every material has its own distinct non-permittivity value and liquid substances have larger non-permittivity value than solid substances. Followings are the example of non-permittivity values for typical substances

Air	1	Styrofoam	1.2
Paper	2.3	Back light	3.6
Tree	6-8	Glass	5
Alcohol	25.8	Water	80