

# Amplifier-in-cable Small Proximity Sensors

## EM Series

### Features

- Ultra-small sensor head
- Amplifier and operation indicator built into cable
- Strong, flexible cable
- IP-67 waterproof housing

### Detecting Distance

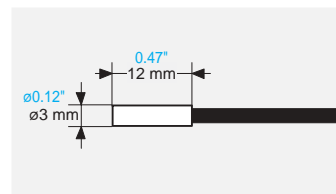
Shielded – Up to 4 mm (0.16")



## Description

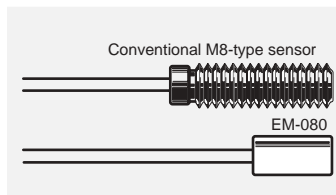
### Compact sensor heads

With a sensor head diameter as small as 3 mm 0.12" for the cylindrical type and M5 for the threaded type, the EM Series sensor is an effective space-saver.



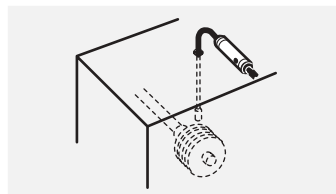
### Short length

The sensor head is half the length of conventional M8-sized self-contained proximity sensors. This enables the EM Series to be installed in limited spaces, thereby broadening its range of applications.



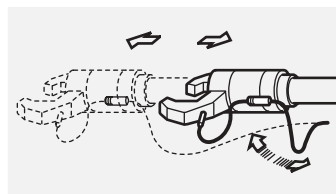
### Visible output indicator

The output indicator is located on the amplifier housing installed in the cable, enabling sensor operation to be easily confirmed.



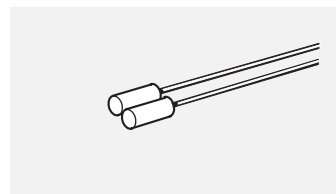
### Flexible cable

The output cable is made of a high-tensile copper alloy giving it 5 times greater flexibility than conventional sheathed cables.



### Parallel installation

Alternate-frequency EM sensors can be installed next to each other without causing interference.



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## Specifications

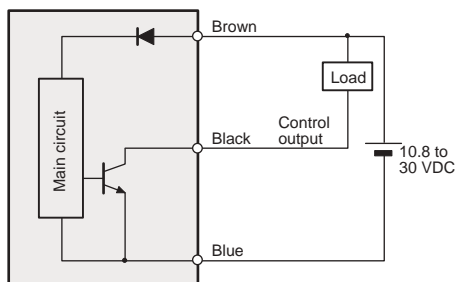
Type		Shielded				
		Cylindrical		Threaded	Cylindrical	
Model	NPN	EM-030	EM-038	EM-005	EM-054	EM-080
	PNP	EM-030P	EM-038P	EM-005P	EM-054P	EM-080P
Size		3 mm 0.12" dia.	3.8 mm 0.15" dia.	M5	5.4 mm 0.21" dia.	8 mm 0.31" dia.
Detecting distance		0.6 mm 0.02" ±15%	0.8 mm 0.31" ±15%	1.0 mm 0.04" ±15%	1.2 mm 0.05" ±10%	2.0 mm 0.08" ±10%
Detectable object		Ferrous metals (see Characteristics for non-ferrous metals)				
Standard target (iron, t=1 mm 0.04")		5 x 5 mm 0.20"			6 x 6 mm 0.24"	10 x 10 mm 0.39"
Hysteresis		10% max. of detecting distance				
Response frequency		1.2 kHz				
Temperature fluctuation		±10% max. of detecting distance at +23°C (73.4°F), within -10 to +70°C (14 to 158°F)				
Indicator		Output: Red LED				
Control output		200 mA (40 V) max., Residual voltage: 1 V max.				
Power supply		10.8 to 30 VDC				
Current consumption		12 mA max.				
Enclosure rating		IP-67				
Ambient temperature		-25 to +80°C (-13 to 176°F), No freezing				
Relative humidity		35 to 95%, No condensation				
Housing		Stainless steel				
Weight (including nuts and 2-m 6.6' cable)		Approx. 36 g	Approx. 38 g	Approx. 40 g		Approx. 42 g

Type		Shielded	
		Threaded	
Model	NPN	EM-010	EM-014
	PNP	EM-010P	EM-014P
Size		M10	M14
Detecting distance		2.0 mm 0.08" ±10%	4.0 mm 0.16" ±10%
Detectable object		Ferrous metals (see Characteristics for non-ferrous metals)	
Standard target (iron, t=1 mm 0.04")		10 x 10 mm 0.39"	15 x 15 mm 0.59"
Hysteresis		10% max. of detecting distance	
Response frequency		1.2 kHz	
Temperature fluctuation		±10% max. of detecting distance at +23°C (73.4°F), within -10 to +70°C (14 to 158°F)	
Indicator		Output: Red LED	
Control output		200 mA (40 V) max. Residual voltage: 1 V max.	
Power supply		10.8 to 30 VDC	
Current consumption		12 mA max.	
Enclosure rating		IP-67	
Ambient temperature		-25 to +80°C (-13 to 176°F), No freezing	
Relative humidity		35 to 95%, No condensation	
Housing		Cr-plated brass	
Weight (including nuts and 2-m 6.6' cable )		Approx. 50 g	Approx. 60 g

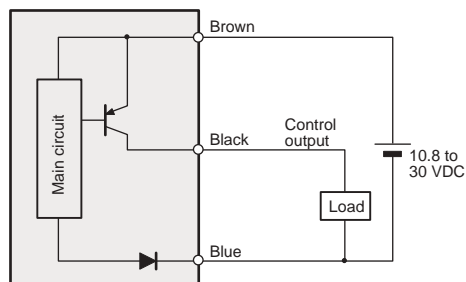
- EM
- EZ/EV
- ES
- ED
- ET
- TA

## Output Circuits

**NPN**

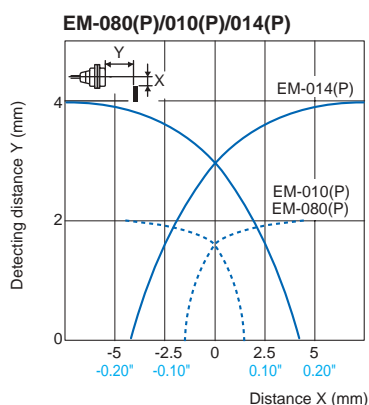
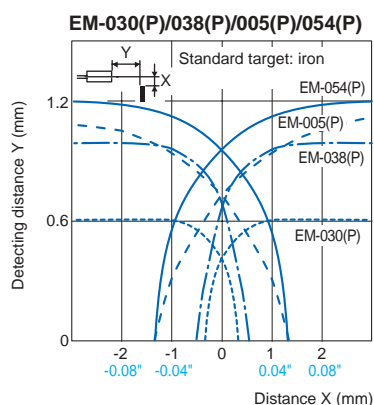


**PNP**

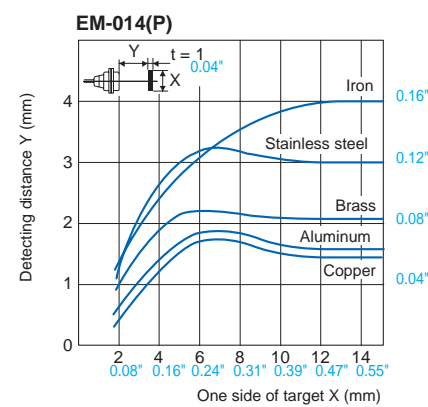
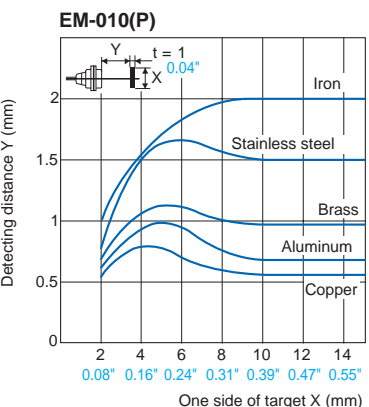
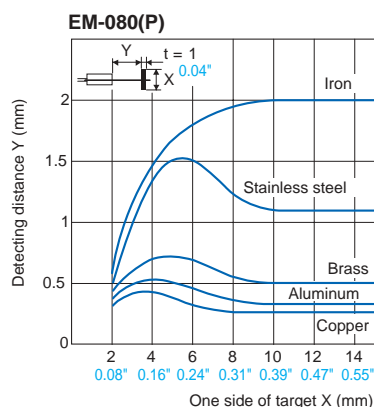
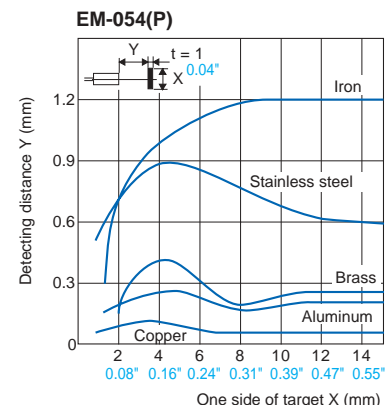
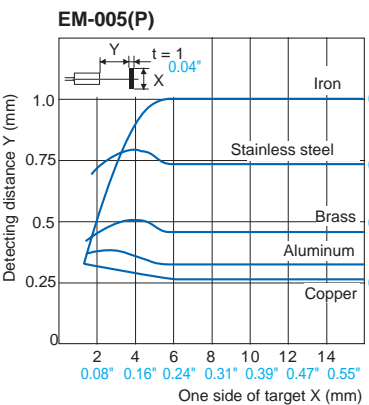
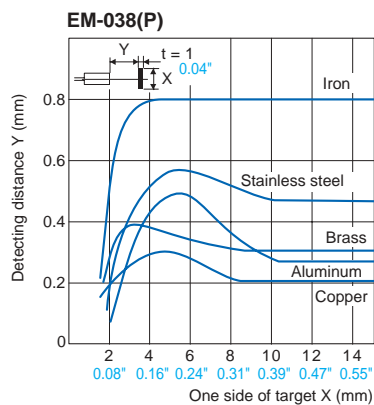
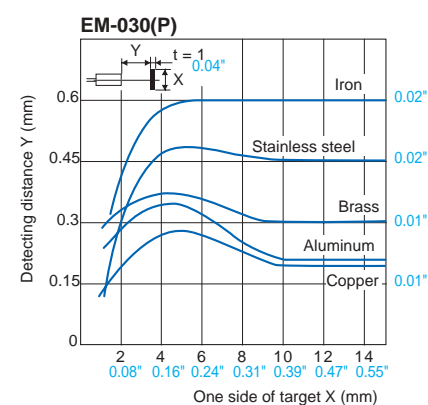


## Characteristics

**Detecting range (Typical)**



**Detecting distance vs. size and material of target (Typical)**



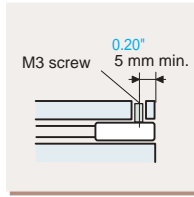
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High Precision Sensors
Displacement Sensors
Thrubeam Measuring
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Video Microscopes

## Hints on Correct Use

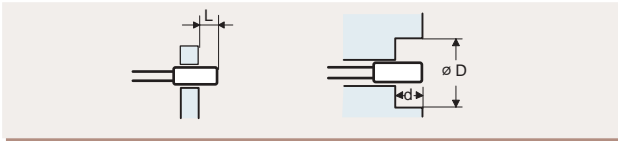
### Mounting

- Cylindrical type  
Secure the sensor head with a screw at a position 5 mm 0.20" or more from the tip of the head.  
[Tightening torque: 0.4 N•m]



### Surrounding metal

When embedding the sensor in an iron base, follow the guidelines given below in order to minimize interference from the surrounding metal.



Model	L (mm min.)	D (mm min.)	d (mm min.)
EM-030(P)	4 0.16"	6 0.24"	5 0.20"
EM-038(P)	4 0.16"	7.6 0.30"	5 0.20"
EM-005(P)	4 0.16"	10 0.39"	5 0.20"
EM-054(P)	4 0.16"	10.8 0.43"	5 0.20"
EM-080(P)	5 0.20"	16 0.63"	8 0.31"
EM-010(P)	5 0.20"	20 0.79"	8 0.31"
EM-014(P)	5 0.20"	28 1.10"	8 0.31"

### Threaded type

When mounting the threaded-type sensor head, do not tighten beyond the torque specified in the following table.

Model	Tightening torque
EM-005(P)	1.5 N•m max.
EM-010(P)	10 N•m max.
EM-014(P)	20 N•m max.

### Wiring

Limit the length of extension to within 50 m 164.0'. The sensor cable (coaxial cable) must not be extended or cut.

### Interference

When installing 2 sensors of the same model face-to-face or in parallel, separate by the distance specified in the following table to prevent interference.

Model	Distance	
	Face-to-face (mm min.)	Parallel (mm min.)
EM-030(P)	12 (1) 0.47" (0.04")	11 (0) 0.43"
EM-038(P)	15 (1) 0.59" (0.04")	12 (0) 0.47"
EM-005(P)	12 (1.5) 0.47" (0.06")	13 (0) 0.51"
EM-054(P)	20 (1.5) 0.79" (0.06")	18 (0) 0.71"
EM-080(P)	24 (2.5) 0.94" (0.10")	23 (0) 0.91"
EM-010(P)	20 (2.5) 0.79" (0.10")	25 (0) 0.98"
EM-014(P)	40 (4.5) 1.57" (0.18")	34 (0) 1.34"

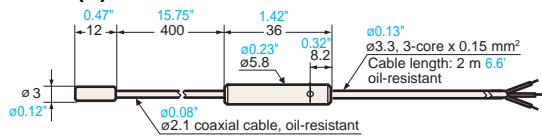
[Note]

The values in parentheses apply to the alternate-frequency type.

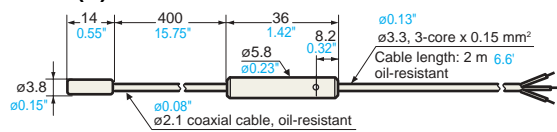
## Dimensions

▶ For CAD Data Download >>> <http://www.keyence.com/cadg>

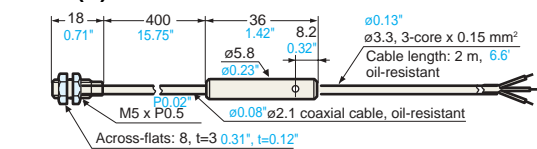
### EM-030(P)



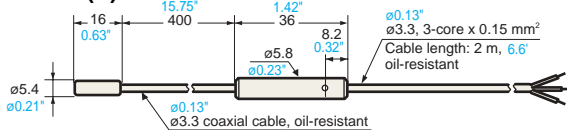
### EM-038(P)



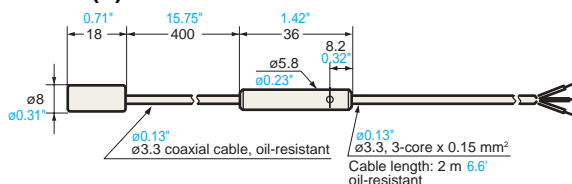
### EM-005(P)



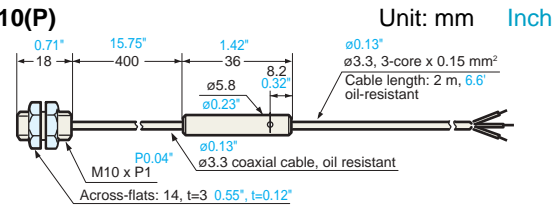
### EM-054(P)



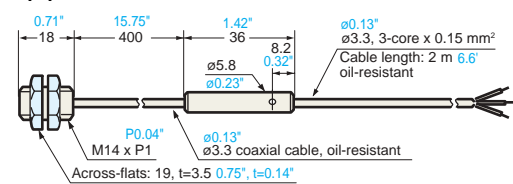
### EM-080(P)



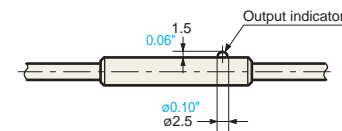
### EM-010(P)



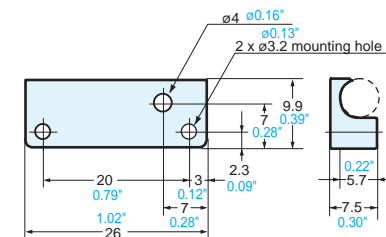
### EM-014(P)



### Detail of output indicator



### Amplifier mounting bracket (standard)



EM
EZ/EV
ES
ED
ET
TA