Installation Instructions — AccuProx™ Analog Inductive Sensor

⚠ WARNING

IN ORDER TO AVOID ELECTRIC SHOCK OR OTHER POSSIBLE INJURY:

- **DO NOT USE THIS PRODUCT FOR HUMAN SAFETY APPLICATIONS. IT WAS NOT DESIGNED, TESTED OR RECOMMENDED FOR THIS USE.**
- **DO NOT USE THIS PRODUCT IN HAZARDOUS LOCATIONS (E.G. EXPLOSIVE ATMOSPHERES). IT WAS NOT DESIGNED, TESTED OR RECOMMENDED FOR THIS USE.**
- **ENSURE THE PRODUCT IS PROPERLY WIRED TO THE CORRECT POWER SUPLLY FOR THE APPLICATION. REFER TO THE SPECIFICATIONS AND WIRING DIAGRAMS IN THIS MANUAL.**

CATALOG NUMBER KEY

E59-A30A112D01-C1

A B C D E F

Key	Value	Description
A = Product Family	E59-A	AccuProx™ Analog Inductive Sensor
B = Barrel Diameter	12	12-millimeter
	18	18-millimeter
	30	30-millimeter
C = Shielding	A1	Shielded / Embeddable
	C1	Unshielded / Nonembeddable
D = Maximum Range	Varies	Sensing Range in Millimeters
E = Connection	C02	2-Meter Cable
	D01	4-Pin Micro DC Connector
	D01P	4-Pin Micro DC Pigtail Connector
F = Output Configuration	C1	Current Output, 4-20 mA
	CV	Current Output, 0-20 mA Voltage Output, 0-10 V
	C1N1 [1]	Current Output, 4-20 mA Digital Output, NPN, N.O.
	CN1 [1]	Current Output, 0-20 mA Digital Output, NPN, N.O.
	C1P1 [1]	Current Output, 4-20 mA Digital Output, PNP, N.O.
	CP1 [1]	Current Output, 0-20 mA Digital Output, PNP, N.O.
	VN1 [1]	Voltage Output, 0-10 V Digital Output, NPN, N.O.
	VP1 [1]	Voltage Output, 0-10 V Digital Output, PNP, N.O.
	V1 [1]	Voltage Output, 0-5 V
	V2 [1]	Voltage Output, 1-5 V
	CN2 [1]	Current Output, 0-20 mA Digital Output, NPN, N.C.
	CP2 [1]	Current Output, 0-20 mA Digital Output, PNP, N.C.

[1] Some product combinations only available as a factory custom order. Contact Eaton's Sensor Application Engineers at (800) 426-9184 x1 to discuss custom product opportunities.

INTRODUCTION

The Cutler-Hammer AccuProx™ from Eaton's electrical business is a high performance analog inductive proximity sensor. The AccuProx family of analog sensors provides unmatched sensing range, linearity and resolution in an affordable and compact tubular package.

Unlike standard inductive sensors, which send an open or close signal upon target presence or absence, AccuProx analog sensors provide an electrical signal that varies in proportion to the position of the metal target within their sensing range. This makes AccuProx ideal for applications requiring precise position sensing and measurement.

The sensing performance of AccuProx sets it apart from traditional analog inductive designs. Utilizing components from the cutting-edge Cutler-Hammer iProx™ family, AccuProx provides sensing range of three to four times that of typical tubular analog inductive sensors—all without compromising accuracy. Unlike many competitive products, which are often hampered by an "S-shaped" output curve, AccuProx outputs are linear.

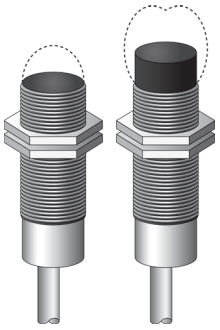
MOUNTING INSTRUCTIONS

The AccuProx family of sensors are available in 12, 18 and 30 millimeter threaded tubular barrels. Two mounting nuts are provided with each sensor. A wide variety of mounting brackets are available, including L-shaped, ball swivel, and adjustable types. For compatible accessories, see the next page.

The AccuProx sensor is available in both shielded (i.e. embeddable or flush-mountable) and unshielded (i.e. nonembeddable or exposed cap) versions. Mounting instructions for shielded and unshielded sensors are different:

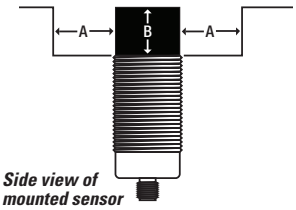
- Shielded sensors can be fully embedded or flush-mounted in surrounding metal. This is because the sensing field is smaller and more contained, resulting in less range versus unshielded sensors.
- Unshielded sensors cannot be flush-mounted in steel and typically require a metal-free zone surrounding the protruding sensor face cap. While unshielded sensors feature longer range, the sensing field blooms out from the face cap and can triggered by perepheral metal. For details on mounting unshielded sensors, see the diagram below.

Typical Sensing Fields



Shielded ***Unshielded***

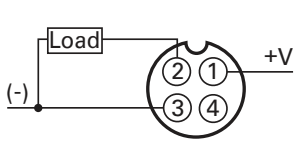
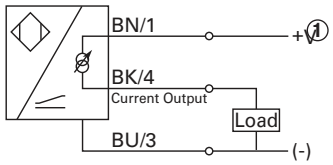
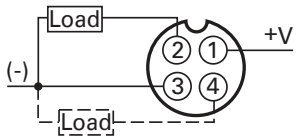
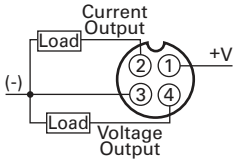
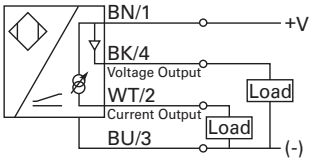
Use the following table to determine the recommended size of the metal-free mounting zone around the sensor.



Side view of mounted sensor

Type	A	B
Unshielded	1.5 x Range	Cap Height
Shielded	0	0

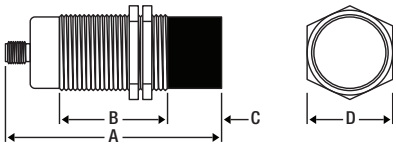
WIRING DIAGRAMS

Style	Output(s)	Micro Connector Models	Cable and Pigtail Models
12 mm Diameter Models Ending in -C1 [1]	Current, 4-20 mA	① 	
18 and 30 mm Diameter Models Ending in -C1 [1]	Current, 4-20 mA	② 	
Models Ending in -CV [2]	Current, 0-20 mA Voltage, 0-10 V		

[1] For models ending in -C1 (current output only models), pins 2 and 4 are internally connected. Note: Do not connect outputs of -C1 models to seperate loads—this sensor should only be connected to a single output load.

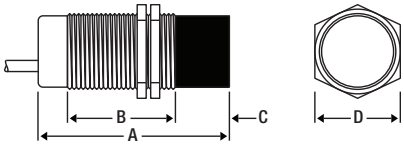
APPROXIMATE DIMENSIONS (IN/MM)

Micro Connector Models



Size	Type	A	B	C	D
12 mm	Shielded	3.05 (77.5)	1.98 (50.3)	0.02 (0.50)	0.67 (17)
	Unshielded	3.05 (77.5)	1.64 (41.6)	0.36 (9)	0.67 (17)
18 mm	Shielded	2.73 (69.3)	2.00 (50.9)	0.02 (0.50)	0.94 (24)
	Unshielded	2.73 (69.3)	1.47 (37.4)	0.55 (14)	0.94 (24)
30 mm	Shielded	2.92 (74.1)	2.13 (54.1)	0.03 (0.75)	1.41 (36)
	Unshielded	2.92 (74.1)	1.41 (35.8)	0.75 (19)	1.41 (36)

Cable and Pigtail Models



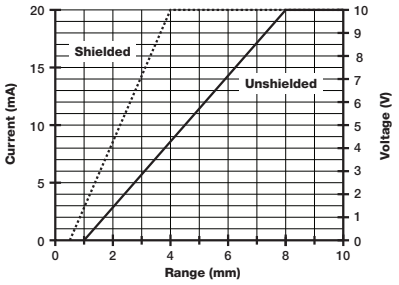
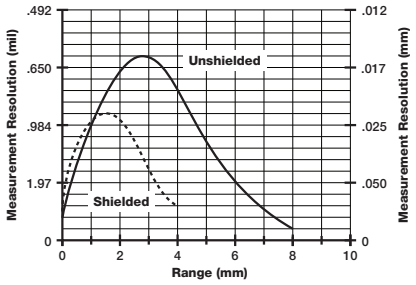
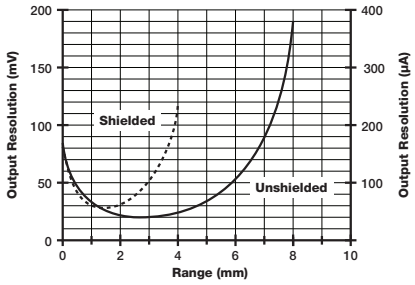
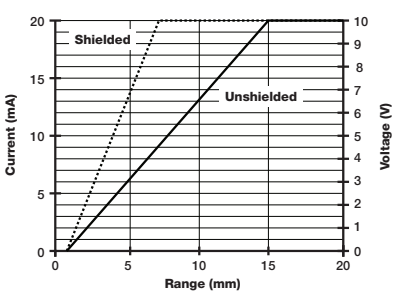
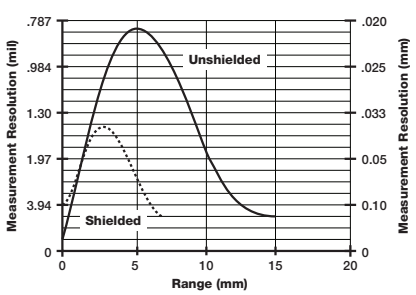
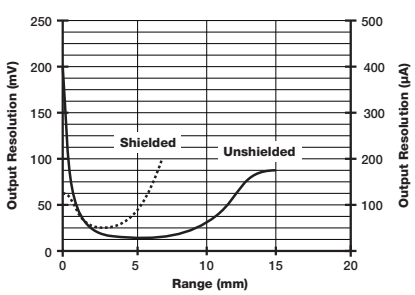
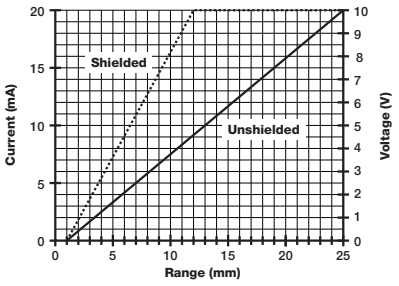
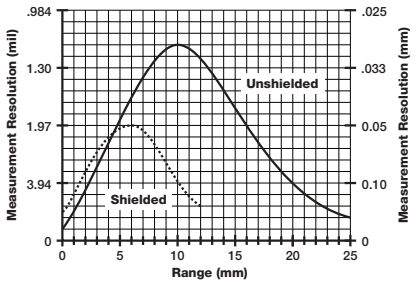
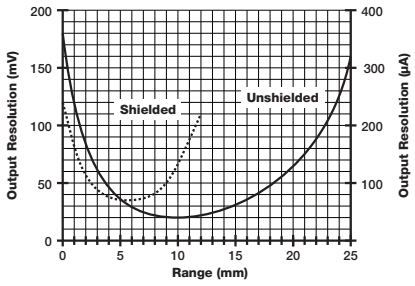
Size	Type	A	B	C	D
12 mm	Shielded	2.46 (62.4)	1.98 (50.3)	0.02 (0.5)	0.67 (17)
	Unshielded	2.46 (62.4)	1.64 (41.6)	0.36 (9)	0.67 (17)
18 mm	Shielded	2.54 (64.5)	2.00 (50.9)	0.02 (0.5)	0.94 (24)
	Unshielded	2.54 (64.5)	1.47 (37.4)	0.55 (14)	0.94 (24)
30 mm	Shielded	2.74 (69.6)	2.13 (54.1)	0.03 (0.75)	1.41 (36)
	Unshielded	2.74 (69.6)	1.41 (35.8)	0.75 (19)	1.41 (36)

COMPATIBLE ACCESSORIES [3]

	Description	Style Number
	Connector Cable, 4-Wire, 2-Meter (6-Foot) Length, PVC Jacket, 22 AWG	CSDS4A4CY2202
	Connector Cable, 4-Wire, 5-Meter (16-Foot) Length, PVC Jacket, 22 AWG	CSDS4A4CY2205
	Connector Cable, 3-Wire, 2-Meter (6-Foot) Length, PVC Jacket, 22 AWG	CSDS4A3CY2202
	Connector Cable, 3-Wire, 5-Meter (16-Foot) Length, PVC Jacket, 22 AWG	CSDS4A3CY2205
	Mounting Bracket, L-Shape, 12 mm, Stainless Steel	E57KM12
	Mounting Bracket, L-Shape, 18 mm, Stainless Steel	E57KM18
	Mounting Bracket, L-Shape, 30 mm, Stainless Steel	E57KM30
	Cushioned Sensor Mount, 12 mm, Includes Protective Cap	E57KNZ12
	Cushioned Sensor Mount, 18 mm, Includes Protective Cap	E57KNZ18
	Replacement Mounting Nuts, 12 mm, Stainless Steel	E57KNS12
	Replacement Mounting Nuts, 18 mm, Stainless Steel	E57KNS18
	Replacement Mounting Nuts, 30 mm, Stainless Steel	E57KNS30

[3] For more information on accessories compatible with AccuProx, consult Eaton's Cutler-Hammer Sensing Solutions Product Guide or contact your local distributor.

GRAPHS FOR MODELS ENDING -CV

Size	Linear Output	Measurement Resolution [4]	Output Resolution [5]
12 mm			
18 mm			
30 mm			

[4] Measurement resolution is the sensor's ability to detect a change in target position. The measurement resolution is the finest at the highest point in the curve.

[5] Output resolution is the change in output signal relative to target position. The minimum change in output resolution is defined by the lowest point in the curve.

SPECIFICATIONS

Parameter	Value					
	12 mm Models		18 mm Models		30 mm Models	
	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
Analog Operating Range	0.5-4 mm [6]	1-8 mm [6]	1-7 mm [6]	1-15 mm [6]	1-12 mm [6]	1-25 mm [6]
Temperature Range	-40º to 70º C					
Temperature Drift	< ± 10%					
Conformity	< ± 10%					
Repeat Accuracy	< 25 µm [7]	< 20 µm [7]	< 40 µm [7]	< 20 µm [7]	< 50 µm [7]	< 30 µm [7]
Minimum Repeat Accuracy	< 3.0% @ max. range	< 1.1% @ max. range	< 2.2% @ max. range	< 1.2% @ max. range	< 1.2% @ max. range	< 0.8% @ max. range
Recovery Time	< 1.0 msec	< 1.1 msec	< 1.5 msec	< 2.0 msec	< 2.0 msec	< 3.0 msec
Response Time	200 Hz	100 Hz	200 Hz	100 Hz	140 Hz	100 Hz
Linearity Tolerance	< ± 1.0% of full scale					
Resolution	23 µm max.	16 µm max.	40 µm max.	21 µm max.	50 µm max.	30 µm max.
Style	AccuProx™ Analog, 3/4-Wire DC					
Operating Voltage	15-30 VDC					
Current Output Signal	0-20 mA or 4-20 mA by model					
Current Output Load Resistance	400-500 ohm					
Current Output Ripple Content	± 40 µA max.					
Current Output Minimum Change	30 µA	20 µA	50 µA	28 µA	66 µA	40 µA
Voltage Output Signal [8]	0-10 V					
Voltage Output Loan Resistance	4.7-5.0 kOhm (2.5 mA max.)					
Voltage Output Ripple Content	± 10 mV max.					
Voltage Output Minimum Change	15 mV	10 mV	25 mV	14 mV	33 mV	20 mV
Burden Current	< 20 mA					
Output LED	Dual-color, 360º viewable; Green for power-on, Red for target detected					
Short Circuit Protection	Incorporated [9]					
Wire Breakage Protection	Incorporated					
Reverse Polarity Protection	Incorporated					
Size	See dimension drawings on Page 2					
Enclosure Protection	NEMA 4, 4X, 6, 6P, 13					
Shock	30 g half-sine @ 11 msec					
Vibration	10-55 Hz, 1 mm amplitude					
Housing Material	Stainless steel Polycarbonate endbell Polyphenylene sulfide front cap					
Termination	Micro connector Potted cable, 2 m Pigtail micro connector, 2 m					

[6] Published range data is based on a one millimeter thick square target made of Type FE 360 steel per ISO Standard 630.
[7] The sensor achieves its maximum repeat accuracy after warming up for a period of at least one hour.
[8] Voltage outputs available on models ending in -CV.
[9] Continuous short-circuits can exceed power dissipation ratings and cause eventual destruction.