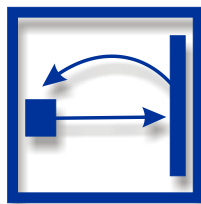




CD ROM General Catalog

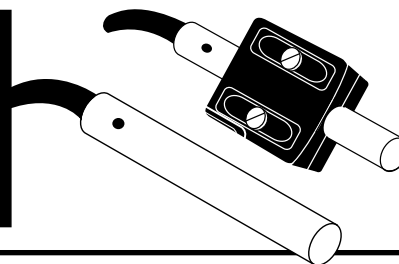
- Proximity Sensors
- Photoelectric Sensors
- Special Application Sensors
- Limit Switches & Solenoids



6.5 mm
20 mm
34 mm

Inductive Tubular Smooth Barrel

DC
AC



Proximity Sensors

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Sensing Range	Maximum Load Current	Maximum Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
6.5mm DC 10-30V Metal											
6.6' Cable	3W, NPN, NO	Metal	50mm	ET110-71001	—	1mm	200mA	<100µA	<2.0	4KHz	yes
6.6' Cable	3W, PNP, NO	Metal	50mm	ET111-71003	—	1mm	200mA	<100µA	<2.0	4KHz	yes
6.5mm NAMUR 5-25 VDC											
6.6' Cable	2W, Analog	Metal	30mm	ET112-75403	—	1mm	N/A	—	—	1KHz	N/A
20mm DC 10-30V Plastic											
6.6' Cable	3W, NPN, NO	Plastic	77mm	—	ET210-73110	10mm	400mA	<10µA	<2.5	200Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	77mm	—	ET211-73110	10mm	400mA	<10µA	<2.5	200Hz	yes
20mm AC 20-250V Plastic											
6.6' Cable	2W, AC, NO	Plastic	77mm	—	ET220-73410	10mm	400mA	<1.5mA @220 VAC	<8 VAC	25Hz	no
34mm DC 10-30V Plastic											
6.6' Cable	3W, PNP, NO	Plastic	80mm	—	ET211-83110	20mm	400mA	<10µA	<2.5 VDC	100Hz	yes
34mm AC 20-250V Plastic											
6.6' Cable	2W, AC, NO	Plastic	80mm	—	ET220-83410	20mm	400mA	<1.5mA @220 VAC	<8 VAC	25Hz	no

* Across conducting sensor

► Consult factory for normally closed model availability.

Replacement Mounting Brackets

6.5mm	ET018-20000
20mm	ET018-20010
34mm	ET018-20020



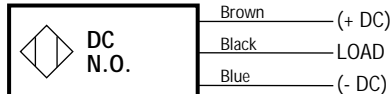
Common Sensor Characteristics

Sensor Diameter	6.5mm	20mm	34mm
Sensing Range (±10%)	1mm	10mm	20mm
Standard Target (mm) (mild steel)	6.5x6.5x1	30x30x1	60x60x1
Temperature Drift (max.)	±10%	±15%	±15%
Repeatability	± 2%		
Hysteresis	3-8% (typical); 15% (max.)		
Ambient Temperature Range	-13°F to +158°F		
Reverse Polarity Protected	yes		
Current Consumption	<10mA		
NEMA Enclosure Type	1,3,4,6,13	1,3,4,4x,6,13	
LED Indicator	red = target		
Metal Housings	Stainless	N/A	
Plastic Housings	N/A	Ultradur®	
Cable Type	PVC		
Shipping Weight	6 oz.	8 oz.	10 oz.

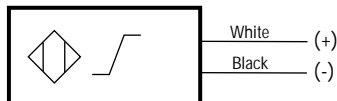
Circuit Drawings

CABLE MODELS

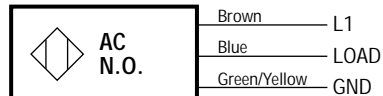
3 Wire DC N.O.



NAMUR

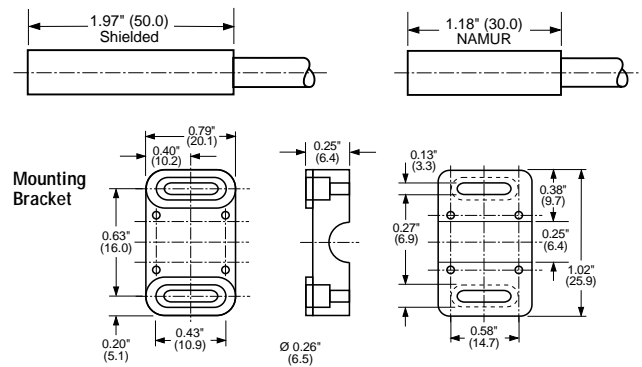


2 Wire AC N.O.

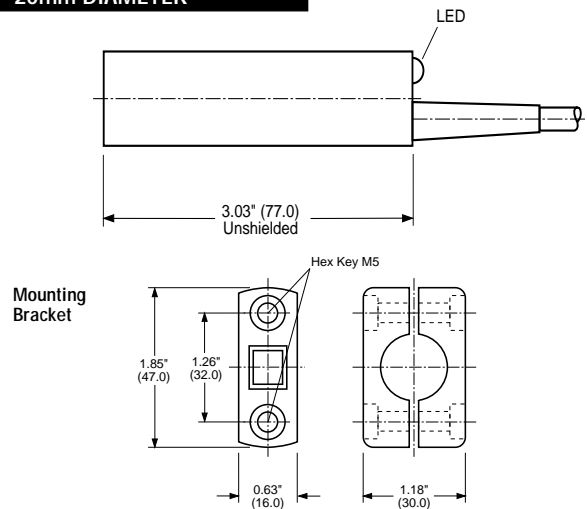


Dimensional Drawings 6.5, 20, 34mm

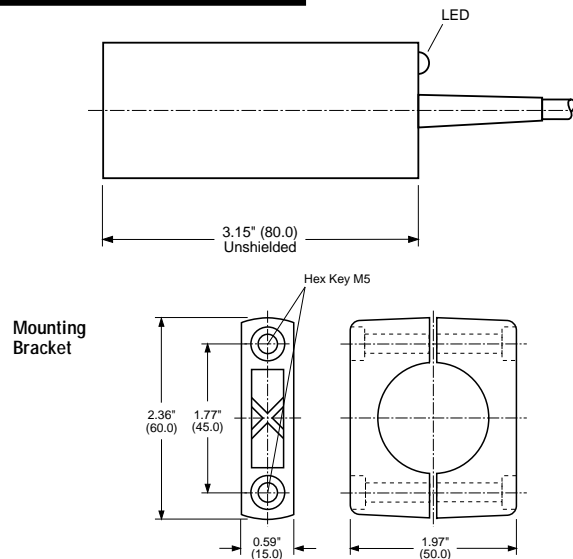
6.5mm DIAMETER



20mm DIAMETER



34mm DIAMETER



Mounting Brackets are included with Smooth Sensors.

NAMCO

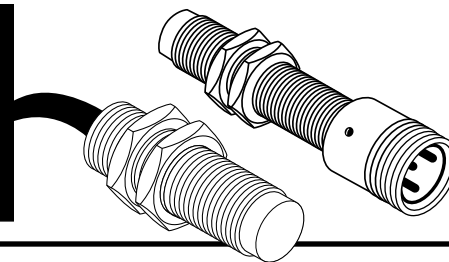
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For technical assistance, call 1-800-NAMTECH

8mm

Inductive Tubular Threaded Barrel

DC



Proximity Sensors

1mm (Shielded) and 2mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected	
									Shielded	Unshielded		
DC 10-30V Metal												
4-pin Euro	3W, PNP, NO	Metal	53mm	ET311-10151	ET311-11151	200mA	<10µA	<2.0 VDC	4KHz	2KHz	yes	
6.6' Cable	3W, NPN, NO	Metal	50mm	ET110-10110	ET110-11110	200mA	<100µA	<2.0 VDC	4KHz	2KHz	yes	
6.6' Cable	3W, PNP, NO	Metal	50mm	ET111-10110	ET111-11110	200mA	<10µA	<2.5 VDC	4KHz	2KHz	yes	
NAMUR 5-25 VDC												
6.6' Cable	Analog	Metal	30mm	ET112-10310	—	N/A	—	—	1KHz	—	N/A	

* Across conducting sensor

► Consult factory for normally closed model availability.



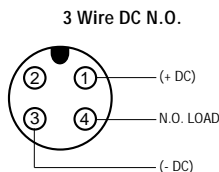
Common Sensor Characteristics

8mm DIAMETER DC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	1mm
Unshielded Sensing Range ($\pm 10\%$)	2mm
Standard Target	8x8x1mm (mild steel)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	$\pm 15\%$
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption	<10mA
NEMA Enclosure Type	1, 3, 4, 6, 13
LED Indicator	yellow = target
Metal Housings	Chrome Plated Brass
Plastic Housings	N/A
Cable Type	PVC
Shipping Weight	Connector model: 3 oz. Cable model: 8 oz.

Circuit Drawings

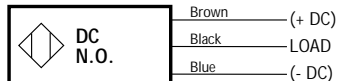
EURO CONNECTOR MODELS

Male view shown



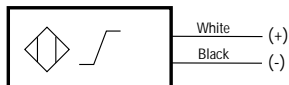
CABLE MODELS

3 Wire DC N.O.



NAMUR MODELS

NAMUR

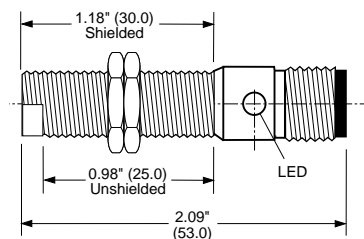


Dimensional Drawings

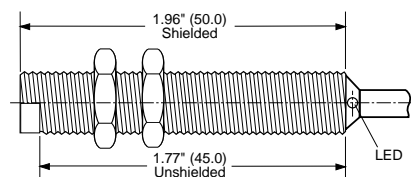
8mm-DC

EURO CONNECTOR MODELS

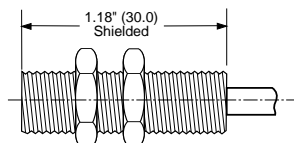
Body threads = M8x1



CABLE MODEL



CABLE MODELS-NAMUR



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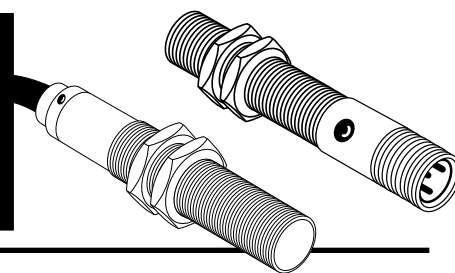
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12mm

Inductive Tubular Threaded Barrel

DC



Proximity Sensors

2mm (Shielded) and 4mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected	
									Shielded	Unshielded		
DC 10-30V Metal												
4-pin Euro	3W, NPN, NO	Metal	54mm	ET310-22151	ET310-23151	400mA	<10µA	<2.5 VDC	700Hz	400Hz	yes	
4-pin Euro	3W, PNP, NO	Metal	54mm	ET311-22151	ET311-23151	400mA	<10µA	<2.5 VDC	700Hz	400Hz	yes	
6.6' Cable	3W, NPN, NO	Metal	35mm	ET310-22110	ET310-23110	200mA	<10µA	<2.5 VDC	1200Hz	800Hz	yes	
6.6' Cable	3W, NPN, NO	Metal	78mm	ET110-22110	ET110-23110	400mA	<10µA	<2.5 VDC	700Hz	400Hz	yes	
6.6' Cable	3W, PNP, NO	Metal	35mm	ET311-22110	ET311-23110	200mA	<10µA	<2.5 VDC	1200Hz	800Hz	yes	
6.6' Cable	3W, PNP, NO	Metal	78mm	ET111-22110	ET111-23110	400mA	<10µA	<2.5 VDC	700Hz	400Hz	yes	
DC 10-30V Plastic												
6.6' Cable	3W, NPN, NO	Plastic	35mm	ET310-42110	ET310-43110	200mA	<10µA	<2.5 VDC	1200Hz	800Hz	yes	
6.6' Cable	3W, NPN, NO	Plastic	75mm	ET210-22110	ET210-23110	400mA	<10µA	<2.5 VDC	700Hz	400Hz	yes	
6.6' Cable	3W, PNP, NO	Plastic	50mm	ET311-42110	ET311-43110	200mA	<10µA	<2.5 VDC	1200Hz	800Hz	yes	
6.6' Cable	3W, PNP, NO	Plastic	75mm	ET211-22110	ET211-23110	400mA	<10µA	<2.5 VDC	700Hz	400Hz	yes	
NAMUR 5-25 VDC												
6.6' Cable	Analog	Metal	30mm	ET112-20310	ET112-21310	N/A	—	—	800Hz	400Hz	N/A	
6.6' Cable	Analog	Plastic	30mm	ET212-20310	ET212-21310	N/A	—	—	800Hz	400Hz	N/A	

* Across conducting sensor

► Consult factory for normally closed model availability.



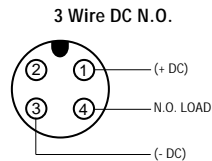
Common Sensor Characteristics

12mm DIAMETER DC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	2mm
Unshielded Sensing Range ($\pm 10\%$)	4mm
Standard Target	12x12x1mm (mild steel)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	$\pm 15\%$
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption	3W DC = <6mA
NEMA Enclosure Type	
Metal	1, 3, 4, 6, 13
Plastic	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	Connector model: 4 oz. Cable model: 9 oz.

Circuit Drawings

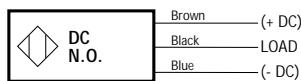
EURO CONNECTOR MODELS

Male view shown

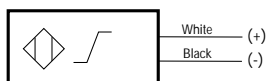


CABLE MODELS

3 Wire DC N.O.



NAMUR MODELS

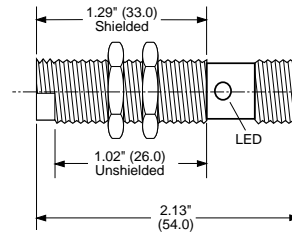


Dimensional Drawings

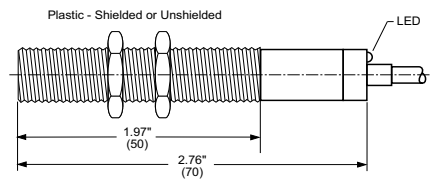
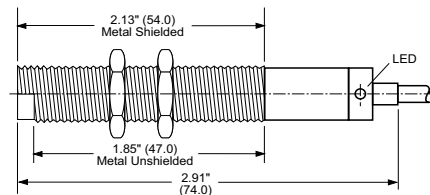
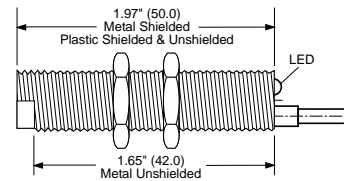
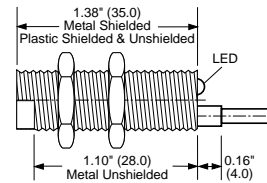
12mm-DC

EURO CONNECTOR MODELS

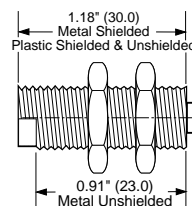
Body threads = M12x1



CABLE MODELS



CABLE MODELS-NAMUR



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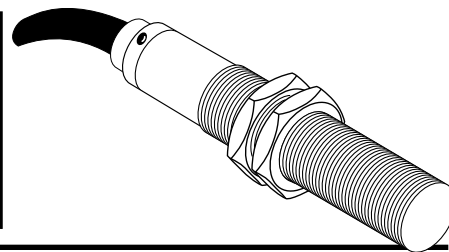
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12mm

Inductive Tubular Threaded Barrel

AC



Proximity Sensors

2mm (Shielded) and 4mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current @220 VAC	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected	
									Shielded	Unshielded		
AC 80-250V Metal												
3-pin Micro	2W, AC, NO	Metal	73mm	ET320-22420	ET320-23420	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no	
3-pin Micro	2W, AC, NO	Metal	86mm	ET120-22420	ET120-23420	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no	
6.6' Cable	2W, AC, NO	Metal	54mm	ET320-22410	ET320-23410	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no	
6.6' Cable	2W, AC, NO	Metal	78mm	ET120-22410	ET120-23410	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no	
AC 80-250V Plastic												
6.6' Cable	2W, AC, NO	Plastic	54mm	ET320-42410	ET320-43410	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no	
6.6' Cable	2W, AC, NO	Plastic	75mm	ET220-22410	ET220-23410	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no	

* Across conducting sensor

► Consult factory for normally closed model availability.

Protected by the
NAMCO
 Lifetime Replacement Program

Common Sensor Characteristics

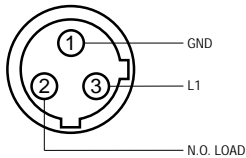
12mm DIAMETER AC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	2mm
Unshielded Sensing Range ($\pm 10\%$)	4mm
Standard Target	12x12x1mm (mild steel)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	$\pm 15\%$
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
NEMA Enclosure Type	
Metal	1, 3, 4, 6, 13
Plastic	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	Connector model: 4 oz. Cable model: 9 oz.

Circuit Drawings

MICRO CONNECTOR MODELS

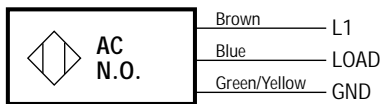
Male view shown

2 Wire AC N.O.



CABLE MODELS

2 Wire AC N.O.

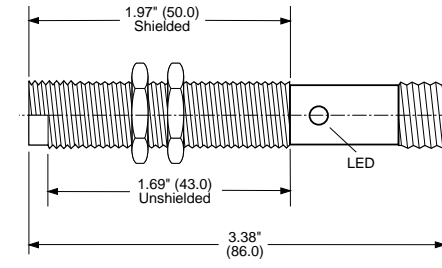
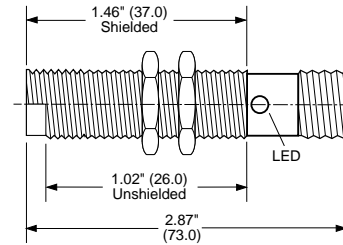


Dimensional Drawings

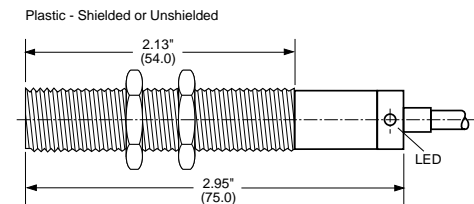
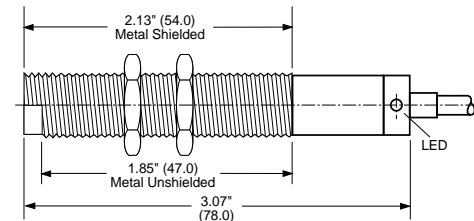
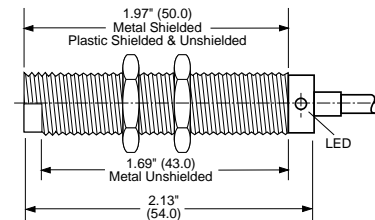
12mm-AC

MICRO CONNECTOR MODELS

Body threads = M12x1



CABLE MODELS



NAMCO

Namco Controls Corporation

Mayfield Village, OH 44143

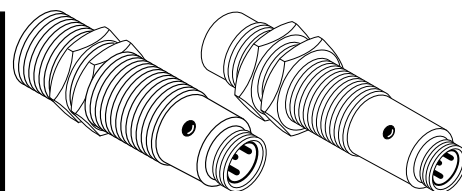
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18mm

Inductive Tubular Threaded Barrel

DC



Proximity Sensors

5mm (Shielded) and 8mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
DC 10-30V Metal											
4-pin Euro	3W, NPN, NO	Metal	76mm	ET310-32151	ET310-33151	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
4-pin Euro	3W, PNP, NO	Metal	76mm	ET311-32151	ET311-33151	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
4-pin Mini	3W, NPN, NO	Metal	70mm	ET310-32100	ET310-33100	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
4-pin Mini	3W, PNP, NO	Metal	66mm	ET311-32100	ET311-33100	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, NPN, NO	Metal	50mm	ET310-32110	ET310-33110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, NPN, NO	Metal	80mm	ET110-32110	ET110-33110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, PNP, NO	Metal	50mm	ET311-32110	ET311-33110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, PNP, NO	Metal	80mm	ET111-32110	ET111-33110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
DC 10-30V Plastic											
6.6' Cable	3W, NPN, NO	Plastic	50mm	ET310-52110	ET310-53110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, NPN, NO	Plastic	80mm	ET210-32110	ET210-33110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	50mm	ET311-52110	ET311-53110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	80mm	ET211-32110	ET211-33110	400mA	<10µA	<2.5 VDC	300Hz	250Hz	yes
NAMUR 5-25 VDC											
6.6' Cable	Analog	Metal	30mm	ET112-30310	ET112-31310	N/A	—	—	500Hz	200Hz	N/A
6.6' Cable	Analog	Plastic	30mm	ET212-30310	ET212-31310	N/A	—	—	500Hz	200Hz	N/A

* Across conducting sensor

► Consult factory for normally closed model availability.

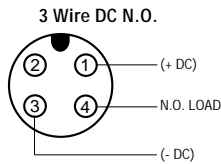


Common Sensor Characteristics

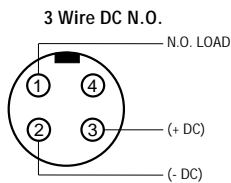
18mm DIAMETER DC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	5mm
Unshielded Sensing Range ($\pm 10\%$)	8mm
Standard Target (mm) (mild steel)	18x18x1 (Shielded) 24x24x1 (Unshielded)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	$\pm 15\%$
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption	<1.5mA
NEMA Enclosure Type	
Metal	1, 3, 4, 6, 13
Plastic	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	Connector model: 4 oz. Cable model: 9 oz.

Circuit Drawings

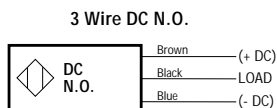
EURO CONNECTOR MODELS Male views shown



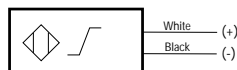
MINI CONNECTOR MODELS Male views shown



CABLE MODELS



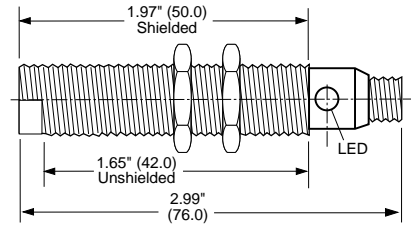
NAMUR MODELS



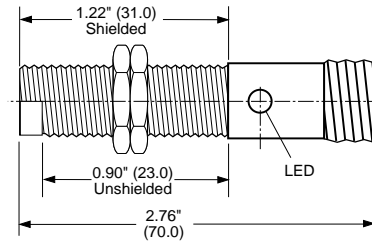
Dimensional Drawings

EURO CONNECTOR MODELS

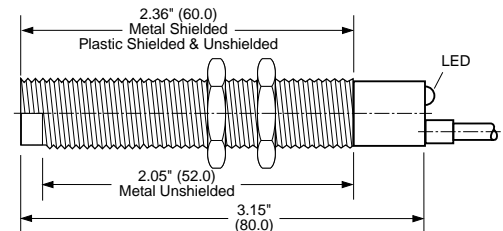
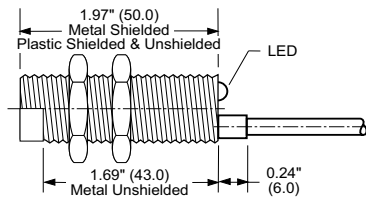
Body threads - M18x1



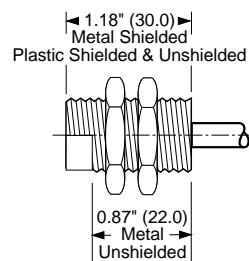
MINI CONNECTOR MODELS



CABLE MODELS



CABLE MODELS-NAMUR



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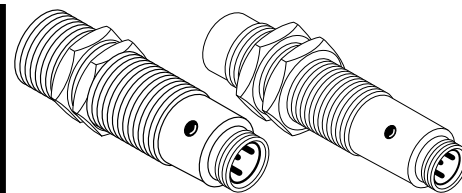
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18mm

Inductive Tubular Threaded Barrel

AC



Proximity Sensors

5mm (Shielded) and 8mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current @220 VAC	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
AC 20-250V											
3-pin Micro	2W, AC, NO	Metal	92mm	ET120-32420	ET120-33420	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
3-pin Mini	2W, AC, NO	Metal	94mm	ET120-32400	ET120-33400	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Metal	80mm	ET120-32410	ET120-33410	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Plastic	80mm	ET220-32410	ET220-33410	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
AC 80-250V											
3-pin Micro	2W, AC, NO	Metal	80mm	ET320-32420	ET320-33420	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no
3-pin Mini	2W, AC, NO	Metal	83mm	ET320-32400	ET320-33400	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Metal	50mm	ET320-32410	ET320-33410	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Plastic	50mm	ET320-52410	ET320-53410	200mA	<2.5mA	<11 VAC	25Hz	25Hz	no

* Across conducting sensor

► Consult factory for normally closed model availability.



Common Sensor Characteristics

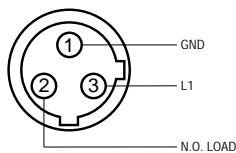
18mm DIAMETER AC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	5mm
Unshielded Sensing Range ($\pm 10\%$)	8mm
Standard Target (mm) (mild steel)	18x18x1 (Shielded) 24x24x1 (Unshielded)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	$\pm 15\%$
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
NEMA Enclosure Type	
Metal	1, 3, 4, 6, 13
Plastic	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	Connector model: 4 oz. Cable model: 9 oz.

Circuit Drawings

MICRO CONNECTOR MODELS

Male view shown

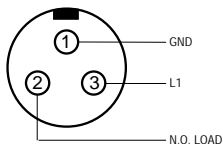
2 Wire AC N.O.



MINI CONNECTOR MODELS

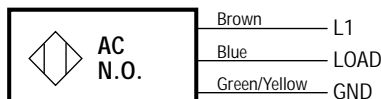
Male view shown

2 Wire AC N.O.



CABLE MODELS

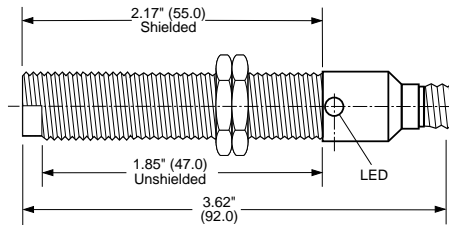
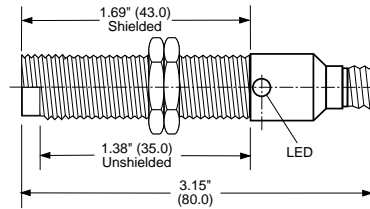
2 Wire AC N.O.



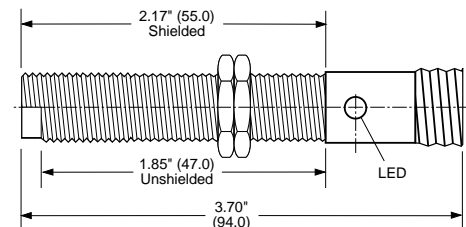
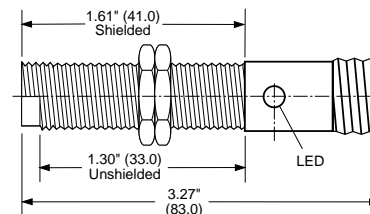
Dimensional Drawings

MICRO CONNECTOR MODELS

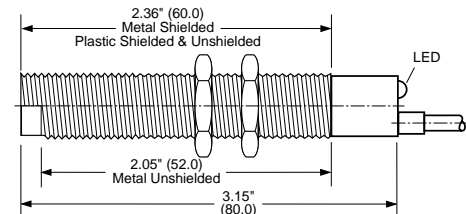
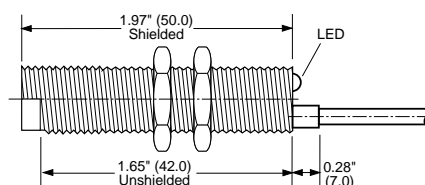
Body threads = M18x1



MINI CONNECTOR MODELS



CABLE MODELS



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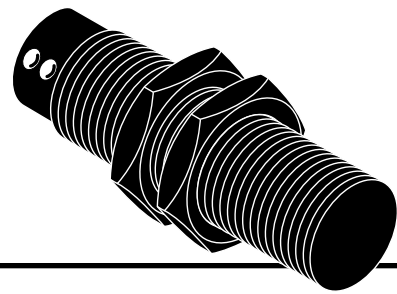
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12mm
18mm

Inductive Tubular Threaded Barrel

Weld
Field
Immune



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP available for DC models only
- Predictable, consistent electrical performance
- New Hardcoat housings are resistant to weld expulsion

These sensors are specifically designed for extreme duty use in harsh applications (i.e., automotive fabrication, assembly plants, etc.). The tubular series is popular as part present and machine location sensors for demanding applications such as resistance welding of body assemblies. Namco's proprietary Hardcoat housings will not allow the hot weld expulsion to adhere to the housing.

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
12mm WFI DC 10-30V Hardcoat, 2mm (Shielded) and 4mm (Unshielded) Sensing Ranges)											
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-78442	EE510-79442	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
18mm WFI DC 10-30V Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73442	EE510-72442	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
90° 4-pin Euro	3W, PNP, NO	Metal-HC**	67mm	EE510-73452	EE510-72452	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73402	EE510-72402	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
90° 4-pin Mini	3W, PNP, NO	Metal-HC**	67mm	EE510-73422	EE510-72422	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
18mm WFI AC/DC 20-230V Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
3-pin Mini	2W, NO	Metal-HC**	76mm	EE530-73402	EE530-72402	500mA	1.7mA	<10V	16Hz	16Hz	Latching
3-pin Mini	2W, NO	Metal-HC**	76mm	EE560-73402	EE560-72402	500mA	4.5mA	<10V	16Hz	16Hz	Latching
3-pin Micro	2W, NO	Metal-HC**	76mm	EE530-73432	EE530-72432	500mA	1.7mA	<10V	16Hz	16Hz	Latching
90° 3-pin Mini	2W, NO	Metal-HC**	67mm	EE530-73422	EE530-72422	500mA	1.7mA	<10V	16Hz	16Hz	Latching
90° 3-pin Mini	2W, NO	Metal-HC**	67mm	EE560-73422	EE560-72422	500mA	4.5mA	<10V	16Hz	16Hz	Latching
18mm WFI DC 10-30V Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73042	EE510-72042	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
90° 4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73052	EE510-72052	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73002	EE510-72002	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
90° 4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73022	EE510-72022	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching

* Across conducting sensor

** Hard Coat: Weld spatter resistant

*** Non-hardcoat versions

► Consult factory for normally closed model availability.



Common Sensor Characteristics

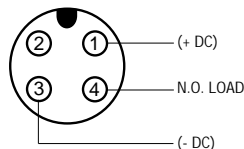
18mm DIAMETER WFI SENSORS		
	18mm	12mm
Shielded Sensing Range ($\pm 10\%$)	5mm	2mm
Unshielded Sensing Range ($\pm 10\%$)	8mm	4mm
Short Circuit Protection	yes	yes
Repeatability	$< \pm 1\%$	
Hysteresis	3-10%	
Temperature Drift (max.)	$\pm 10\%$	
Ambient Temperature Range	-4°F to $+158^{\circ}\text{F}$	
Reverse Polarity Protected	yes	
Current Consumption (3-wire DC only)	10mA	
NEMA Enclosure Type	1, 3, 4, 6, 13	
LED Indicator (AC/DC)	red = power, grn = target	
LED Indicator (DC)	grn = pwr, Amber = target	
Metal Housings	Weld Flash Proof	
Shipping Weight	4 oz.	

Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

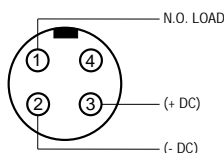
3 Wire DC N.O.



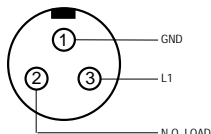
MINI CONNECTOR MODELS

Male views shown

3 Wire DC N.O.



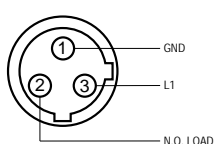
2 Wire AC/DC N.O.



MICRO CONNECTOR

Male view shown

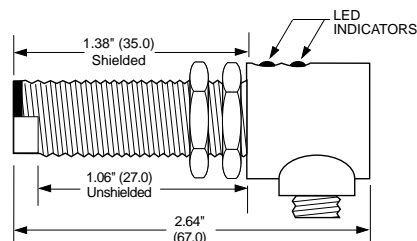
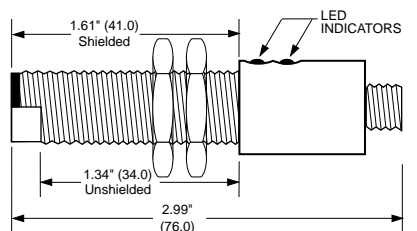
2 Wire AC/DC N.O.



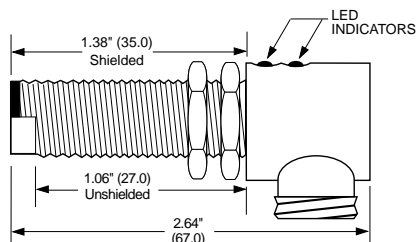
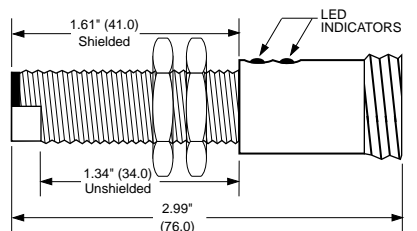
Dimensional Drawings 12/18mm-WFI

18mm EURO CONNECTOR

Body threads = M18x1

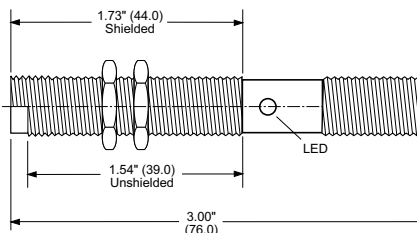


18mm MINI CONNECTOR



12mm EURO CONNECTOR

Body threads = M12x1



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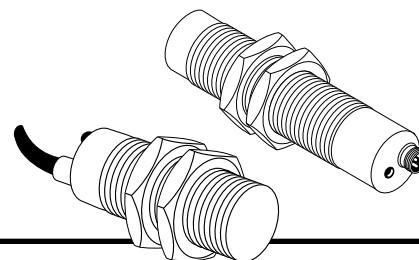
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30mm

Inductive Tubular Threaded Barrel

DC



Proximity Sensors

10mm (Shielded) and 15mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
DC 10-30V Metal											
4-pin Euro	3W, NPN, NO	Metal	73mm	ET310-62151	ET310-63151	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
4-pin Euro	3W, PNP, NO	Metal	73mm	ET311-62151	ET311-63151	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
4-pin Mini	3W, NPN, NO	Metal	78mm	ET110-42100	ET110-43100	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
4-pin Mini	3W, PNP, NO	Metal	78mm	ET111-42100	ET111-43100	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, NPN, NO	Metal	50mm	ET310-62110	ET310-63110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, NPN, NO	Metal	80mm	ET110-42110	ET110-43110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, PNP, NO	Metal	50mm	ET311-62110	ET311-63110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, PNP, NO	Metal	80mm	ET111-42110	ET111-43110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
DC 10-30V Plastic											
6.6' Cable	3W, NPN, NO	Plastic	50mm	ET310-72110	ET310-73110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, NPN, NO	Plastic	80mm	ET210-42110	ET210-43110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	50mm	ET311-72110	ET311-73110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	80mm	—	ET211-43110	400mA	<10µA	<2.5 VDC	200Hz	100Hz	yes
NAMUR 5-25 VDC											
6.6' Cable	Analog	Metal	40mm (Sh) 42mm (UnSh)	ET112-40310	ET112-41310	N/A	—	—	300Hz	100Hz	N/A
6.6' Cable	Analog	Plastic	40mm	ET212-40310	ET212-41310	N/A	—	—	300Hz	100Hz	N/A

* Across conducting sensor

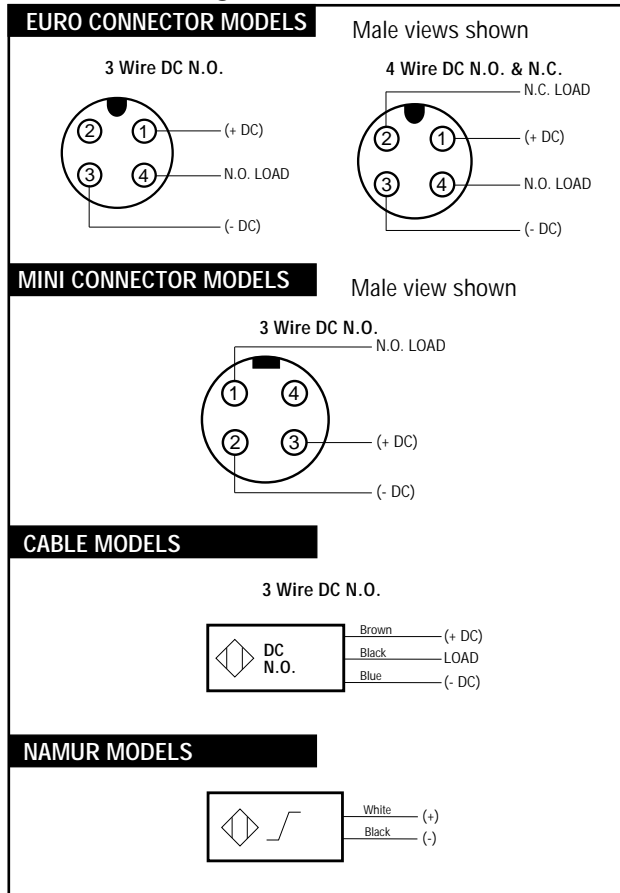
► Consult factory for normally closed model availability.



Common Sensor Characteristics

30mm DIAMETER DC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	10mm
Unshielded Sensing Range ($\pm 10\%$)	15mm
Standard Target (mm) (mild steel)	30x30x1 (Shielded) 45x45x1 (Unshielded)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Range Drift over Temperature	$\pm 15\%$
Operating Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption	<1.5mA
NEMA Enclosure Type	
Metal	1, 3, 4, 6, 13
Plastic	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	Connector model: 5 oz. Cable model: 10 oz.

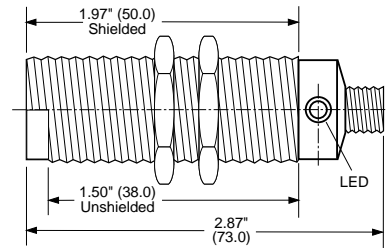
Circuit Drawings



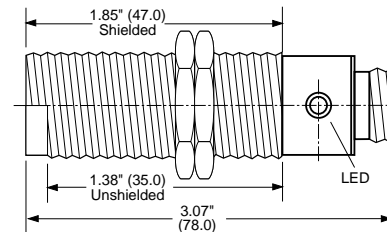
Dimensional Drawings

EURO CONNECTOR MODELS

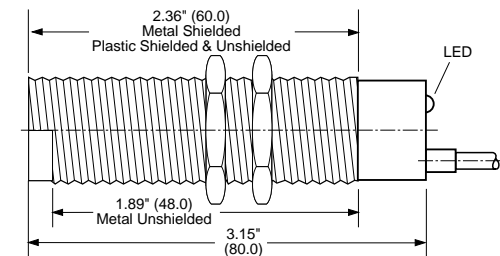
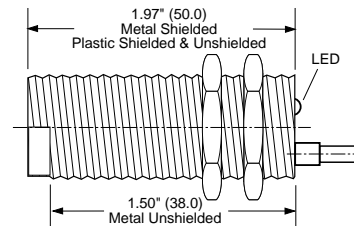
Body threads = M30x1.5



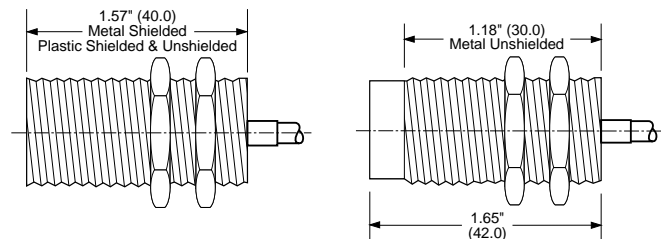
MINI CONNECTOR MODELS



CABLE MODELS



CABLE MODELS-NAMUR



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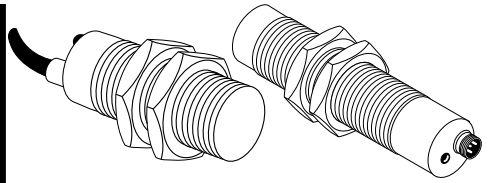
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30mm

Inductive Tubular Threaded Barrel

AC



Proximity Sensors

10mm (Shielded) and 15mm (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
AC 20-250V Metal											
3-pin Micro	2W, AC, NO	Metal	78mm	ET120-42420	—	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
3-pin Mini	2W, AC, NO	Metal	82mm	ET120-42400	—	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Metal	50mm	ET320-62410	ET320-63410	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Metal	80mm	ET120-42410	ET120-43410	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
AC 20-250V Plastic											
6.6' Cable	2W, AC, NO	Plastic	80mm	ET220-42410	ET220-43410	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no
6.6' Cable	2W, AC, NO	Plastic	50mm	ET320-72410	ET320-73410	400mA	<1.5mA	<8 VAC	25Hz	25Hz	no

* Across conducting sensor

► Consult factory for normally closed model availability.



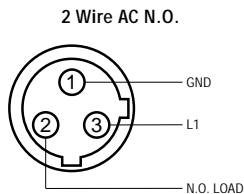
Common Sensor Characteristics

30mm DIAMETER AC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	10mm
Unshielded Sensing Range ($\pm 10\%$)	15mm
Standard Target (mm) (mild steel)	30x30x1 (Shielded) 45x45x1 (Unshielded)
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Range Drift over Temperature	$\pm 15\%$
Operating Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
NEMA Enclosure Type	
Metal	1, 3, 4, 6, 13
Plastic	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	Connector model: 5 oz. Cable model: 10 oz.

Circuit Drawings

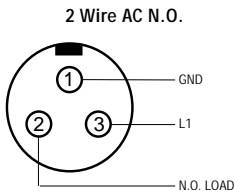
MICRO CONNECTOR MODELS

Male view shown



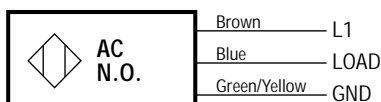
MINI CONNECTOR MODELS

Male view shown



CABLE MODELS

2 Wire AC N.O.

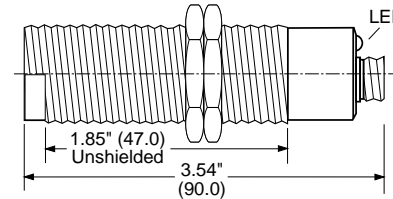
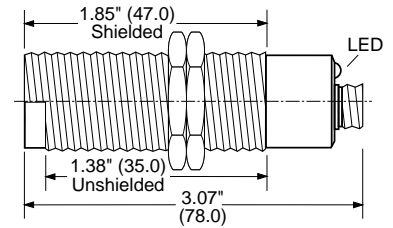


Dimensional Drawings

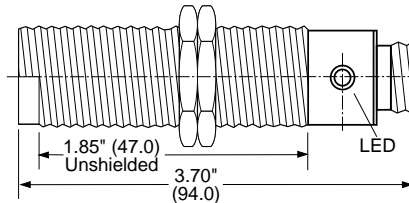
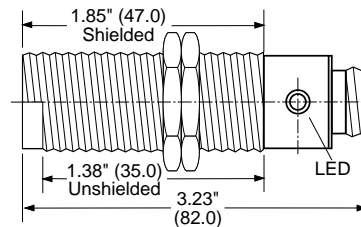
30mm-AC

MICRO CONNECTOR MODELS

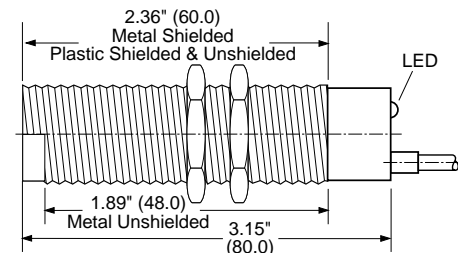
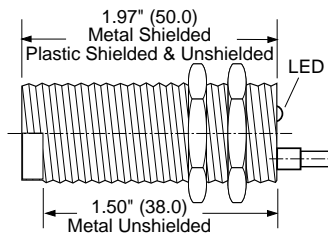
Body threads = M30x1.5



MINI CONNECTOR MODELS



CABLE MODELS



NAMCO

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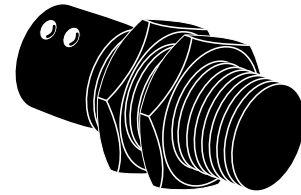
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30mm

Inductive Tubular Threaded Barrel

Weld Field Immune



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP available for DC models only.
- Dual LED indicators
- Predictable, consistent electrical performance
- 100% tested & burned-in
- New Hardcoat housings are resistant to weld expulsion

These sensors are specifically designed for extreme duty use in harsh applications (i.e., automotive fabrication, assembly plants, etc.). The tubular series is popular as part present and machine location sensors for demanding applications such as resistance welding of body assemblies. Namco's proprietary Hardcoat housings will not allow the hot weld expulsion to adhere to the housing.

10mm (Shielded) and 15mm (Unshielded) Sensing Range

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
WFI DC 10-30V											
4-pin Euro	3W, PNP, NO	Metal-HC	76mm	EE510-77442	EE510-76442	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Mini	3W, PNP, NO	Metal-HC	76mm	EE510-77402	EE510-76402	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Euro	3W, PNP, NO	Metal-HC	76mm	EE510-77042	EE510-76042	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Metal-HC	76mm	EE510-77002	EE510-76002	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
WFI AC/DC 20-230V											
3-pin Mini	2W, AC/DC, NO,LL	Metal-HC	76mm	EE530-77402	EE530-76402	500mA	1.7mA	<10V	16Hz	16Hz	Latching
3-pin Mini	2W, AC/DC, NO, HL	Metal-HC	76mm	EE560-77402	EE560-76402	500mA	4.5mA	<10V	16Hz	16Hz	Latching
3-pin Micro	2W, AC/DC, NO	Metal-HC	76mm	EE530-77432	EE530-76432	500mA	1.7mA	<10V	16Hz	16Hz	Latching

* Across conducting sensor

► Consult factory for normally closed model availability.

Protected by the
NAMCO
Lifetime Replacement Program

Common Sensor Characteristics

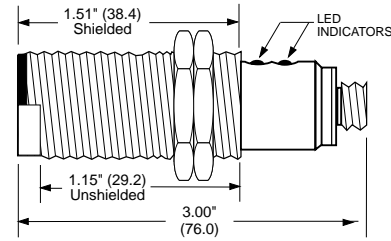
30mm DIAMETER WFI SENSORS	
Shielded Sensing Range ($\pm 10\%$)	10mm
Unshielded Sensing Range ($\pm 10\%$)	15mm
Short Circuit Protection	yes
Repeatability	$< \pm 1\%$
Hysteresis	3-10%
Range Drift over Temperature	$\pm 10\%$
Operating Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
NEMA Enclosure Type	1, 3, 4, 6, 13
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Metal Housings	Weld Flash Proof
Shipping Weight	5 oz.

Dimensional Drawings

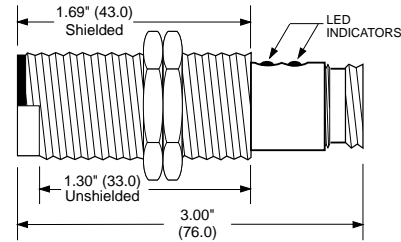
30mm-WFI

EURO/MICRO CONNECTOR MODELS

Body threads = M30x1.5



MINI CONNECTOR MODELS

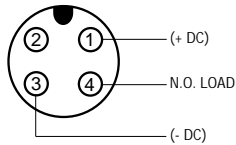


Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

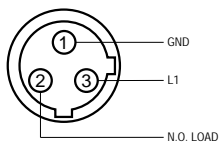
3 Wire DC N.O.



MICRO CONNECTOR MODELS

Male view shown

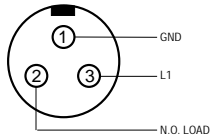
2 Wire AC/DC N.O.



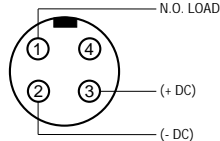
MINI CONNECTOR MODELS

Male views shown

2 Wire AC/DC N.O.



3 Wire DC N.O.



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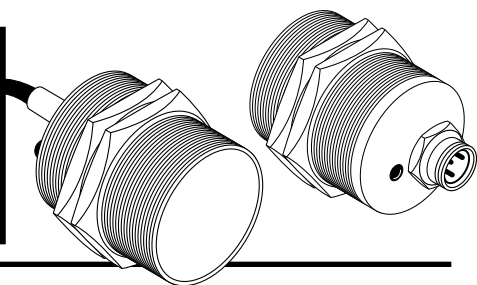
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47mm

Inductive Tubular Threaded Barrel

DC AC



Proximity Sensors

20mm (Shielded) Sensing Range

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
DC 10-30V Metal											
4-pin Mini	3W, NPN, NO	Metal	83mm	ET110-92100	—	400mA	<10µA	<2.5 VDC	50Hz	—	yes
4-pin Mini	3W, PNP, NO	Metal	83mm	ET111-92100	—	400mA	<10µA	<2.5 VDC	50Hz	—	yes
6.6' Cable	3W, NPN, NO	Metal	60mm	ET110-92110	—	400mA	<10µA	<2.5 VDC	50Hz	—	yes
6.6' Cable	3W, PNP, NO	Metal	60mm	ET111-92110	—	400mA	<10µA	<2.5 VDC	50Hz	—	yes
AC 20-250V Metal											
3-pin Mini	2W, AC, NO	Metal	83mm	ET120-92400	—	400mA	<1.8mA	<8 VAC	25Hz	—	no
6.6' Cable	2W, AC, NO	Metal	60mm	ET120-92410	—	400mA	<1.8mA	<8 VAC	25Hz	—	no

* Across conducting sensor

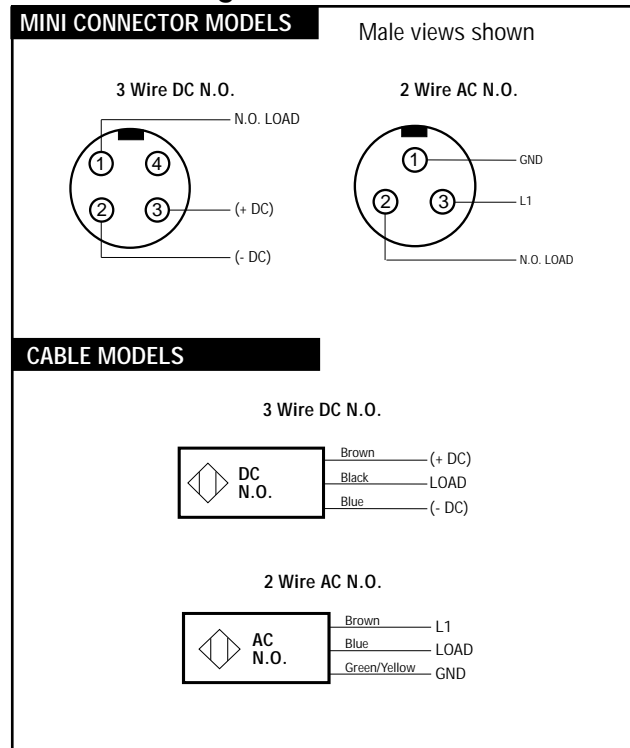
► Consult factory for normally closed model availability.

Protected by the
NAMCO
Lifetime Replacement Program

Common Sensor Characteristics

47mm DIAMETER DC & AC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	20mm
Unshielded Sensing Range ($\pm 10\%$)	N/A
Standard Target (mm) (mild steel)	60x60x1
Repeatability	$\pm 2\%$
Hysteresis	3-8% (typ.); 15% (max.)
Range Drift over Temperature	$\pm 15\%$
Operating Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	<7mA
NEMA Enclosure Type	1, 3, 4, 6, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Cable Type	PVC
Shipping Weight	Connector model: 6 oz. Cable model: 11 oz.

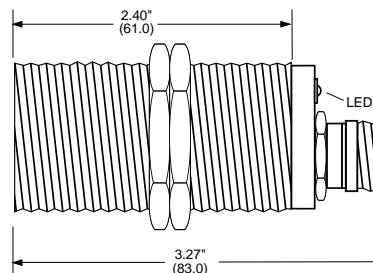
Circuit Drawings



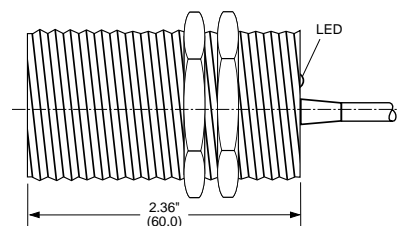
Dimensional Drawings 47mm-DC & AC

MINI CONNECTOR MODELS

Body threads = PG36



CABLE MODELS



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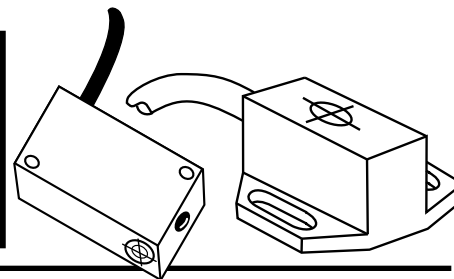
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Small Plastic

Inductive Rectangular

DC AC



Proximity Sensors

Connector Type	Circuit Description	Housing Dimensions	Shielded Model No.	Unshielded Model No.	Sensing Range	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
MINIATURE FLAT PACK DC 10-30V										
6.6' Cable	3W, NPN, NO	17x35x35mm	—	ET910-23110	10mm	400mA	<10µA	<2.5 VDC	200Hz	yes
MINIATURE FLAT PACK AC 80-250V										
6.6' Cable	2W, AC, NO	17x35x35mm	—	ET920-23410	10mm	200mA	<2.5mA @220 VAC	<11VAC @200mA	25Hz	no
SMALL RECTANGULAR DC 10-30V										
6.6' Cable	3W, NPN, NO	12x26x40mm	ET910-12110	—	2mm	400mA	<10µA	<2.5 VDC	1200Hz	yes
6.6' Cable	3W, NPN, NO	12x26x40mm	—	ET910-13110	4mm	400mA	<10µA	<2.5 VDC	800Hz	yes
6.6' Cable	3W, PNP, NO	12x26x40mm	ET911-12110	—	2mm	400mA	<10µA	<2.5 VDC	1200Hz	yes
6.6' Cable	3W, PNP, NO	12x26x40mm	—	ET911-13110	4mm	400mA	<10µA	<2.5 VDC	800Hz	yes
SMALL RECTANGULAR AC 20-250V										
6.6' Cable	2W, AC, NO	12x26x40mm	ET920-12410	—	2mm	400mA	<1.5mA @220 VAC	<8 VAC @400mA	25Hz	no
6.6' Cable	2W, AC, NO	12x26x40mm	—	ET920-13410	4mm	400mA	<1.5mA @220 VAC	<8 VAC @400mA	25Hz	no
SMALL RECTANGULAR NAMUR 5-25 VDC										
6.6' Cable	Analog	12x26x40mm	ET912-10310	—	2mm	N/A	—	—	800Hz	N/A
6.6' Cable	Analog	12x26x40mm	—	ET912-11310	4mm	N/A	—	—	400Hz	N/A

* Across conducting sensor

► Consult factory for normally closed model availability.



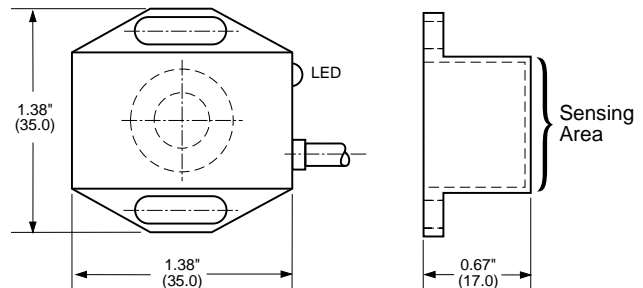
Common Sensor Characteristics

SMALL PLASTIC RECTANGULAR DC & AC SENSORS	
Shielded Sensing Range ($\pm 10\%$)	2mm
Unshielded Sensing Ranges ($\pm 10\%$)	4mm & 10mm
Standard Target (mm) (mild steel)	12x12x1 (2mm Shielded) 16x16x1 (4mm Unshielded) 30x30x1 (10mm Unshielded)
Repeatability	$\pm 1\%$ (Shielded) $\pm 2\%$ (Unshielded)
Hysteresis	3-8% (typ.); 15% (max.)
Range Drift over Temperature	$\pm 15\%$
Operating Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	<1.5mA
NEMA Enclosure Type	1, 3, 4, 4x, 6, 13
LED Indicator	red = target
Plastic Housings	Ultradur®
Cable Type	PVC
Shipping Weight	10 oz.

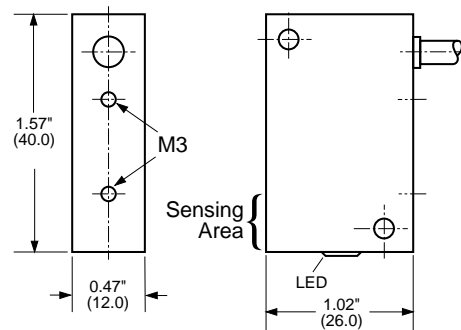
Dimensional Drawings

CABLE MODELS

Miniature Flat Pack



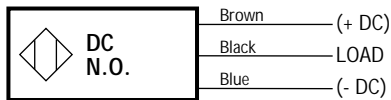
Small Rectangular



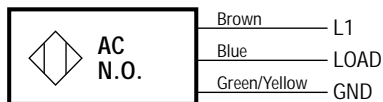
Circuit Drawings

CABLE MODELS

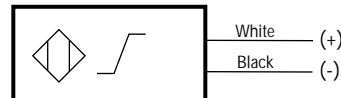
3 Wire DC N.O.



2 Wire AC N.O.



NAMUR MODELS



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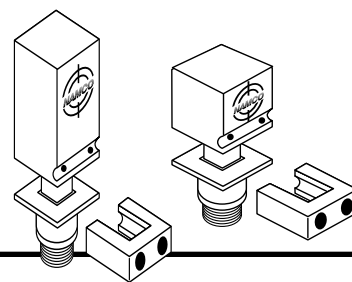
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**Weld
Field
Immune**

Inductive Rotatable Rectangular

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Predictable, Consistent Performance
- 100% Tested and Burned-in
- New Ultra Long Range models in latching and non-latching

These sensors are specifically designed for extreme duty use in harsh applications such as automotive fabrication and assembly plants. The rectangular series has been the standard of the automotive industry for over 25 years. In that time several different versions, all with a common mounting, have been developed for use as part present and machine location sensors. In addition, specific accessories have been developed to make these sensors even more reliable in your application.

0.5"/1.0" Range (Unshielded) Rotatable Sensors

Connector Type	Circuit Description	Front Sense Model No.	Left Sense Model No.	Right Sense Model No.	Top Sense Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Short Circuit Protected	Inrush Current
SHORT HOUSING DC 10-30V 0.5" Range										
4-pin Euro	3W, PNP, NO	EE510-15440	EE510-16440	EE510-18440	EE510-19440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-15040	EE510-16040	EE510-18040	EE510-19040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-15400	EE510-16400	EE510-18400	EE510-19400	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-15000	EE510-16000	EE510-18000	EE510-19000	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
SHORT HOUSING AC/DC 20-230V 0.5" Range										
3-pin Mini	2W, NO, LL	EE530-15400	EE530-16400	EE530-18400	EE530-19400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Micro	2W, NO, LL	EE530-15420	EE530-16420	EE530-18420	EE530-19420	500mA	1.7mA	<10V	Latching	3A (20ms)
LONG HOUSING DC 10-30V 0.5" Range										
4-pin Euro	3W, PNP, NO	EE510-10440	EE510-11440	EE510-13440	EE510-14440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-10040	EE510-11040	EE510-13040	EE510-14040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-10400	EE510-11400	EE510-13400	EE510-14400	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-10000	EE510-11000	EE510-13000	EE510-14000	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
8' Cable	3W, PNP, NO	EE510-10415	EE510-11415	EE510-13415	EE510-14415	200mA	10µA	2.0V @ 100mA	Latching	N/A
8' Cable	3W, PNP, NO	EE510-10015	EE510-11015	EE510-13015	EE510-14015	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
LONG HOUSING AC/DC 20-230V 0.5" Range										
3-pin Mini	2W, NO, LL	EE530-10400	EE530-11400	EE530-13400	EE530-14400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Micro	2W, NO, LL	EE530-10420	EE530-11420	EE530-13420	EE530-14420	500mA	1.7mA	<10V	Latching	3A (20ms)
LONG HOUSING DC 10-30V 1.0" Range										
4-pin Euro	3W, PNP, NO	EE510-30440	EE510-31440	EE510-33440	EE510-34440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-30040	EE510-31040	EE510-33040	EE510-34040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
LONG HOUSING AC/DC 20-150V 1.0" Range										
3-pin Mini	2W, NO, LL	EE530-30400	EE530-31400	EE530-33400	EE530-34400	200mA	1.7mA	<10V	Latching	1.5A

* Across conducting sensor

- "LL" indicates *Low Leakage*
- Consult factory for normally closed and *High Leakage* model availability.



Common Sensor Characteristics

ROTATABLE INDUCTIVE RECTANGULAR SENSORS	
Nominal Sensing Range ($\pm 10\%$)	0.5"/1.0"*
Short Circuit Protection	yes
Repeatability	$< \pm 1\%$
Hysteresis	3-10%
Temperature Drift (max.)	$\pm 10\%$
Ambient Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Housing	Weld Flash Resistant
Cable Type	PVC
Shipping Weight	Connector model: 6 oz. Cable model: 11 oz.
Maximum Switching Frequency	16Hz

* 1" range is for the Ultra Long Range models only

Circuit Drawings

EURO CONNECTOR MODELS Male view shown

3 Wire DC N.O.

1 (+ DC)
2 N.O. LOAD
3 (- DC)
4

MINI CONNECTOR MODELS Male views shown

3 Wire DC N.O.

1 N.O. LOAD
2 (+ DC)
3 (- DC)
4

2 Wire AC/DC N.O.

1 L1
2 N.O. LOAD
3

CABLE MODELS

3 Wire DC N.O.

DC N.O.
Brown (+ DC)
Black LOAD
Blue (- DC)

2 Wire AC/DC N.O.

AC N.O.
Green L1
Black LOAD
White GND

Dimensional Drawings

ROTATABLE SENSORS – SHORT HOUSING

ROTATABLE SENSORS – LONG HOUSING Rectangular/Ultra Long Range models

Proximity Sensors



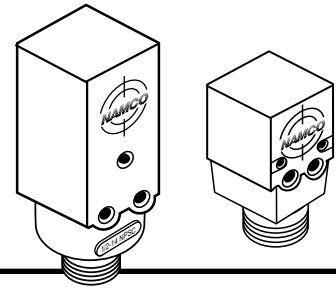
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**Weld
Field
Immune**

Inductive Thermoset Rectangular

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Weld Spatter Resistant Housings Will Not Support Combustion
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP Available for DC Models only

These sensors are specifically designed for extreme duty use in harsh applications such as automotive fabrication and assembly plants. The rectangular series has been the standard of the automotive industry for over 25 years. In that time several different versions, all with a common mounting, have been developed for use as part present and machine location sensors. In addition, specific accessories have been developed to make these sensors even more reliable in your application.

0.5" Range (Unshielded) Thermoset Sensors

Connector Type	Circuit Description	Front Sense Model No.	Left Sense Model No.	Right Sense Model No.	Top Sense Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Short Circuit Protected	Inrush Current
SHORT HOUSING DC 10-30V										
4-pin Euro	3W, PNP, NO	EE510-55440	EE510-56440	EE510-58440	EE510-59440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-55040	EE510-56040	EE510-58040	EE510-59040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
SHORT HOUSING AC/DC 20-230V										
3-pin Mini	2W, NO, LL	EE530-55400	EE530-56400	EE530-58400	EE530-59400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Mini	2W, NO, HL	EE560-55400	EE560-56400	EE560-58400	EE560-59400	500mA	4.5mA	<10V	Latching	3A (20ms)
LONG HOUSING DC 10-30V										
4-pin Mini	3W, PNP, NO	EE510-50400	EE510-51400	EE510-53400	EE510-54400	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-50000	EE510-51000	EE510-53000	EE510-54000	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-50440	EE510-51440	EE510-53440	EE510-54440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-50040	EE510-51040	EE510-53040	EE510-54040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
LONG HOUSING AC/DC 20-230V										
3-pin Mini	2W, NO, LL	EE530-50400	EE530-51400	EE530-53400	EE530-54400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Mini	2W, NO, HL	EE560-50400	EE560-51400	EE560-53400	EE560-54400	500mA	4.5mA	<10V	Latching	3A (20ms)
8' Cable	2W, NO, HL	EE560-50415	EE560-51415	EE560-53415	EE560-54415	500mA	4.5mA	<10V	Latching	3A (20ms)
LONG HOUSING AC/DC 20-230V DUAL SENSING										
5-pin Mini	2W, NO, LL	EE530-65500	—	—	—	500mA	1.7mA	<10V	Latching	3A (20ms)
5-pin Mini	2W, NO, HL	EE560-65500	—	—	—	500mA	4.5mA	<10V	Latching	3A (20ms)

* Across conducting sensor

- "LL" indicates *Low Leakage* and "HL" indicates *High Leakage*.
- Consult factory for normally closed model availability.

Protected by the
NAMCO
Lifetime Replacement Program

Common Sensor Characteristics

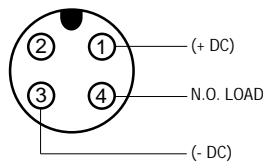
THERMOSET INDUCTIVE RECTANGULAR SENSORS	
Nominal Sensing Range ($\pm 10\%$)	0.5"
Short Circuit Protection	yes
Repeatability	$< \pm 1\%$
Hysteresis	3-10%
Temperature Drift (max.)	$\pm 10\%$
Ambient Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Housing	Weld Flash Proof
Cable Type	PVC
Shipping Weight	6 oz.
Maximum Switching Frequency	16Hz

Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

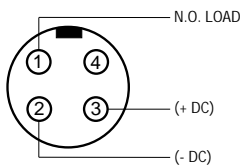
3 Wire DC N.O.



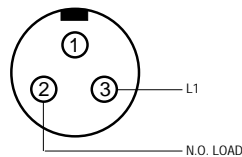
MINI CONNECTOR MODELS

Male views shown

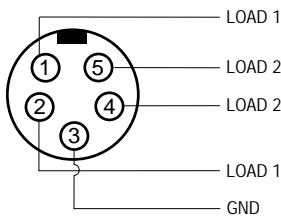
3 Wire DC N.O.



2 Wire AC/DC N.O.

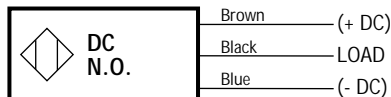


5 Wire AC/DC N.O.

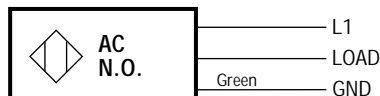


CABLE MODELS

3 Wire DC N.O.



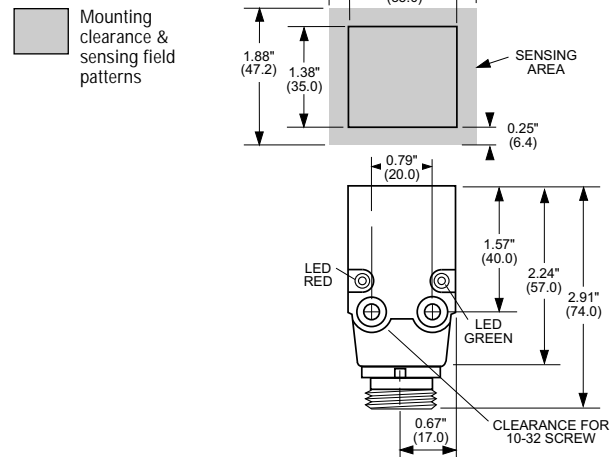
2 Wire AC/DC N.O.



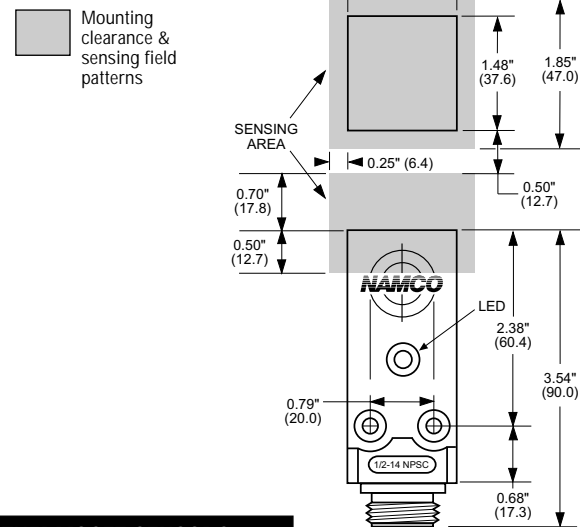
Dimensional Drawings

DC, AC/DC

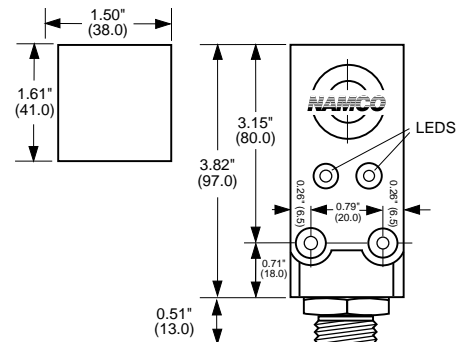
THERMOSET SENSORS – SHORT HOUSING



THERMOSET SENSORS – LONG HOUSING



THERMOSET SENSORS – DUAL SENSING



NAMCO

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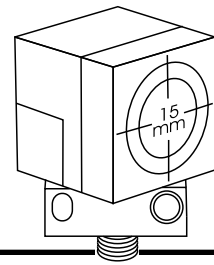
For technical assistance, call 1-800-NAMTECH

Proximity Sensors

**Weld
Field
Immune**

HammerHead™ Proximity Sensor

**DC
AC/DC**



Proximity Sensors

Introducing the Namco HammerHead™ Proximity Sensor: Evolution Means Survival of the Fittest.

All Metal Body Stands up to Abuse

To evolve means to adapt to your surroundings. The HammerHead sensor is completely enclosed in a rugged die-cast body. All metal means more strength in the face of abuse.

9-Way Position Flexibility

Eight-point indexed side-sense, plus top sense configuration make the HammerHead sensor "9-sensors-in-one."

Positive Grip Compression Clamp Bracket

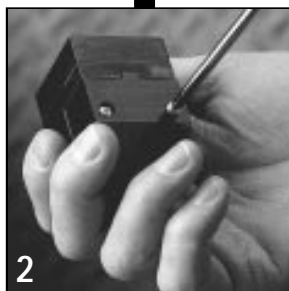
Provides superior mounting strength.



"Show us your metal!" The HammerHead sensor has an all-metal body so it is not prone to mechanical breakage like other user-configurable sensors with plastic housings.

Streamlined Design Shakes off Weld Slag . . . Without Protective "Boots"

The HammerHead sensor's face is weld slag resistant, so even heavy deposits roll right off. Plus, because it has no nooks or crevices for slag to accumulate, you'll never have to worry about "false triggering" from slag build-up.



Adjustment screws go straight in . . . no difficult angles to slow things down.



Configuring is as easy as "1-2-3"

The HammerHead sensor is field-adaptable to positions for top, front, left or right sensing. This means you can site-adapt sensors to changing application conditions.

Proximity Sensors

An Easy Upgrade. Directly Replaces Other Configurable Sensors

Two sets of mounting holes on bracket allow easy retrofit of traditional rectangular sensors (using lower pair of holes), or retrofit of limit switch-style sensors (using the upper pair).



Simplifies Ordering

Because it is "9-sensors-in-one," the HammerHead sensor makes things easy for your Purchasing Department. A single part number replaces as many as five conventional rectangular proximity sensors.



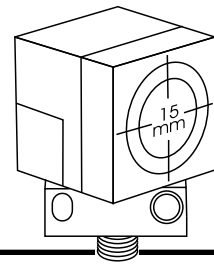
360° Connector Swivel

Allows for convenient cordset routing, especially with 90° cordsets.

**Weld
Field
Immune**

HammerHead™ Proximity Sensor

**DC
AC/DC**



Proximity Sensors

- Nine-way position flexibility
- Weld Field Immune circuitry is designed to operate within 1" of a resistance welding electrode carrying 20,000 Amperes RMS (45,000 Amperes peak) without changing state
- Will not exhibit false turn-ons from walkie-talkies or other in-plant sources of RF noise
- Patented Short Circuit Protection
- Covered by Namco Lifetime Replacement Program
- Rugged metal body and clamp bracket

The HammerHead sensor is field-configurable to sense in nine different positions: top, front, back, left, right, and four 45° side sense positions.

The HammerHead sensor features Namco's famous weld field immune circuit proven reliable the world over in the harshest conditions. Totally epoxy encapsulated, the electronics are truly "automotive grade."



9-Way Configurable Proximity Sensors

Connector Type	Circuit Description	Housing Dimensions	Non-latching SCP Model No.	Latching SCP Model No.	Maximum Load Current	Leakage Current	Voltage Drop	Short Circuit Protected
15mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-90000	EE510-90400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-90040	EE510-90440	200mA	< 10µA	2.5V	Yes
20mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-91000	EE510-91400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-91040	EE510-91440	200mA	< 10µA	2.5V	Yes
25mm SENSING RANGE DC 10-30V (UNSHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-92000	EE510-92400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-92040	EE510-92440	200mA	< 10µA	2.5V	Yes
15mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO, LL	40x40x68.5mm		EE530-90400	200mA	1.7mA	10V	Yes
3-pin Micro ³	2W, NO, LL	40x40x68.5mm		EE530-90420	200mA	1.7mA	10V	Yes
20mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO, LL	40x40x68.5mm		EE530-91400	200mA	1.7mA	10V	Yes
3-pin Micro ³	2W, NO, LL	40x40x68.5mm		EE530-91420	200mA	1.7mA	10V	Yes
25mm SENSING RANGE AC/DC 20-150V (UNSHIELDED)								
3-pin Mini	2W, NO, LL	40x40x68.5mm		EE530-92400	200mA	1.7mA	10V	Yes
3-pin Micro ³	2W, NO, LL	40x40x68.5mm		EE530-92420	200mA	1.7mA	10V	Yes

³Consult factory for availability.

- ▶ "LL" indicates *Low Leakage* and "HL" indicates *High Leakage*.
- ▶ Consult factory for normally closed model availability.

Common Sensor Characteristics

HAMMERHEAD SENSORS		
	2 Wire AC/DC	3 Wire DC
Supply Voltage	20-150V	10-30V
Voltage Drop	10V	2.5V
Max. Load Current	200mA	200mA
Current Consumption	N/A	11mA
Leakage Current	1.7mA	< 10µA
Mis-wiring Protected	Yes ¹	Yes ²
Response Time	30ms	30ms
Output Circuit	2 Wire	Sourcing
Ambient Temperature Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

	2 Wire AC/DC		3 Wire DC	
	Red	Green	Green	Amber
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	Off	On	On	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

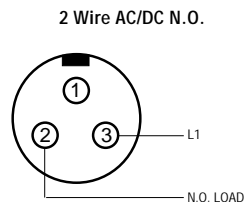
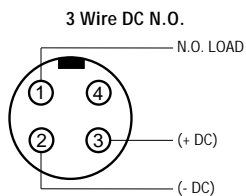
¹ Namco 2-wire AC/DC sensors are bipolar by design - they cannot be mis-wired.

² Namco 3-wire DC sensors incorporate reverse polarity protection.

Wiring Diagrams

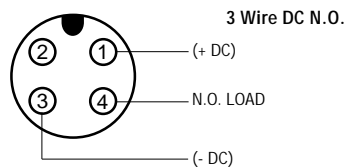
MINI CONNECTOR MODELS

Male views shown



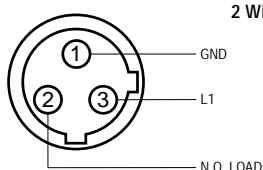
EURO CONNECTOR MODELS

Male view shown



MICRO CONNECTOR MODELS

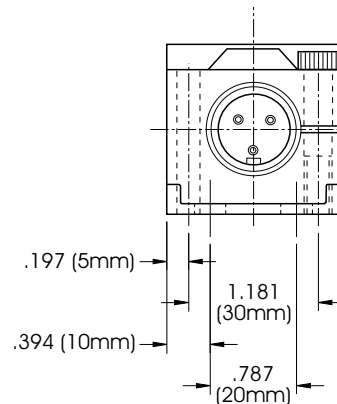
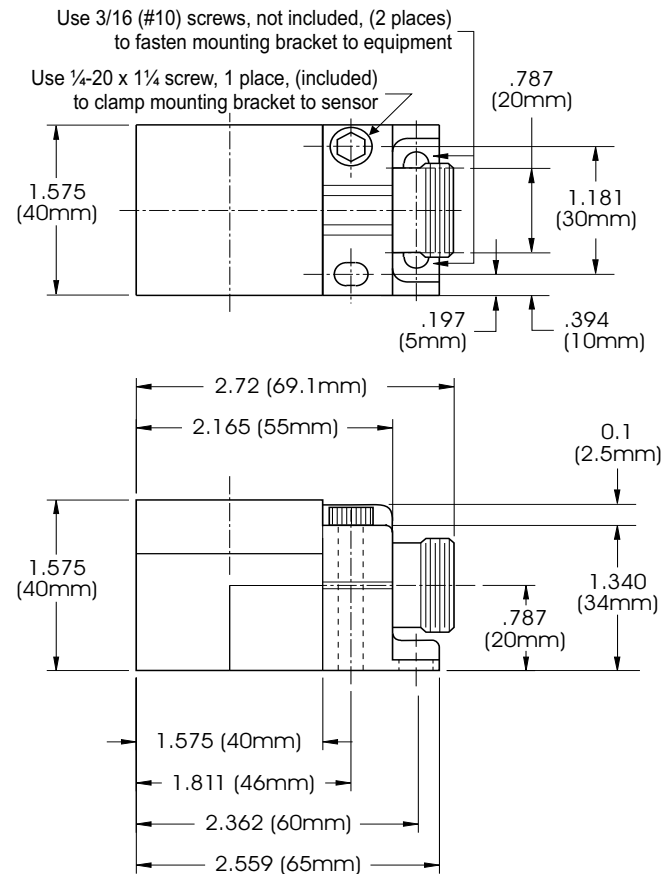
Male view shown



Dimensional Drawings

DC, AC/DC

HAMMERHEAD SENSORS - MINI CONNECTORS



NAMCO

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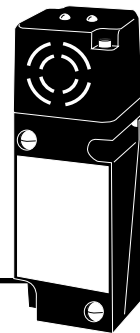
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For technical assistance, call 1-800-NAMTECH

Inductive Limit Switch Style

AC/DC



Proximity Sensors

AC/DC 20-230V 13mm (Unshielded) Sensing Range

Connector Type	Circuit Description	Sensing Face	Housing Dimensions	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
COMPLETE ASSEMBLIES										
Terminal	2W, AC/DC, NO	Side	43x41x117mm	—	EE630-50510	500mA	1.7mA	<10V	15Hz	yes
Terminal	2W, AC/DC, NC	Side	43x41x117mm	—	EE630-50610	500mA	1.7mA	<10V	15Hz	yes
Terminal	2W, AC/DC, NO	Top	43x41x117mm	—	EE630-54510	500mA	1.7mA	<10V	15Hz	yes
Terminal	2W, AC/DC, NC	Top	43x41x117mm	—	EE630-54610	500mA	1.7mA	<10V	15Hz	yes
SENSING HEADS										
—	2W, AC/DC, NO	Side	N/A	—	EE631-00510	500mA	1.7mA	<10V	15Hz	yes
—	2W, AC/DC, NC	Side	N/A	—	EE631-00610	500mA	1.7mA	<10V	15Hz	yes
—	2W, AC/DC, NO	Top	N/A	—	EE631-04510	500mA	1.7mA	<10V	15Hz	yes
—	2W, AC/DC, NC	Top	N/A	—	EE631-04610	500mA	1.7mA	<10V	15Hz	yes
BASE ASSEMBLY										
Terminal	—	—	N/A	—	EE631-51000	500mA	1.7mA	<10V	15Hz	yes

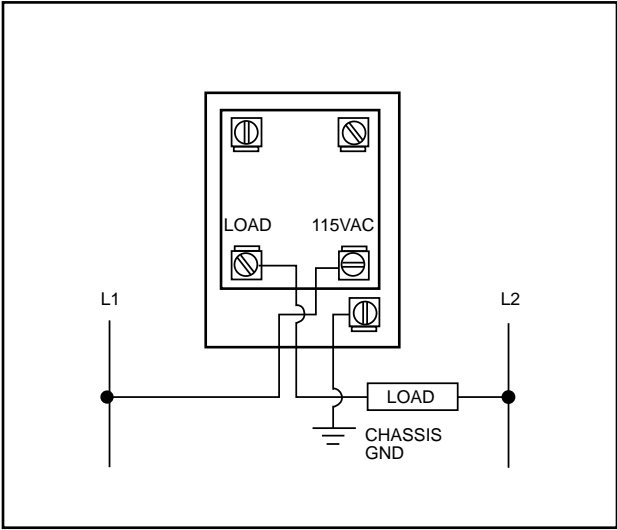
* Across conducting sensor



Common Sensor Characteristics

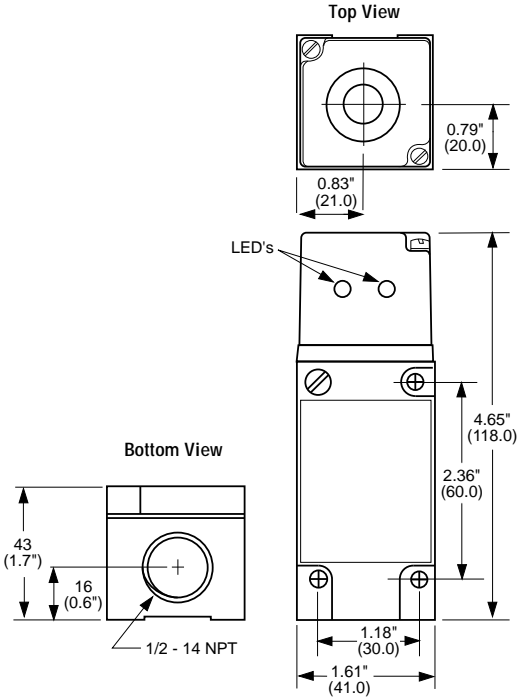
LIMIT SWITCH STYLE SENSORS	
Sensing Distance	0.5" ±10%
Repeatability	<±1%
Hysteresis	10%
Ambient Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
NEMA Enclosure Type	1, 12, 13
Operating Temperature Range	-20°C to +70°C
LED Indicators	red = power green = target
Shipping Weight	14 oz.

Wiring Diagram

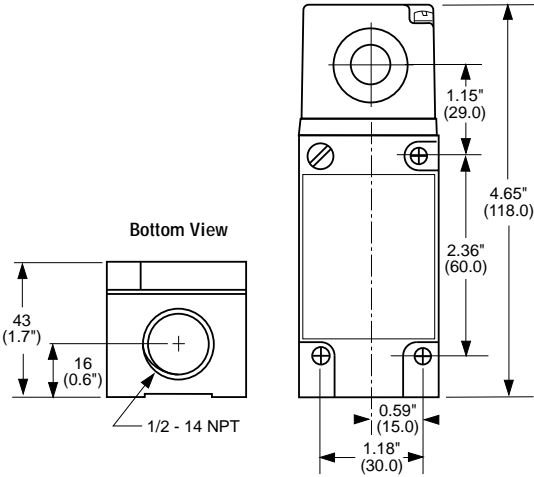


Dimensional Drawings

TOP SENSE MODELS



SIDE SENSE MODELS



Proximity Sensors



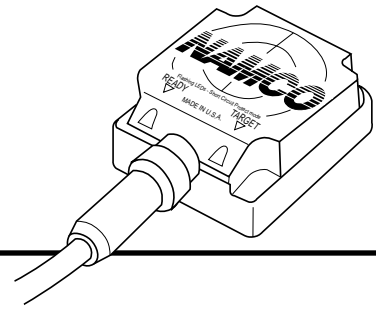
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For technical assistance, call 1-800-NAMTECH

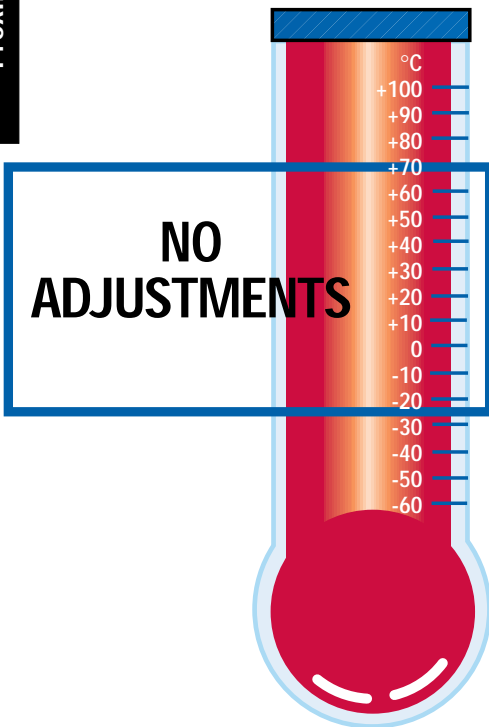
Weld
Field
Immune

Focused Field Long Range Sensors



Proximity Sensors

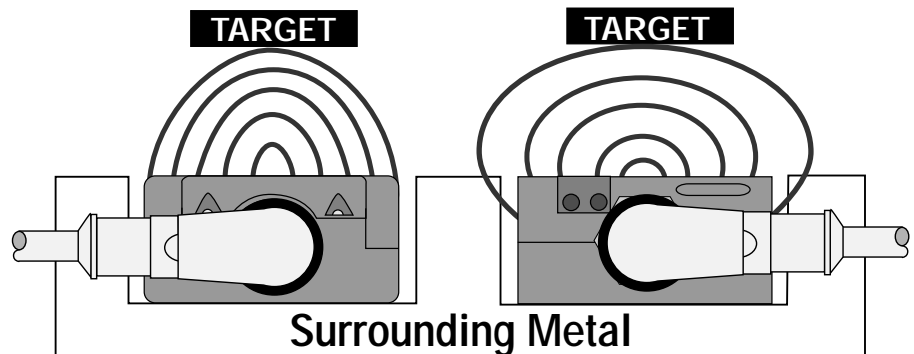
Focused Field FlatPak™ Sensor: Range Stable to 70°C, Never Needs Range Adjustments



The Namco Focused Field FlatPak™ Proximity Sensor is a Super Heavy Duty, completely encapsulated sensor designed to sense large metal objects at long ranges. It is the first sensor of this body style to offer a focused sensing field.

The focused sensing field allows this sensor to be mounted flush with surrounding metal with only a .25 inch gap between the sensor and the metal surface. This sensor will operate reliably in this setting without sensing range adjustments all year round regardless of changes in ambient temperature.

Competitive sensors have traditionally included a trim pot to enable the user to revise the sensing distance when ambient conditions changed. These sensors were susceptible to substantial growth in sensing range when ambient temperature changed from season to season. They would eventually "lock on" to surrounding metal due to this growth in range and to the un-focused nature of their sensing fields. Only a .25 inch clearance is necessary to insure that the Focused Field FlatPak will never lock on to surrounding metal.

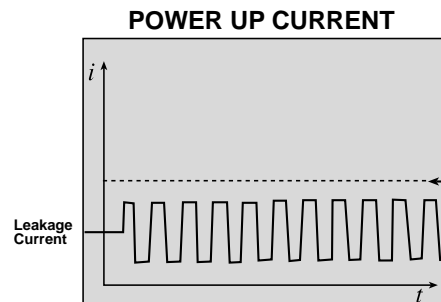


Namco FlatPak

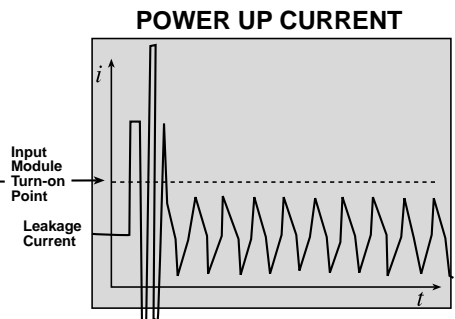
Other Extended Range Sensors

No TRANSIENTS at Power-Up

The Namco FlatPak sensor has the most noise resistant circuitry in the business, **Namco's patented Weld Field Immune (WFI) circuitry**. Not only will the sensor operate reliably in the presence of 20,000 amp weld fields, it also powers-up glitch-free and is extremely resistant to radio frequency interference and other forms of electrical noise. Problems such as "false detection" and "dropping out" are non-existent, further minimizing programming and maintenance requirements.



Namco Focused Field FlatPak Sensor. A clean wave means predictable performance.



Power-up current draw of competitive sensor will turn on PLC inputs.

An Easy Upgrade... Directly Replaces Other Extended Range Sensors

The Namco Focused Field FlatPak™ Sensor is designed to directly replace existing sensors of this format. It mounts on 65mm bolt centers and is the only sensor of this type that is made in the USA. It comes with a Lifetime Free Replacement Warranty.



Assists in Troubleshooting

Namco's WFI circuit includes latching Short Circuit Protection (SCP). If the sensor detects excessive current, it reverts to a sleep state with LEDs alternately flashing. This provides a clear indication of a problem in the circuit, simplifying the troubleshooting task. The sensor draws minimal current (2mA) and can remain in this state indefinitely.

No sensing range adjustments, ever.

Namco Weld Field Immune circuitry is designed to operate in presence of resistance welding electrodes carrying 20,000 Amperes RMS (45,000 Amperes peak).

Weld-splatter resistant housing.

Super Reliable—Covered by Namco Lifetime Replacement Program.

Built-in connector available.

Available with either 40mm or 50mm sensing range.

Namco's patented latching short circuit protection is very fast acting. Prolonged shorts will not damage electronics; latching feature aids in the diagnosis of troublesome intermittent faults.

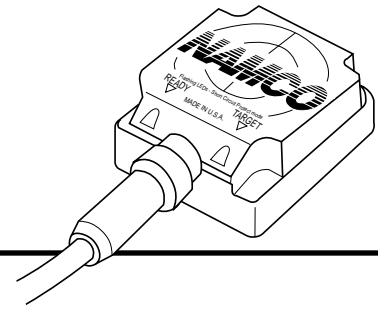
Available in either 20-150 VAC/DC or 10-30 VDC styles.

Only extended range sensor made in the USA.



You can mount flush with metal floors or within metal channel.

Focused Field Long Range Sensors



- 40mm or 50mm Sensing Range
- “No Adjustment” Sensor
- Focused Field Will not Lock on Surrounding Metal
- Easy Upgrade/Direct Replacement
- Sensing Range - Stable From - 25°C to 70°C
- Namco Weld Field Immune Circuit
- Clean PowerUp - No Turn-on Transients
- Latching SCP - Simplifies Troubleshooting
- Super Reliable, Fully Epoxy-Encapsulated: Covered by Lifetime Free Replacement Program
- Non-Latching SCP Available for DC Modes Only
- **ONLY SENSOR OF ITS TYPE MADE IN USA**



The NAMCO Focused Field FlatPak™ Proximity Sensor is a Super Heavy Duty, completely encapsulated sensor designed to sense large metal objects at long ranges in tough environments. It is the first sensor of this body style to offer a focused sensing field.

The focused sensing field allows this sensor to be mounted flush with surrounding metal with only a .25 inch gap between the sensor and the metal surface. This sensor will operate reliably in this setting without adjustment all year round regardless of changes in ambient temperature.

Competitive sensors have traditionally included a trim pot to enable the user to revise the sensing distance when ambient conditions change. These sensors are susceptible to substantial growth in sensing range when ambient temperatures change from season to season. They eventually “lock on” to surrounding metal due to this growth in range and to the unfocused nature of their sensing fields.

The Namco Focused Field FlatPak™ Sensor has two advantages over competitive products that eliminate the need for constant adjustment. **In fact, there are no sensitivity adjustments to be made, ever!!!**

The first advantage is the focused field. The shape of this field minimizes sensing of surrounding metal. When mounted in an identical setting to the competitive switch, the Focused Field FlatPak's sensing range changes less than 10%, and the shape of the field stays focused forward of the switch.

The second advantage is exceptional stability over temperature. The Namco FlatPak's range will increase a maximum of 10% even at the maximum ambient temperature, and the shape of the field will continue in a non-side-sensing focused field.

The Namco Focused Field FlatPak™ proximity sensor requires only a .25 inch clearance to surrounding metal. Once installed with this clearance, the sensor will never lock on to surrounding metal.

This Namco FlatPak also includes the most noise resistant circuitry in the business, Namco's patented Weld Field Immune (WFI) circuitry. Not only will the sensor operate reliably in the presence of 20,000 amp weld fields, it also powers up glitch-free and is extremely resistant to radio frequency interference and other forms of electrical noise. Problems such as “false detection” and “dropping out” are non-existent, further minimizing programming and maintenance requirements.

Namco's WFI circuit includes latching Short Circuit Protection (SCP). If the sensor detects excessive current, it reverts to a sleep state with LEDs flashing. This provides a clear indication of a problem in the circuit, simplifying the troubleshooting task. The sensor draws minimal current (2 mA) and can remain in this state indefinitely.

The Namco Focused Field FlatPak™ Sensor is designed to directly replace existing sensors of this format. It mounts on 65mm bolt centers and is **the only sensor of this type that is Made in the USA**. It comes with a Lifetime Free Replacement Warranty.

Connector Type	Circuit Description	Housing Material	Housing Dimensions	Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
40mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-86440	200mA	<10µA	<2.5V @ 200mA	15Hz	Latching
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-86040	200mA	<10µA	<2.5V @ 200mA	15Hz	Non-latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-86400	200mA	<10µA	<2.0V @ 200mA	15Hz	Latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-86000	200mA	<10µA	<2.0V @ 200mA	15Hz	Non-latching
40mm SENSING RANGE AC/DC 20-150V									
3-pin Micro	2W, NO, LL	Fortron	79x92x40mm	EE530-86420	200mA	1.7mA	≤10V	15Hz	Latching
3-pin Mini	2W, NO, LL	Fortron	79x92x40mm	EE530-86400	200mA	1.7mA	≤10V	15Hz	Latching
50mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-88440	200mA	<10µA	<2.5V @ 200mA	15Hz	Latching
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-88040	200mA	<10µA	<2.5V @ 200mA	15Hz	Non-latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-88400	200mA	<10µA	<2.0V @ 200mA	15Hz	Latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-88000	200mA	<10µA	<2.0V @ 200mA	15Hz	Non-latching
50mm SENSING RANGE AC/DC 20-150V									
3-pin Micro	2W, NO, LL	Fortron	79x92x40mm	EE530-88420	200mA	1.7mA	≤10V	15Hz	Latching
3-pin Mini	2W, NO, LL	Fortron	79x92x40mm	EE530-88400	200mA	1.7mA	≤10V	15Hz	Latching

Common Sensor Characteristics

FLATPAK PROXIMITY SENSORS		
Supply Voltage	10-30V DC	20-150V AC/DC
Voltage Drop	≤ 2.5V @ 200mA	≤ 10V
	≤ 2.0V @ ≤ 100mA	
Max. Load Current @ 25°C	200mA	
Inrush Current (rms 1Hz)	-	1.5A
Leakage Current	10μA	1.7mA
Sensing Range	40mm/50mm	
Response Time	30ms	
Power-up Time	70ms	
Max. Switching Frequency	15Hz	
Ambient Temp. Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

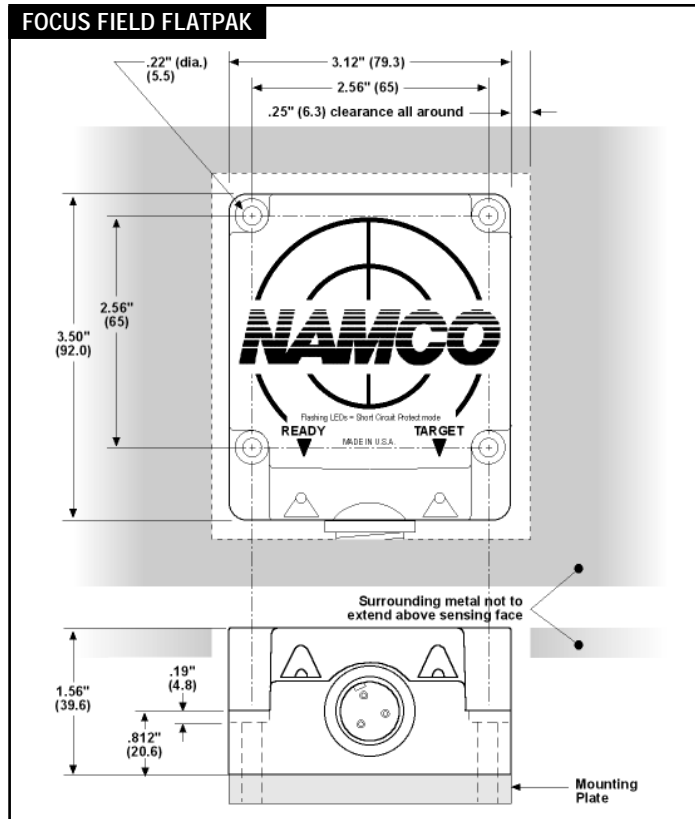
	10-30V DC		20-150V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Flashing		Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Dimensional Drawings

EE500

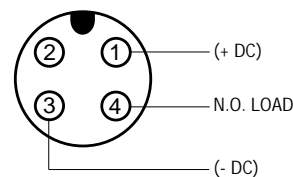
Proximity Sensors



Circuit Drawings

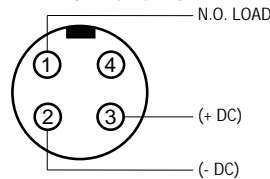
EURO CONNECTOR MODELS

3 Wire DC N.O.

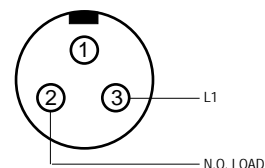


MINI CONNECTOR MODELS

3 Wire DC N.O.

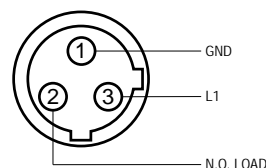


2 Wire AC/DC N.O.



MICRO CONNECTOR MODELS

2 Wire AC N.O.



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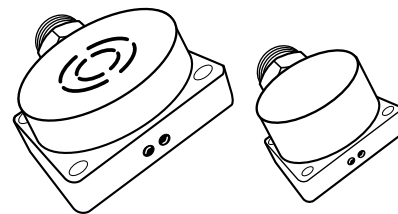
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**Weld
Field
Immune**

Extended Range Sensors

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP Available for DC Models Only
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in

These sensors are specifically designed for extreme duty use in harsh applications such as automotive fabrication and assembly plants. Our Extended Range sensors have been designed primarily for use as part present sensors for sheet metal operations, or other applications where target to sensor relationship cannot be guaranteed during operation. For the 25mm range unit, a special cover is available to protect the thermoset housing from damage caused by extreme weld expulsion.

Connector Type	Circuit Description	Housing Material	Housing Dimensions	Model No. (Unshielded)	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
25mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83441	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Euro	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83041	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83401	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Mini	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83001	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
8' Cable	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83411	200mA	10µA	2.0V @ 100mA	16Hz	Latching
8' Cable	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83011	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
25mm SENSING RANGE AC/DC 20-230V									
3-pin Micro	2W, NO, LL	Thermoset	74x50x41mm	EE530-83421	500mA	1.7mA	<10V	16Hz	Latching
3-pin Micro	2W, NO, HL	Thermoset	74x50x41mm	EE560-83421	500mA	4.5mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, LL	Thermoset	74x50x41mm	EE530-83401	500mA	1.7mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, HL	Thermoset	74x50x41mm	EE560-83401	500mA	4.5mA	<10V	16Hz	Latching
8' Cable	2W, NO, HL	Thermoset	74x50x41mm	EE560-83411	500mA	4.5mA	<10V	16Hz	Latching
50mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84440	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Euro	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84040	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84400	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Mini	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84000	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
8' Cable	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84410	200mA	10µA	2.0V @ 100mA	16Hz	Latching
8' Cable	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84010	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
50mm SENSING RANGE AC/DC 20-230V									
3-pin Micro	2W, NO, LL	Thermoplastic	117x101x50mm	EE530-84420	500mA	1.7mA	<10V	16Hz	Latching
3-pin Micro	2W, NO, HL	Thermoplastic	117x101x50mm	EE560-84420	500mA	4.5mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, LL	Thermoplastic	117x101x50mm	EE530-84400	500mA	1.7mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, HL	Thermoplastic	117x101x50mm	EE560-84400	500mA	4.5mA	<10V	16Hz	Latching
8' Cable	2W, NO, HL	Thermoplastic	117x101x50mm	EE560-84410	500mA	4.5mA	<10V	16Hz	Latching

* Across conducting sensor

- ▶ "LL" indicates *Low Leakage* and "HL" indicates *High Leakage*.
- ▶ Consult factory for normally closed model availability.

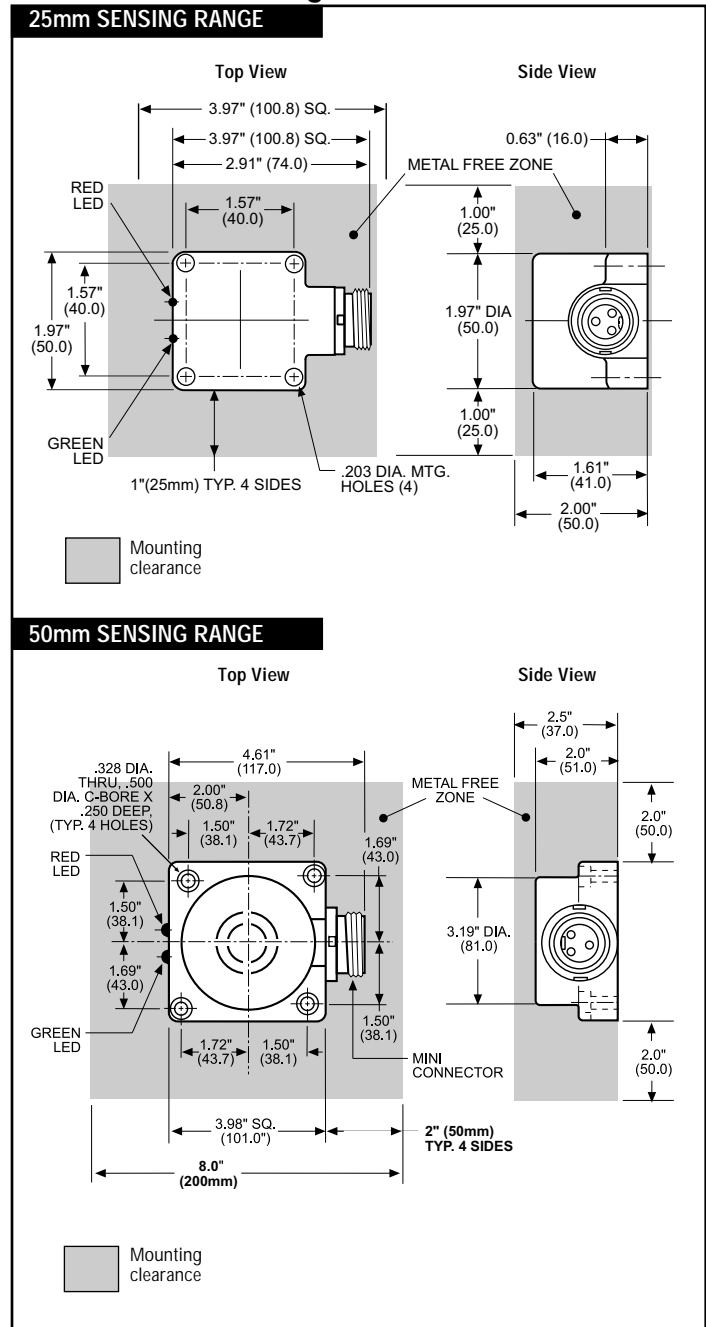


Common Sensor Characteristics

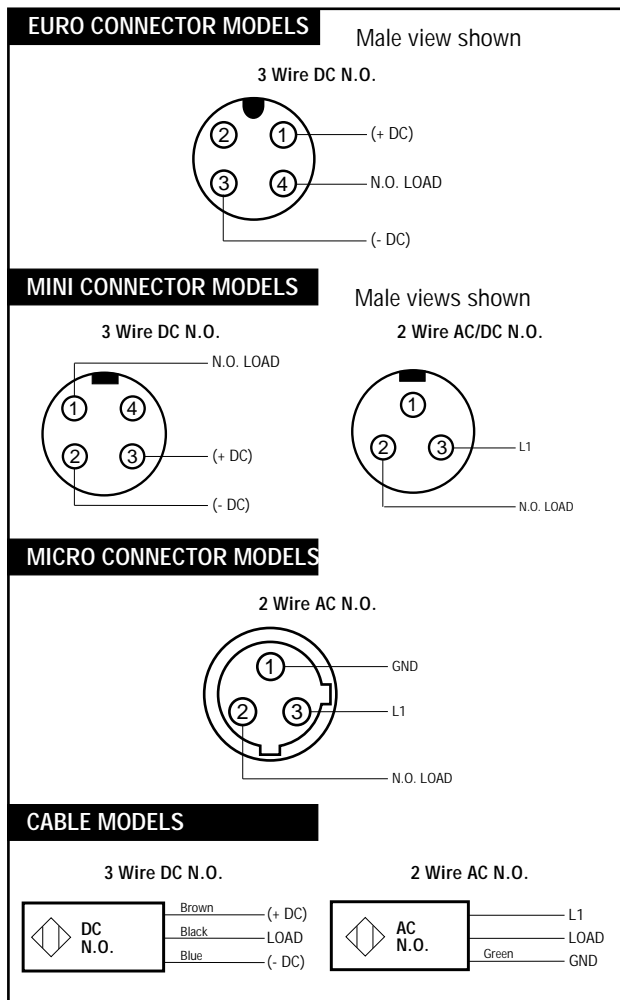
EXTENDED RANGE SENSORS		
	2W AC/DC	3W DC
Nominal Sensing Range ($\pm 10\%$)	25mm & 50mm	
Current Consumption	N/A	10mA
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Temperature Drift (Max.)	$\pm 10\%$	
Ambient Temperature Range	25mm: -4°F to $+158^{\circ}\text{F}$ 50mm: -4°F to $+122^{\circ}\text{F}$	
Cable Type	PVC	
Hysteresis	3-10%	
Repeatability	$< \pm 1\%$	
LED Indicator	red = power green = target	grn = power amber = target
Shipping Weight	25mm	50mm
Connector model:	10 oz.	2 lb.
Cable model:	15 oz.	2 lb. 5 oz.

* See Proximity Reference Information Section for details on mounting clearances for extended range sensors.

Dimensional Drawings



Circuit Drawings



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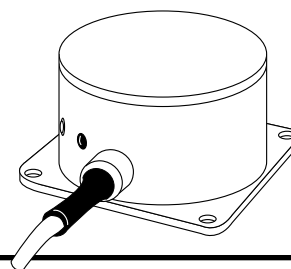
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Round Metal

Inductive Flat Pack

DC AC



Proximity Sensors

These long range sensors are shielded and not susceptible to side sensing of surrounding metal.

20-90mm (Shielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
20mm Sensing Range DC 10-30V									
6.6' Cable	3W, NPN, NO	Metal	ER510-80130	—	400mA	<10µA	<2.5 VDC	30Hz	yes
6.6' Cable	3W, PNP, NO	Metal	ER511-80130	—	400mA	<10µA	<2.5 VDC	30Hz	yes
20mm Sensing Range AC 20-250V									
6.6' Cable	2W, AC, NO	Metal	ER520-80430**	—	400mA	<1.5mA @220 VAC	<8 VAC @400mA	25Hz	no
20-45mm Adjustable Sensing Range DC 10-55V									
4-pin Mini	3W, NPN, NO	Metal	ER510-81120	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
4-pin Mini	3W, PNP, NO	Metal	ER511-81120	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
6.6' Cable	3W, NPN, NO	Metal	ER510-81130	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
6.6' Cable	3W, PNP, NO	Metal	ER511-81130	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
20-45mm Adjustable Sensing Range AC 80-250V									
3-pin Mini	2W, AC, NO	Metal	ER520-81420**	—	400mA	<2mA	<8 VAC @400mA	10Hz	no
6.6' Cable	2W, AC, NO	Metal	ER520-81430**	—	400mA	<2mA	<8 VAC @400mA	10Hz	no
45-90mm Adjustable Sensing Range DC 10-55V									
4-pin Mini	3W, NPN, NO	Metal	ER510-82120	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
4-pin Mini	3W, PNP, NO	Metal	ER511-82120	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
6.6' Cable	3W, NPN, NO	Metal	ER510-82130	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
6.6' Cable	3W, PNP, NO	Metal	ER511-82130	—	400mA	<10µA	<2.5 VDC @400mA	30Hz	yes
45-90mm Adjustable Sensing Range AC 80-250V									
3-pin Mini	2W, AC, NO	Metal	ER520-82420**	—	400mA	<2.5mA @220 VAC	<8 VAC @400mA	10Hz	no
6.6' Cable	2W, AC, NO	Metal	ER520-82430**	—	400mA	<2.5mA @220 VAC	<8 VAC @400mA	10Hz	no

* Across conducting sensor

** Without Mounting Plate

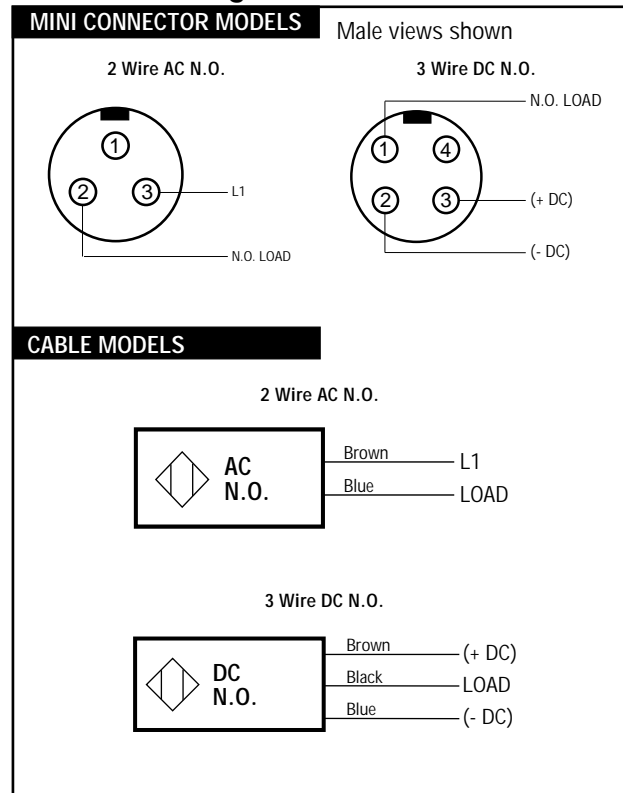
► Consult factory for normally closed model availability.



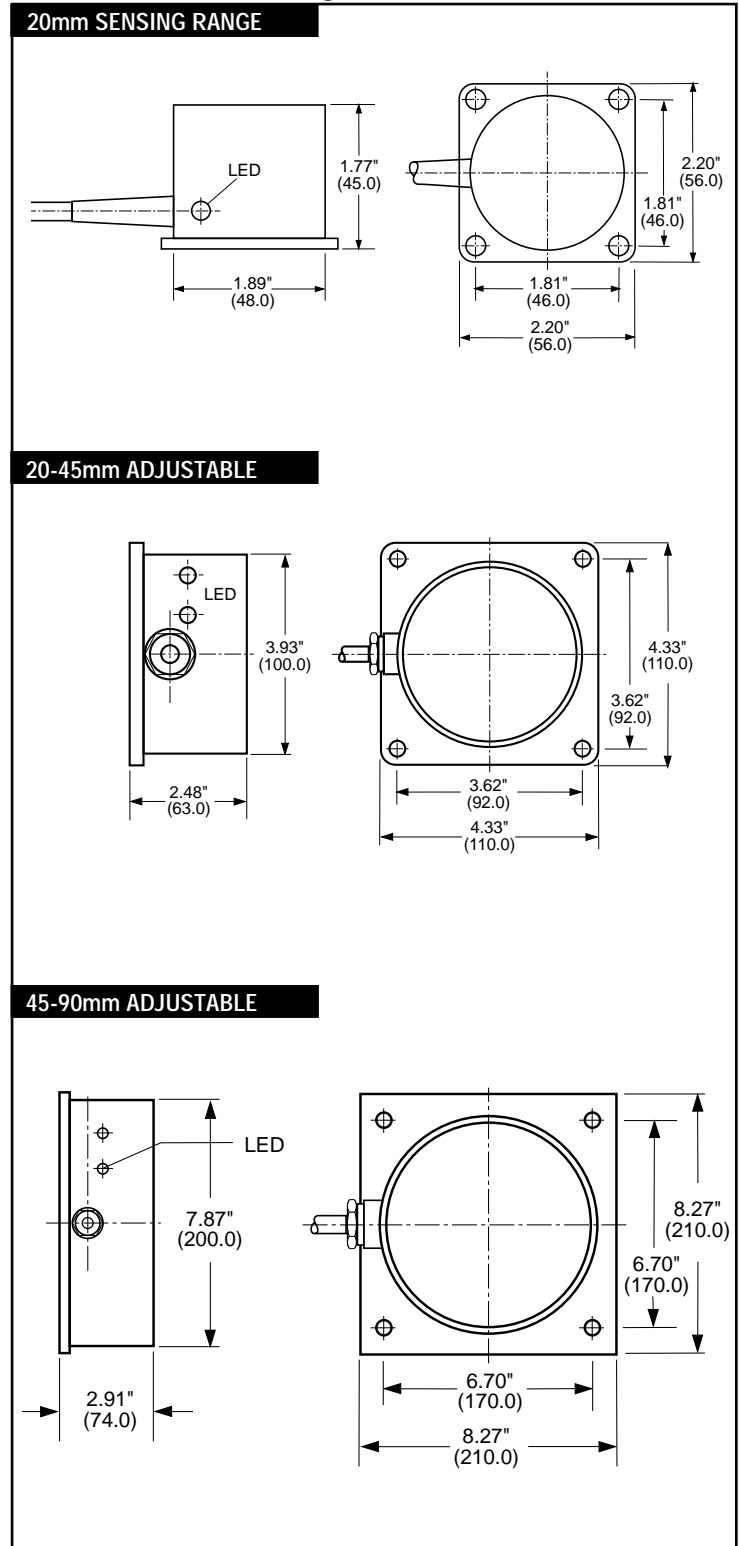
Common Sensor Characteristics

ROUND METAL FLAT PACK DC & AC SENSORS	
Shielded Sensing Range	20-90mm
Standard Target (mm) (mild steel)	60x60x1 (20mm Range) 135x135x1 (20-45mm Range) 270x270x1 (45-90mm Range)
Repeatability	± 2%
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	±15%
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption	<1.5mA
NEMA Enclosure Type	1, 3, 4, 4x
LED Indicator	red = target
Metal Housings	Aluminum
Shipping Weight	Connector model: 2 lb. Cable model: 2 lb. 5 oz.

Circuit Drawings



Dimensional Drawings



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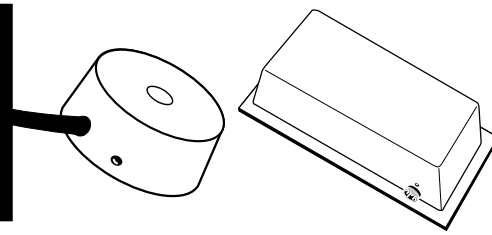
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Plastic

Inductive Flat Pack

DC AC



Proximity Sensors

These ultra long range sensors are ideal when exact positioning of large objects is not possible.

20-250mm Adjustable (Unshielded) Sensing Ranges

Connector Type	Circuit Description	Housing Material	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
Round 20-50mm Adjustable DC 10-55V									
6.6' Cable	3W, NPN, NO	Plastic	—	ER510-25121	400mA	<10µA	<2.5 VDC @ 400mA	30Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	—	ER510-25123	400mA	<10µA	<2.5 VDC @ 400mA	30Hz	yes
Round 20-50mm Adjustable AC 80-250V									
6.6' Cable	2W, AC, NO	Plastic	—	ER520-25165	400mA	<2mA @ 220 VAC	<8 VAC @ 400mA	8Hz	no
Round 30-70mm Adjustable DC 10-30V									
6.6' Cable	3W, NPN, NO	Plastic	—	ER510-27021	400mA	<10µA	<2.5 VDC @ 400mA	30Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	—	ER510-27023	400mA	<10µA	<2.5 VDC @ 400mA	30Hz	yes
Round 30-70mm Adjustable AC 80-250V									
6.6' Cable	2W, AC, NO	Plastic	—	ER520-27065**	400mA	<2mA @ 220 VAC	<8 VAC @ 400mA	8Hz	no
Round 40-100mm Adjustable DC 10-30V									
4-pin Mini	3W, NPN, NO	Plastic	—	ER510-21221	400mA	<10µA	<2.5 VDC @ 400mA	20Hz	yes
4-pin Mini	3W, PNP, NO	Plastic	—	ER510-21223	400mA	<10µA	<2.5 VDC @ 400mA	20Hz	yes
6.6' Cable	3W, NPN, NO	Plastic	—	ER510-21021	400mA	<10µA	<2.5 VDC @ 400mA	20Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	—	ER510-21023	400mA	<10µA	<2.5 VDC @ 400mA	20Hz	yes
Round 40-100mm Adjustable AC 80-250V									
3-pin Mini	2W, AC, NO	Plastic	—	ER520-21265**	400mA	<2mA @ 220 VAC	<8 VAC @ 400mA	8Hz	no
6.6' Cable	2W, AC, NO	Plastic	—	ER520-21065**	400mA	<2mA @ 220 VAC	<8 VAC @ 400mA	8Hz	no
Rectangular 70-150mm Adjustable AC/DC 38-250V									
3-pin Mini	2W, AC/DC, NO	Plastic	—	ER520-86401**	400mA	<2mA @ 220 VAC	<11 VAC	10Hz	yes
6.6' Cable	2W, AC/DC, NO	Plastic	—	ER520-86411**	400mA	<2mA @ 220 VAC	<11 VAC	10Hz	yes
Rectangular 100-250mm Adjustable AC/DC 38-250V									
3-pin Mini	2W, AC/DC, NO	Plastic	—	ER520-87401**	400mA	<2mA @ 220 VAC	<11 VAC	5Hz	yes
6.6' Cable	2W, AC/DC, NO	Plastic	—	ER520-87411**	400mA	<2mA @ 220 VAC	<11 VAC	5Hz	yes

* Across conducting sensor

** Without Mounting Plate

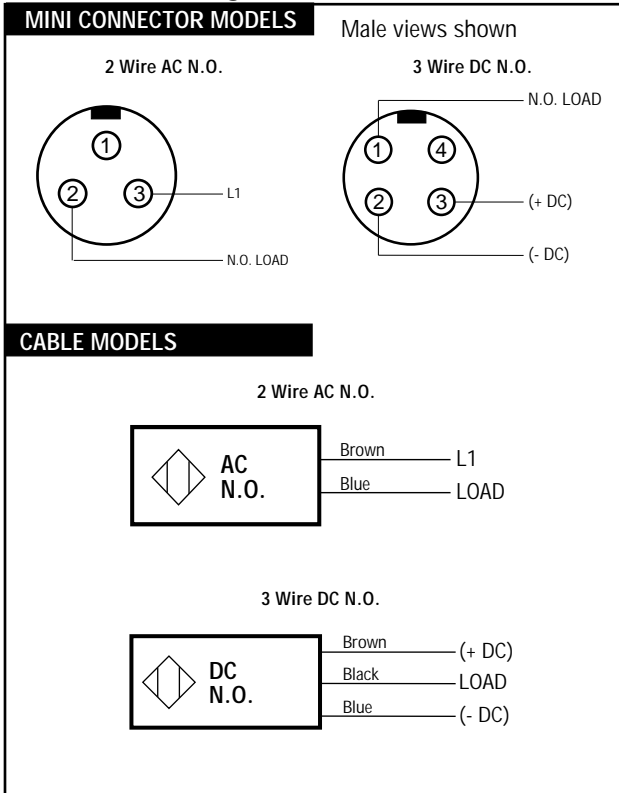
► Consult factory for normally closed model availability.



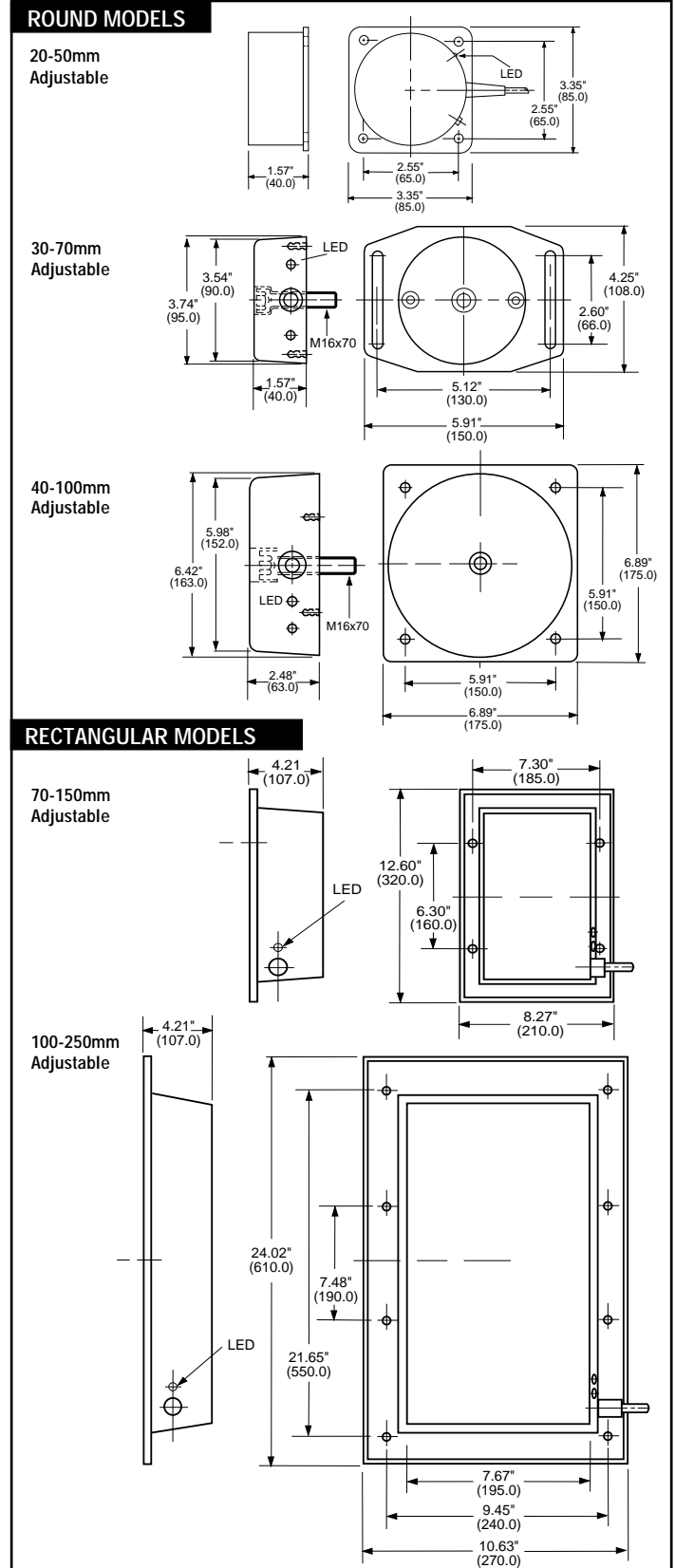
Common Sensor Characteristics

PLASTIC FLAT PACK DC & AC SENSORS	
Unshielded Sensing Range	20-250mm Adjustable
Standard Target (mm) (mild steel)	150x150x1 (20-50mm range) 210x210x1 (30-70mm range) 300x300x1 (40-100mm range) 450x450x1 (70-150mm range) 600x600x1 (100-250mm range)
Repeatability	± 2%
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (max.)	±15%
Ambient Temperature Range	-13°F to +158°F
Reverse Polarity Protected	yes
Current Consumption	<6mA (DC)
NEMA Enclosure Type	1, 12, 13
LED Indicator	red = target
Plastic Housings	Noryl®
Shipping Weight	Connector model: 5 lb. Cable model: 5 lb. 5 oz.

Circuit Drawings



Dimensional Drawings



NAMCO

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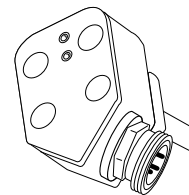
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**Weld
Field
Immune**

90° Rotatable Cylindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- 3000 PSI Pressure Rating
- Standard Latching Short Circuit Protection (SCP), Non-Latching Available in DC Models
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Purpose-Designed Housings and Materials

For over 25 years, the Cylindicator sensor has been the standard for industrial applications that require end-of-stroke indication on Hydraulic and Pneumatic Cylinders. Available in several styles, they are the standard for many OEM cylinder manufacturers. All Cylindicators are completely PLC compatible with many output configurations, including a UL Listed Intrinsically Safe version (see EE931 series for details).



	3-Pin Mini 2-W, 20-230V AC/DC, N.O.		4-Pin Mini* 3-Wire, 10-30V DC, N.O., 10µA Leakage Current				
	Latching SCP		Non-Latching SCP		Latching SCP		
	1.7mA Leakage Current	4.5mA Leakage Current	SI (NPN)	SO (PNP)	SI (NPN)	SO (PNP)	SI/SO*
Probe Length	EE230	EE260	EE210-	EE210-	EE210-	EE210-	EE210-
0.915	—	—	EE210-38820	EE210-38800	EE210-38860	EE210-38840	EE210-38880
0.950	EE230-30120	EE260-30120	EE210-30120	EE210-30100	EE210-30160	EE210-30140	EE210-30180
1.025	EE230-30420	EE260-30420	EE210-30420	EE210-30400	EE210-30460	EE210-30440	EE210-30480
1.050	EE230-30520	EE260-30520	EE210-30520	EE210-30500	—	EE210-30540	—
1.125	EE230-30820	EE260-30820	EE210-30820	EE210-30800	EE210-30860	EE210-30840	EE210-30880
1.150	EE230-30920	EE260-30920	—	—	—	—	—
1.225	EE230-31220	—	—	EE210-31200	—	EE210-31240	—
1.250	EE230-31320	EE260-31320	EE210-31320	EE210-31300	EE210-31360	EE210-31340	EE210-31380
1.275	EE230-31420	EE260-31420	—	—	—	—	—
1.295	EE230-31520	EE260-31520	EE210-31520	EE210-31500	EE210-31560	EE210-31540	EE210-31580
1.350	EE230-31720	EE260-31720	—	—	—	EE210-31740	—
1.400	EE230-31920	—	EE210-31920	—	EE210-31960	EE210-31940	EE210-31980
1.475	EE230-32220	EE260-32220	—	—	—	—	—
1.500	EE230-32320	EE260-32320	EE210-32320	EE210-32300	—	EE210-32340	EE210-32380
1.525	EE230-32420	—	—	—	—	—	—
1.625	EE230-32820	—	—	—	—	—	—
1.725	EE230-33220	EE260-33220	EE210-33220	EE210-33200	EE210-33260	EE210-33240	EE210-33280
1.750	EE230-33320	EE260-33320	—	EE210-33300	—	EE210-33340	EE210-33380
1.875	EE230-33820	EE260-33820	EE210-33820	EE210-33800	EE210-33860	EE210-33840	EE210-33880
2.062	EE230-38720	EE260-38720	EE210-38720	EE210-38700	EE210-38760	EE210-38740	EE210-38780
2.125	EE230-34820	EE260-34820	EE210-34820	EE210-34800	EE210-34860	EE210-34840	EE210-34880
2.275	EE230-35420	EE260-35420	EE210-35420	EE210-35400	EE210-35460	EE210-35440	EE210-35480
2.375	EE230-35820	—	—	—	—	—	—
2.775	EE230-37420	EE260-37420	—	—	—	—	—
2.875	EE230-37820	EE260-37820	EE210-037820	EE210-37800	EE210-37860	EE210-37840	EE210-37880
3.750	EE230-39120	—	—	—	—	—	—
3.775	EE230-39020	EE260-39020	—	EE210-39000	—	EE210-39040	—
4.560	EE230-38620	EE260-38620	EE210-38620	—	EE210-38660	EE210-38640	EE210-38680
4.850	EE230-38920	EE260-38920	EE210-38920	EE210-38900	EE210-38960	—	EE210-38980
4.990	EE230-38520	—	EE210-38520	EE210-38500	EE210-38560	—	EE210-38580

* Sink/Source Combination Devices Use a 5-Pin, 4-Wire Connector!

► Consult factory for Normally Closed, DC Sinking, and Cable model availability.

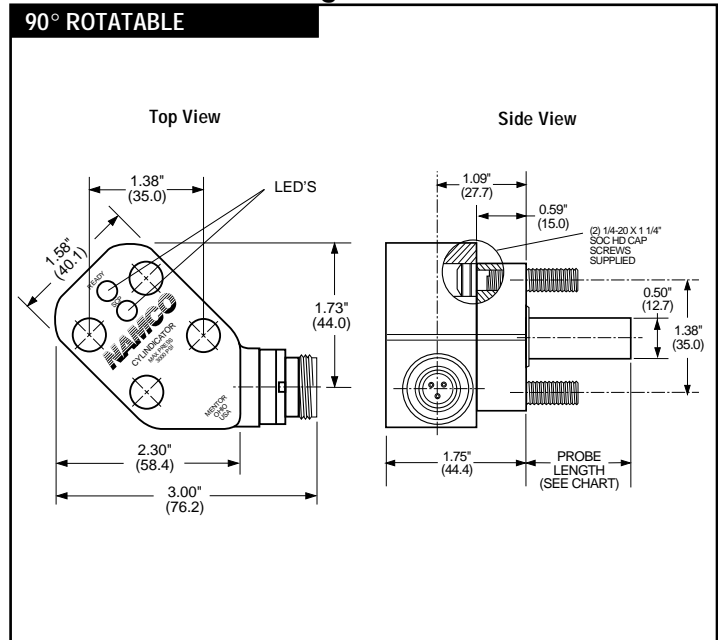
Common Sensor Characteristics

CYLINDRICATOR® SENSORS		
	AC/DC	DC
Nominal Sensing Range ($\pm 10\%$)	0.080"	
Current Consumption	1.7 or 4.5mA	10 μ A
Voltage Drop	≈ 10 VAC	2.0V@100mA
Temperature Drift (Max.)	$\pm 10\%$	
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Ambient Temperature Range	-4°F to +158°F	
Maximum Switching Frequency	16Hz	
Hysteresis	3-10%	
Repeatability	$< \pm 1.25\%$	
Designed to meet NEMA Enclosure Type	4, 6, 12 & 13	
Load Current	5mA to 500mA	200mA max.
LED Indicator	red = power green = target	green = power amber = target
Shipping Weight	12 oz.	

See Cylindricator® Sensor Design Guide Section for details.

Dimensional Drawings

DC, AC/DC

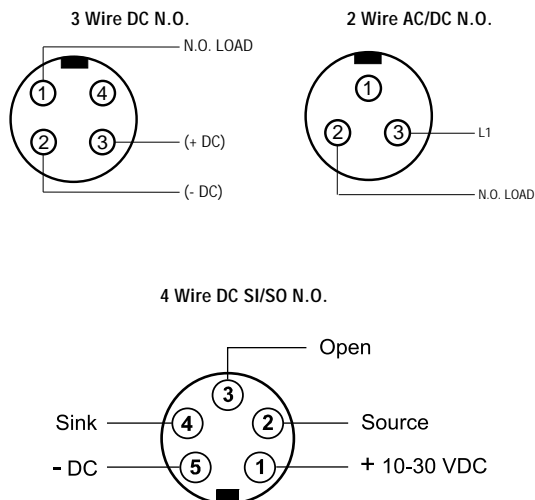


Proximity Sensors

Circuit Drawings

MINI CONNECTORS

(Male views shown)



NAMCO

Namco Controls Corporation

Mayfield Village, OH 44143

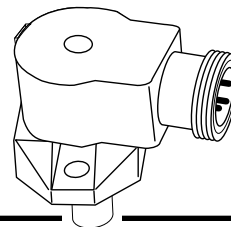
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For technical assistance, call 1-800-NAMTECH

**Weld
Field
Immune**

LPR Cyllindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Both 3,000 and 5,000 PSI Pressure Ratings
- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP) — Non-latching Available in DC Models
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Purpose-Designed Housings and Materials

For over 25 years, the Cyllindicator sensor has been the standard for industrial applications that require end-of-stroke indication on Hydraulic and Pneumatic Cylinders. Available in both 3,000 and 5,000 PSI pressure ratings, they are the standard for many OEM cylinder manufacturers. All Cyllindicators are completely PLC compatible with many output configurations, including a UL Listed Intrinsically Safe version (see EE931 series for details).

LPR 3000 (3,000 PSI)

Probe Length	3-pin Micro, N.O.	3-pin Mini, N.O.		4-pin Mini, N.O.		4-pin Euro, N.O.	
	2-wire, 20-230V, AC/DC Latching SCP	2-wire, 20-230V, AC/DC Latching SCP		3-wire, 10-30V DC, Sourcing (PNP) 10µA leakage current		3-wire, 10-30V DC Sourcing (PNP) 10µA leakage current	
	1.7mA leakage current	1.7mA leakage current	4.5mA leakage current	Latching SCP	Non-Latching SCP	Latching SCP	Non-Latching SCP
1.025	EE230- EE230-10423	EE230- EE230-10420	EE260- EE260-10420	EE210- EE210-10440	EE210- EE210-10400	EE210- EE210-10444	EE210- EE210-10404
1.250	EE230-11323	EE230-11320	EE260-11320	EE210-11340	EE210-11300	EE210-11344	EE210-11304
1.500	EE230-12323	EE230-12320	EE260-12320	EE210-12340	EE210-12300	EE210-12344	EE210-12304
1.750	EE230-13323	EE230-13320	EE260-13320	EE210-13340	EE210-13300	EE210-13344	EE210-13304
2.062	EE230-18723	EE230-18720	EE260-18720	EE210-18740	EE210-18700	EE210-18744	EE210-18704
2.875	EE230-17823	EE230-17820	EE260-17820	EE210-17840	EE210-17800	EE210-17844	EE210-17804
3.775	EE230-19023	EE230-19020	EE260-19020	EE210-19040	EE210-19000	EE210-19044	EE210-19004
4.560	EE230-18623	EE230-18620	EE260-18620	EE210-18640	EE210-18600	EE210-18644	EE210-18604

LPR 5000 (5,000 PSI)

Probe Length	3-pin Micro, N.O.	3-pin Mini, N.O.		4-pin Mini, N.O.		4-pin Euro, N.O.	
	2-wire, 20-230V, AC/DC Latching SCP	2-wire, 20-230V, AC/DC Latching SCP		3-wire, 10-30V DC, Sourcing (PNP) 10µA leakage current		3-wire, 10-30V DC Sourcing (PNP) 10µA leakage current	
	1.7mA leakage current	1.7mA leakage current	4.5mA leakage current	Latching SCP	Non-Latching SCP	Latching SCP	Non-Latching SCP
1.025	EE230- EE230-10427	EE230- EE230-10425	EE260- EE260-10425	EE210- EE210-10445	EE210- EE210-10405	EE210- EE210-10446	EE210- EE210-10406
1.250	EE230-11327	EE230-11325	EE260-11325	EE210-11345	EE210-11305	EE210-11346	EE210-11306
1.500	EE230-12327	EE230-12325	EE260-12325	EE210-12345	EE210-12305	EE210-12346	EE210-12306
1.750	EE230-13327	EE230-13325	EE260-13325	EE210-13345	EE210-13305	EE210-13346	EE210-13306
2.062	EE230-18727	EE230-18725	EE260-18725	EE210-18745	EE210-18705	EE210-18746	EE210-18706
2.875	EE230-17827	EE230-17825	EE260-17825	EE210-17845	EE210-17805	EE210-17846	EE210-17806
3.775	EE230-19027	EE230-19025	EE260-19025	EE210-19045	EE210-19005	EE210-19046	EE210-19006
4.560	EE230-18627	EE230-18625	EE260-18625	EE210-18645	EE210-18605	EE210-18646	EE210-18606

► Consult factory for Normally Closed and DC Sinking model availability.



Common Sensor Characteristics

CYLINDRICATOR® SENSORS		
	AC/DC	DC
Nominal Sensing Range (±10%)	0.080"	
Current Consumption	1.7 or 4.5mA	10µA
Voltage Drop	≈10 VAC	2.0V@100mA
Temperature Drift (Max.)	±10%	
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Ambient Temperature Range	-4°F to +158°F	
Maximum Switching Frequency	16Hz	
Hysteresis	3-10%	
Repeatability	<±1.25%	
Designed to meet NEMA Enclosure Type	4, 6, 12 & 13	
Load Current	5mA to 500mA	200mA max.
LED Indicator	red = power green = target	green = power amber = target
Shipping Weight	12 oz.	

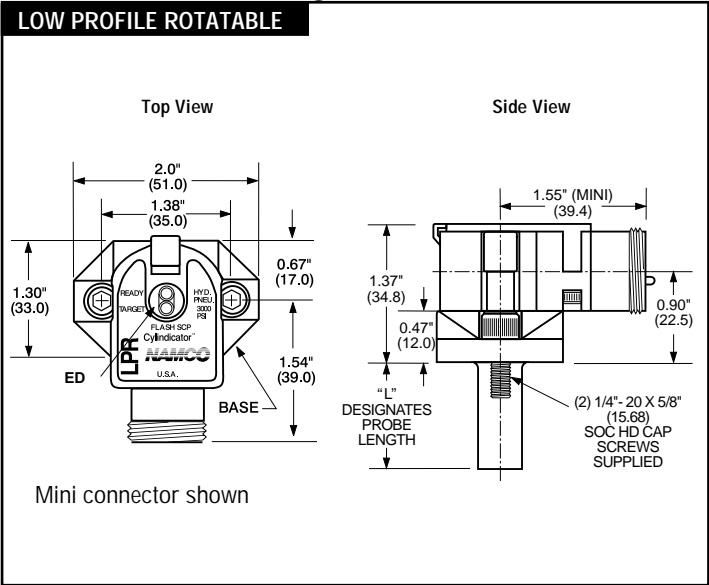
See Cylindricator® Sensor Design Guide Section for details.

LED Functions

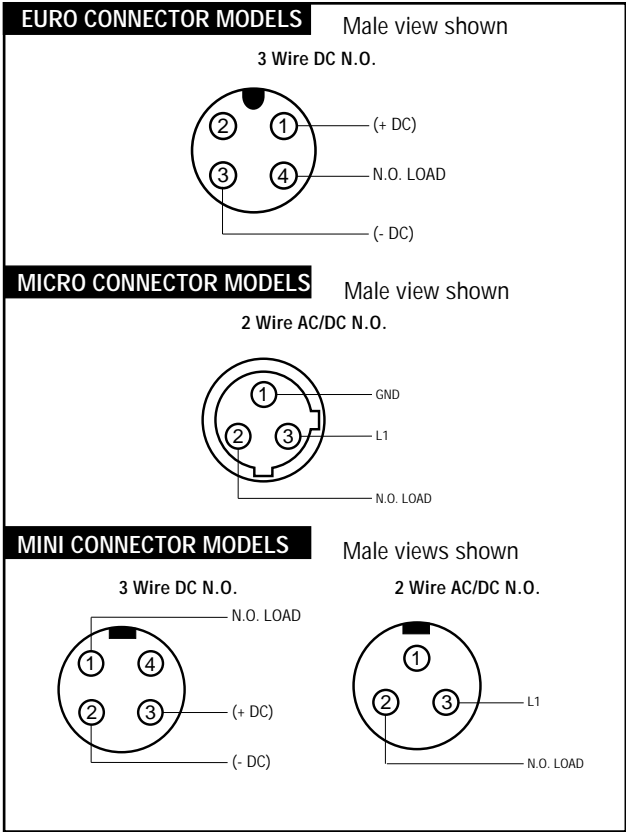
	10-30V DC		20-230V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Dimensional Drawings



Circuit Drawings



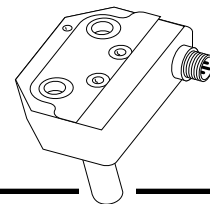
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For technical assistance, call 1-800-NAMTECH

**Weld
Field
Immune**

Low-Profile Cylindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- 1500 PSI Continuous Pressure Rating
- Standard Latching Short Circuit Protection (SCP), Non-Latching Available in DC Models
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Purpose-Designed Housings and Materials

For over 25 years, the Cylindicator sensor has been the standard for industrial applications that require end-of-stroke indication on Hydraulic and Pneumatic Cylinders. Available in several styles, they are the standard for many OEM cylinder manufacturers. All Cylindicators are completely PLC compatible with many output configurations, including a UL Listed Intrinsically Safe version (see EE931 series for details).

	3-Pin Micro Connector 2-W, 20-230V, AC/DC, N.O.		4-Pin Euro Connector 3-W, 10-30V, DC Sourcing (PNP), N.O.	
	Latching Short-Circuit Protection (SCP)			Non-Latching SCP
	1.7mA Leakage Current	4.5mA Leakage Current	10µA Leakage Current	
Probe Length	EE230-	EE260-	EE210-	EE210-
0.915"	EE230-28820	EE260-28820	EE210-28844	EE210-28804
0.950"	EE230-20120	EE260-20120	EE210-20144	EE210-20104
1.025"	EE230-20420	EE260-20420	EE210-20444	EE210-20404
1.130"	EE230-20320	EE260-20320	EE210-20344	EE210-20304
1.250"	EE230-21320	EE260-21320	EE210-21344	EE210-21304
1.350"	EE230-21720	EE260-21720	EE210-21744	EE210-21704
2.062"	EE230-28720	EE260-28720	EE210-28744	EE210-28704
2.775"	EE230-27420	EE260-27420	EE210-27444	EE210-27404
2.875"	EE230-27820	EE260-27820	EE210-27844	EE210-27804
3.775"	EE230-29020	EE260-29020	EE210-29044	EE210-29004
4.560"	EE230-28620	EE260-28620	EE210-28644	EE210-28604



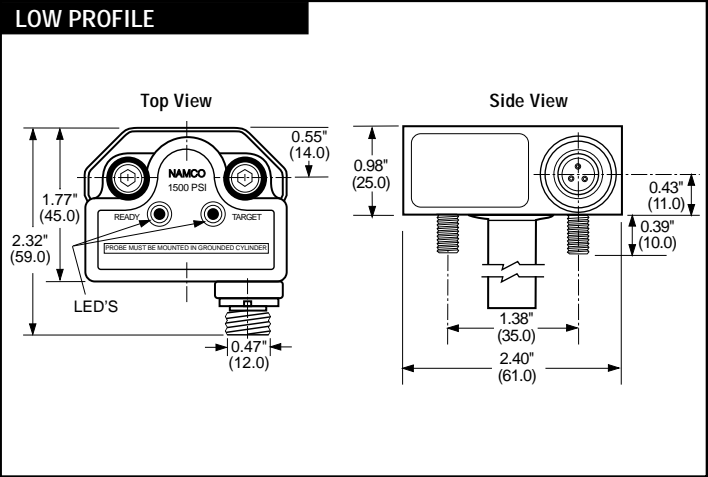
► Consult factory for Normally Closed, DC Sinking, and Cable model availability.

Common Sensor Characteristics

CYLINDRICATOR® SENSORS		
	AC/DC	DC
Nominal Sensing Range (±10%)	0.080"	
Current Consumption	1.7 or 4.5mA	10µA
Voltage Drop	≈10 VAC	2.0V@100mA
Temperature Drift (Max.)	±10%	
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Ambient Temperature Range	-4°F to +158°F	
Maximum Switching Frequency	16Hz	
Hysteresis	3-10%	
Repeatability	<±1.25%	
Designed to meet NEMA Enclosure Type	4, 6, 12 & 13	
Load Current	5mA to 500mA	200mA max.
LED Indicator	red = power green = target	green = power amber = target
Shipping Weight	12 oz.	

See Cylindicator® Sensor Design Guide Section for details.

Dimensional Drawings

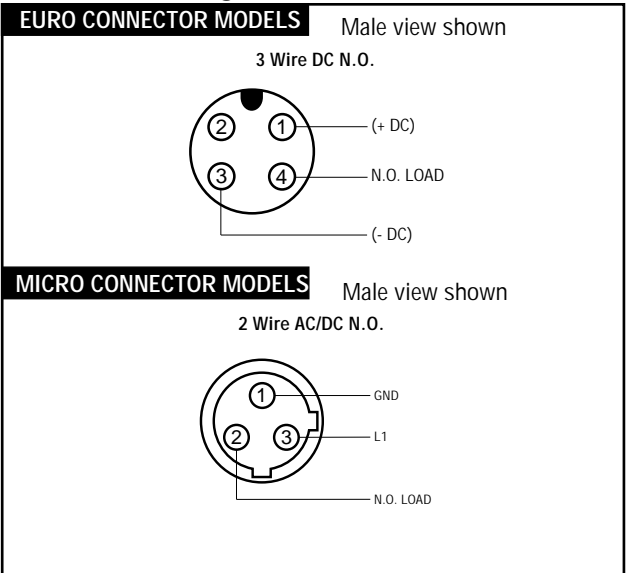


LED Functions

	10-30V DC		20-230V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Circuit Drawings



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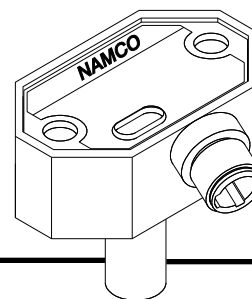
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For technical assistance, call 1-800-NAMTECH

**Weld
Field
Immune**

C2™ Cylindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Low Mass - Less Susceptible to Damage from Shock and Vibration
- Lowest Profile Cylinder Sensor on the Market
- Weld Field and Electrical Noise Immunity
- 300 PSI Continuous Pressure Rating
- Single Piece Rugged Die-Cast Housing
- Tested to over 20 Million Switching Cycles
- Purpose-Designed Housings and Materials
- Standard Latching Short Circuit Protection (SCP), Non-Latching Available in DC Models

As the leader in end-of-stroke cylinder position sensing for over 18 years, Namco is proud to introduce the newest member of the Namco Cylindicator series: the C2™ Cylindicator® sensor.

Many developments in cylinder position sensing have resulted in sophisticated, overly-complicated sensors. The C2 sensor, on the other hand, is a "back to basics" design. This new design capitalizes on the real needs of the pneumatic power clamp cylinder user.

	3-Pin Micro	4-Pin Euro	
	2-W, 20-150V AC/DC, N.O. 1.7mA Leakage Current Latching SCP	3-W, 10-30V DC, N.O., Sourcing (PNP) 10µA Leakage Current Latching SCP	Non-Latching SCP
Probe Length	EE230-	EE210-	EE210-
1.025"	EE230-60420	EE210-60444	EE210-60404
1.250"	EE230-61320	EE210-61344	EE210-61304
1.500"	EE230-62320	EE210-62344	EE210-62304
1.750"	EE230-63320	EE210-63344	EE210-63304
2.062"	EE230-68720	EE210-68744	EE210-68704
2.875"	EE230-67820	EE210-67844	EE210-67804
3.775"	EE230-69020	EE210-69044	EE210-69004
4.560"	EE230-68620	EE210-68644	EE210-68604

Protected by the
NAMCO
Lifetime Replacement Program

Common Sensor Characteristics

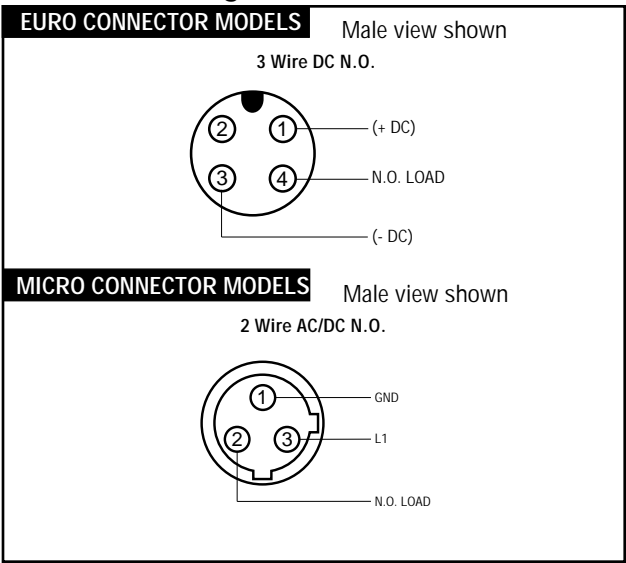
C2 CYLINDRATOR® SENSORS		
Nominal Sensing Range (±10%)		0.080"
Supply Voltage	10-30V DC	20-150V AC/DC
Voltage Drop	≤ 2.5V @ 200mA	≤ 10V
	≤ 2.0V @ ≤ 100mA	
Max. Load Current @ 25°C	200mA	
Inrush Current (rms 1Hz)	-	1.5A
Leakage Current	10µA	1.7mA
Max. Continuous Pressure	300 psi	
Response Time	30ms	
Power-up Time	35ms to 45ms	
Max. Switching Frequency	15Hz	
Ambient Temp. Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

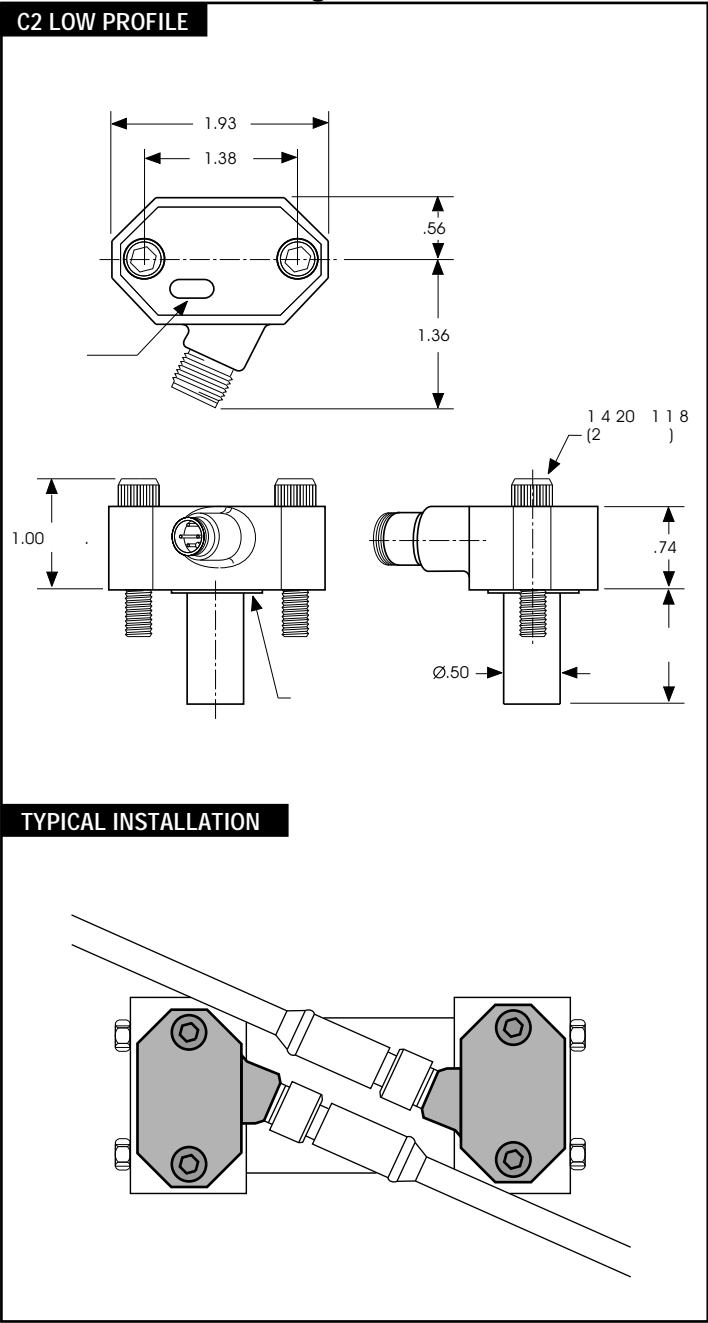
	10-30V DC		20-150V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Circuit Drawings



Dimensional Drawings



NAMCO

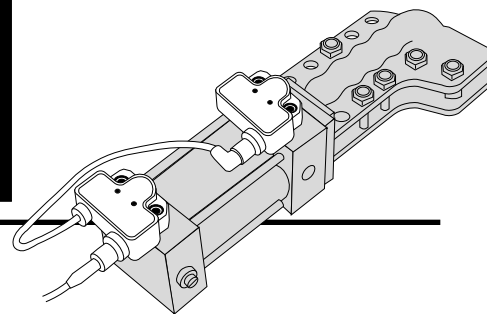
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For technical assistance, call 1-800-NAMTECH

**Weld
Field
Immune**

Tandem Low Profile - Power Clamp Sensor Kit



Proximity Sensors

- Cabling is Reduced 50%
- Cabling is Industry-Standard Micro Style
- Outputs Remain Independent - Power and Ground Connectors are Factory Interconnected
- Cable Terminations Reduced for Installer
- Cable Bundle Density Reduced
- Reduces Junction Box Size
- Reduces Fitting Size
- Reduces Panel Size

The new Namco LP2™ Tandem Low Profile Power Clamp Sensor Kit is an adaptation of our successful Low Profile Cylindicator® sensor.

This new version reduces the cabling necessary by 50% when two sensors are required on an air or hydraulic cylinder.

The system consists of a new Low Profile Cylindicator sensor specially constructed as a common wiring point. Cabling is brought to the Master unit, then the built-in cable from the Master unit is connected to a standard Low Profile Cylindicator sensor. This eliminates 50% of the wiring density and labor required as compared to "conventional" practices.

The LP2™ sensor kit is the most cost effective, highest reliability solution for reducing sensor wiring complexity and cost in power clamp applications.

Applications:

Patented Weld Field Immune circuitry permits application within one inch of resistance welder tips carrying 20,000 Amperes. This system is ideal for end-of-stroke detection on hydraulic or pneumatic clamping cylinders in automotive assembly, metal fabricating, and general automated welding applications.

Cylindicator is a registered trademark of Namco Controls Corporation.

LP2 is a trademark of Namco Controls Corporation.

Ordering Information

Description	Part No.	Part No.
	2-wire AC/DC	3-wire DC
Standard LP2 Kit, 1.025" Probe	EE270-20420	EE280-20446
Kit includes: 1 Master Low Profile Cylindicator® Sensor with "pigtail" interconnect 1 Standard Low Profile Cylindicator® Sensor	EE270-20421 EE230-20420	EE280-20447 EE210-20444

Protected by the
NAMCO
Lifetime Replacement Program

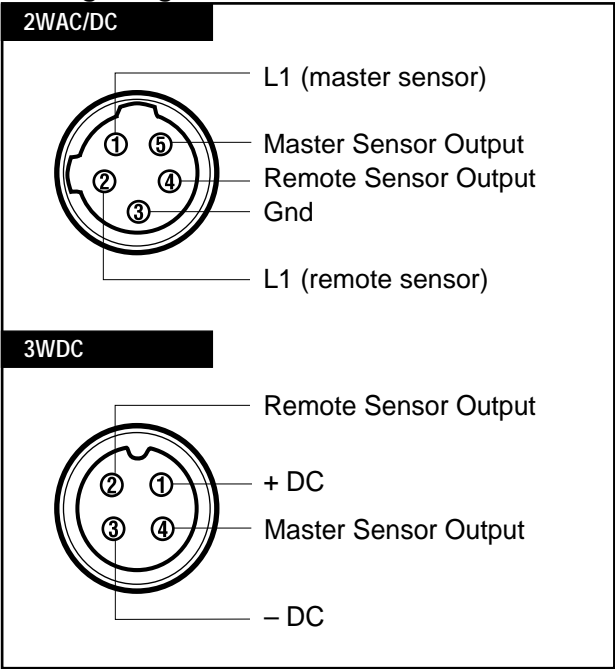
Specifications

LP2 POWER CLAMP SENSOR KIT		
Supply Voltage	10-30V DC	20-230V AC/DC
Voltage drop	≤2.5V @ 200mA ≤2.0V@≤100mA	≤10V
Max. Load Current @ 25°C	200mA	500mA
Inrush Current (rms 1Hz)	—	3A
Leakage Current	10µA	1.7mA
Response Time	30ms	
Power-up Time	35ms to 45ms	
Max. Switching Frequency	15 Hz	
Ambient Temp. Range	-20°C to 70°C	
Max. Continuous Pressure	1500 PSI	

LED Functions				
	10-30V DC		20-230V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

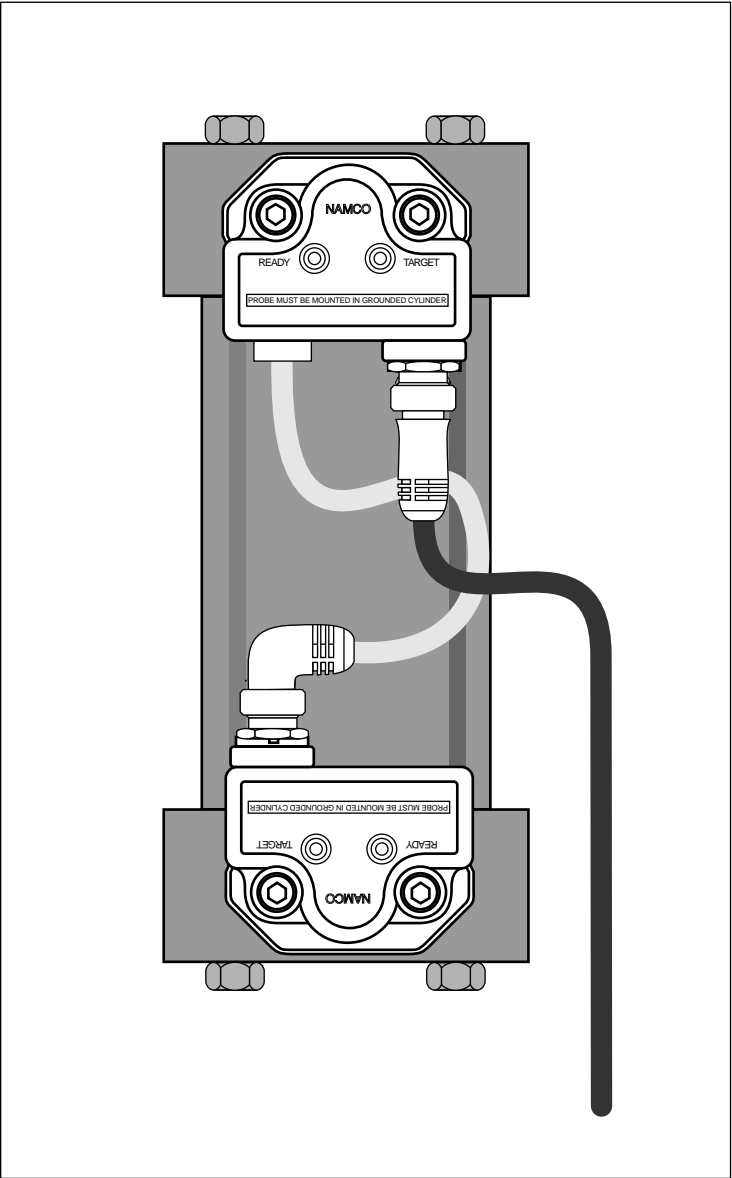
* Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LED's will flash and the sensor will limit current flow to about 2.0mA.

Wiring Diagram



Tandem Low Profile - Power Clamp Sensor Kit

EE270-2



Proximity Sensors

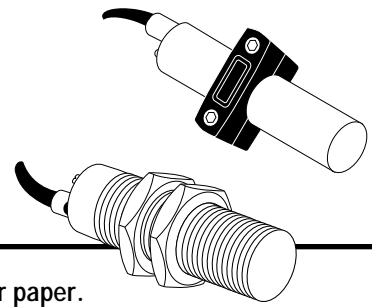


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Capacitive Sensors

DC
AC



For sensing metallic and non-metallic objects such as liquids, glass, plastic, powders, or paper.

Proximity Sensors

0-70mm (Unshielded) and 3-10mm (Shielded) Adjustable Sensing Ranges

Connector Type	Circuit Description	Housing Material	Shielded Model No.	Unshielded Model No.	Maximum Load Current @ 140°F	Maximum Load Current @ 176°F	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
18mm Threaded Tubular 2-8mm Adjustable DC 10-55V										
6.6' Cable	3W, NPN, NO	Plastic	—	ET710-33110	200mA	100mA	<10µA	<2.5 VDC	300Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	—	ET711-33110	200mA	100mA	<10µA	<2.5 VDC	300Hz	yes
18mm Threaded Tubular 2-8mm Adjustable AC 20-250V										
6.6' Cable	2W, AC, NO	Plastic	—	ET720-33410	200mA	100mA	<2mA @250VAC	<8 VAC	15Hz	no
30mm Threaded Tubular 5-15mm Adjustable DC 10-55V										
6.6' Cable	3W, NPN, NO	Metal	ET710-42110	—	200mA	100mA	<10µA	<2.5 VDC	100Hz	yes
6.6' Cable	3W, PNP, NO	Metal	ET711-42110	—	200mA	100mA	<10µA	<2.5 VDC	100Hz	yes
30mm Threaded Tubular 5-15mm Adjustable AC 20-250V										
6.6' Cable	2W, AC, NO	Metal	ET720-42410	—	200mA	100mA	<2mA @250VAC	<8 VAC	15Hz	no
30mm Threaded Tubular 8-20mm Adjustable DC 10-55V										
6.6' Cable	3W, NPN, NO	Metal	—	ET710-43110	200mA	100mA	<10µA	<2.5 VDC	100Hz	yes
6.6' Cable	3W, PNP, NO	Metal	—	ET711-43110	200mA	100mA	<10µA	<2.5 VDC	100Hz	yes
6.6' Cable	3W, NPN, NO	Plastic	—	ET710-53110	200mA	100mA	<10µA	<2.5 VDC	100Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	—	ET711-53110	200mA	100mA	<10µA	<2.5 VDC	100Hz	yes
30mm Threaded Tubular 8-20mm Adjustable AC 20-250V										
6.6' Cable	2W, AC, NO	Metal	—	ET720-43410	200mA	100mA	<2mA @250VAC	<8 VAC	15Hz	no
6.6' Cable	2W, AC, NO	Plastic	—	ET720-53410	200mA	100mA	<2mA @250VAC	<8 VAC	15Hz	no
34mm Smooth Tubular 0-20mm Adjustable DC 10-55V										
6.6' Cable	3W, NPN, NO	Plastic	ET710-82110	ET710-83110	200mA	100mA	<10µA	<3 VDC	100Hz	yes
6.6' Cable	3W, PNP, NO	Plastic	—	ET711-83110	200mA	100mA	<10µA	<3 VDC	100Hz	yes
34mm Smooth Tubular 0-20mm Adjustable AC 20-250V										
6.6' Cable	2W, AC, NO	Plastic	—	ET720-83410	200mA	100mA	<2mA @250VAC	<8 VAC	15Hz	no

* Across conducting sensor

► Consult factory for normally closed model availability.



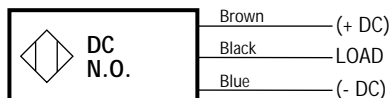
Common Sensor Characteristics

CAPACITIVE SENSORS	
Shielded Sensing Range	3-10mm
Unshielded Sensing Range	0-70mm
Standard Target (mm) (mild steel)	24x24x1 (2-8 Unshielded Range) 45x45x1 (3-10mm Shielded Range) 60x60x1 (0-20mm Unshielded Range) 210x210x1 (20-70mm Unshielded Range)
Repeatability	±5%
Hysteresis	3-20%
Temperature Drift (max.)	± 20%
Ambient Temperature Range	-13°F to +176°F (18mm & 34mm) -13°F to +140°F (30mm & Flat Pack)
Reverse Polarity Protected	yes
Current Consumption	18mm & 34mm DC: <7mA 30mm & 34mm AC: <2mA 30mm & Flat Pack DC: <10mA
NEMA Enclosure Type	Metal: 1, 12, 13 Plastic: 1, 4, indoor, 12, 13
LED Indicator	red = target
Metal Housings	Chrome Plated Brass
Plastic Housings	Ultradur®
Shipping Weight	18mm: 8 oz. 30mm: 10 oz. 34mm: 11 oz. (Add 5 oz. for 6' Cable)

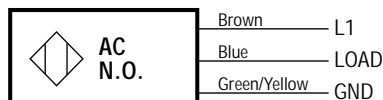
Circuit Drawings

CABLE MODELS

3 Wire DC N.O.



2 Wire AC N.O.

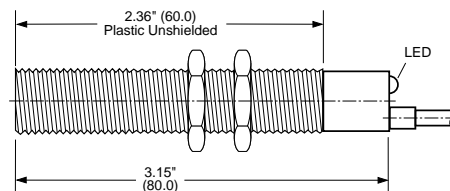


Dimensional Drawings

DC & AC

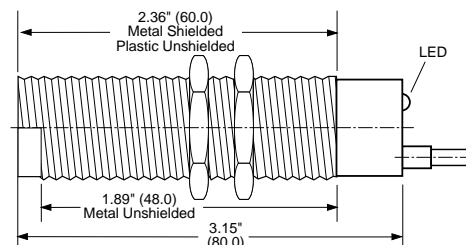
18mm MODELS

Body threads = M18x1

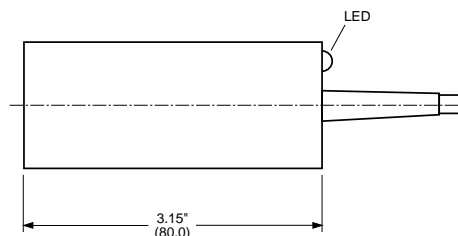


30mm MODELS

Body threads = M30x1.5



34mm MODELS

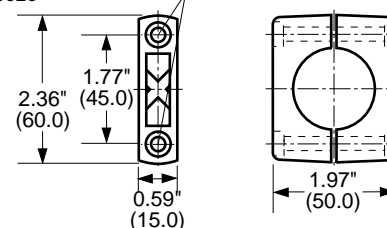


MOUNTING BRACKET

Part No. ET018-20020

Included with sensors

Hex Key M5



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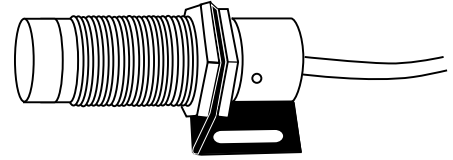
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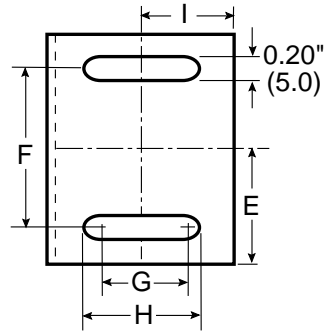
Brackets, etc.

Proximity Sensor Accessories

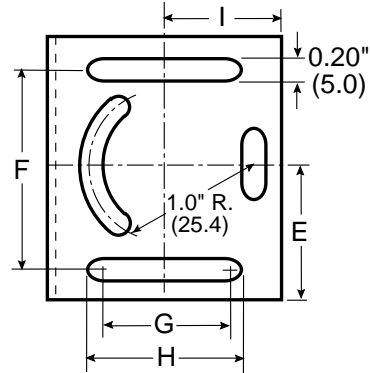


Proximity Sensors

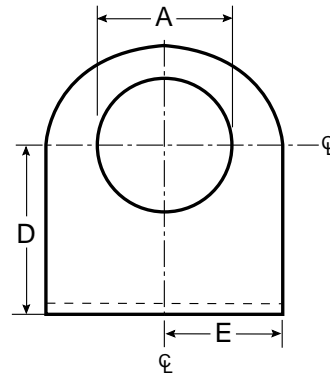
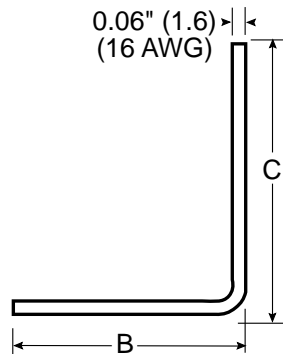
12-47mm TUBULAR MOUNTING BRACKETS



12-30mm Base



47mm Base



12-47mm Side and Front

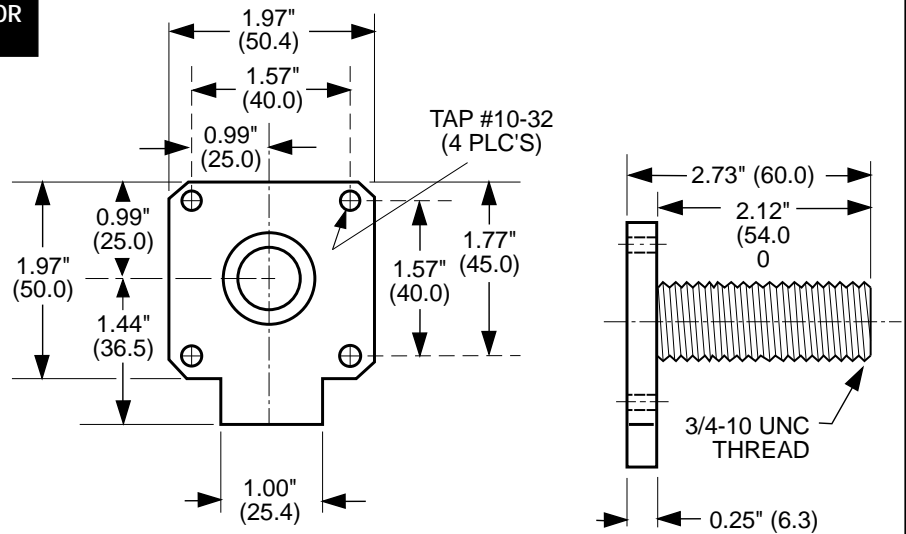
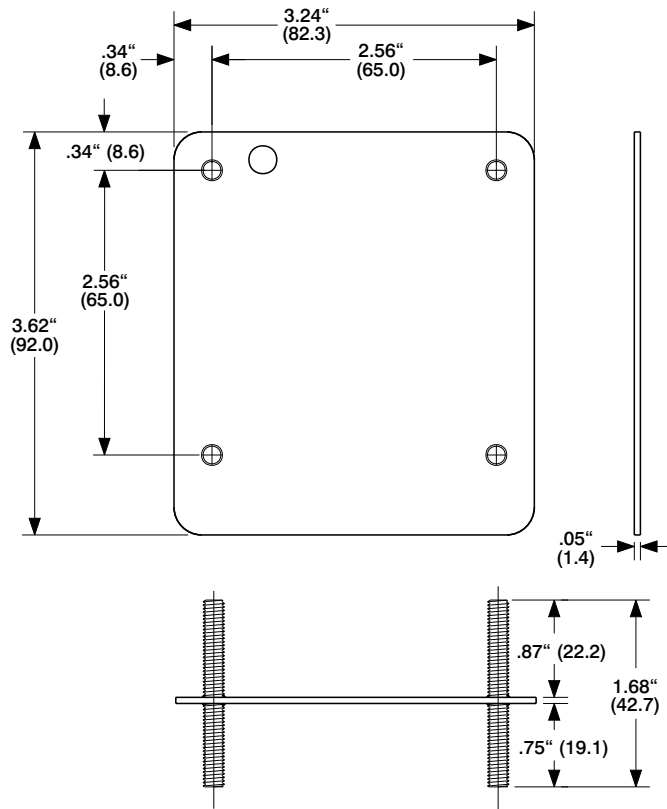
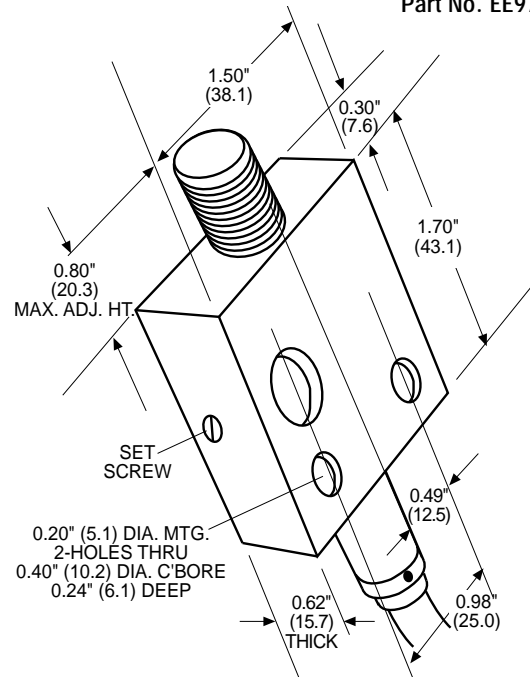
Model No.	Sensor Diameter	Hole Diameter	Depth	Height	Height to Center	Width to Center	Slot Centers	Drill Centers	Slot Length	Depth Center	Material
		A	B	C	D	E	F	G	H	I	
EE972-01803	8mm	0.38" (9.6)	1.00" (25.4)	1.25" (31.8)	0.75" (19.1)	0.50" (12.7)	0.51" (13.0)	0.36" (9.1)	0.56" (14.2)	0.50" (12.7)	C. F. Steel
EE972-01804	12mm	0.50" (12.7)	1.00" (25.4)	1.25" (31.8)	0.75" (19.1)	0.50" (12.7)	0.51" (13.0)	0.36" (9.1)	0.56" (14.2)	0.50" (12.7)	C. F. Steel
EE972-01835	18mm	0.76" (19.5)	1.00" (25.4)	1.51" (38.2)	0.88" (22.3)	0.63" (15.8)	0.80" (20.3)	0.46" (11.6)	0.66" (16.7)	0.56" (14.2)	C. F. Steel
EE972-01807	30mm	1.25" (31.8)	1.50" (38.1)	1.92" (48.6)	1.09" (27.6)	0.83" (20.9)	1.16" (29.3)	0.80" (20.3)	1.00" (25.4)	0.75" (19.0)	C. F. Steel
EE972-02001	47mm	1.86" (47.2)	1.50" (38.1)	2.84" (72.0)	1.59" (40.3)	1.25" (31.8)	2.00" (50.8)	0.80" (20.3)	1.00" (25.4)	0.75" (19.0)	C. F. Steel

25mm ADJUSTABLE EXTENDED RANGE SENSOR MOUNTING BRACKET KIT**Part No. EE972-01860**

Allows 25mm Proximity Sensors to be adjusted similarly to a standard tubular sensor. Kit includes (4) #10-32 socket head cap screws and (2) hex jam nuts.

Part No. EE972-01861

Bracket only.

**40mm FLATPAK BRACKET****Part No. EE972-01859****12mm TUBULAR BRACKET****Part No. EE972-01834**

Continued on
next page. ➡

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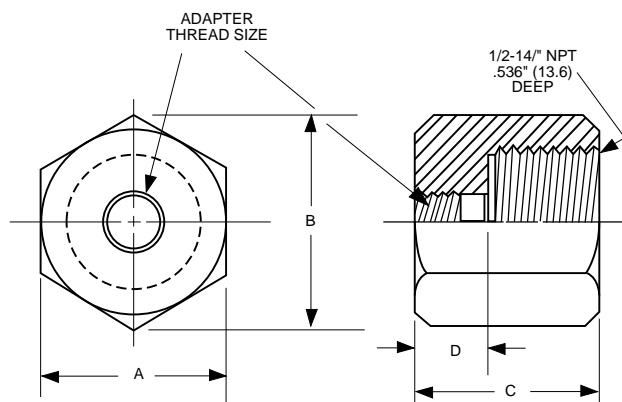
(440) 460-1360 • FAX (440) 460-3800 • namcocontrols.com

For technical assistance, call 1-800-NAMTECH

Brackets, etc.

Proximity Sensor Accessories

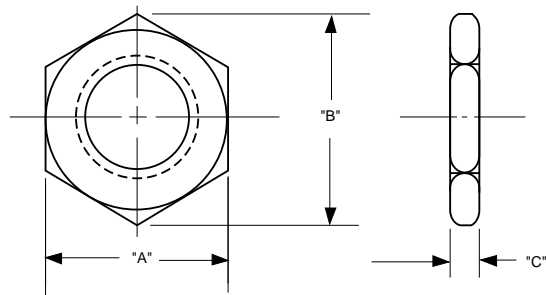
CONDUIT ADAPTERS



Adapter Thread Size (mm)	HEX SIZE				Model No.
	Flats	Corners	Length	Depth	
	A	B	C	D	
8	1.00" (25.4)	1.15" (29.2)	1.00" (25.4)	0.25" (6.3)	EE014-20009
12	1.00" (25.4)	1.15" (29.2)	1.50" (38.1)	0.25" (6.3)	EE014-20010
18	1.00" (25.4)	1.15" (29.2)	2.00" (50.8)	0.25" (6.3)	EE014-20011
30	1.50" (38.1)	1.73" (43.9)	2.25" (57.1)	0.38" (9.6)	EE014-20012
47	2.00" (50.8)	2.31" (58.7)	2.50" (63.5)	0.38" (9.6)	EE014-20013

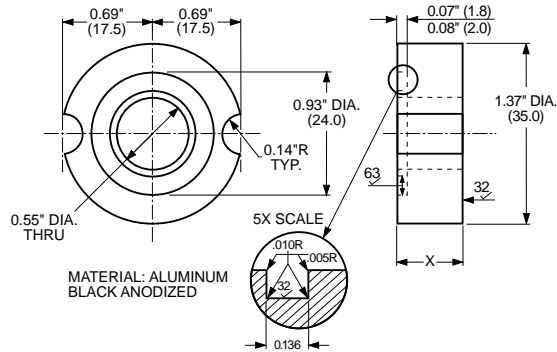
Material: Aluminum 2024
Stainless Steel version available on special order.
Consult factory.

MOUNTING NUTS



I.D.	Mounting Nuts					Lock Washer
	Dimensions			Model No.		Black, Serrated
	A	B	C	Metal	Plastic	
3/4-20	1.06" (26.9)	1.22" (30.9)	0.16" (4.1)	EE154-80001*	—	—
8mm	0.51" (13.0)	0.58" (14.7)	0.16" (4.1)	EE013-80011	EE013-80000	—
12mm	0.67" (17.0)	0.77" (19.5)	0.22" (5.6)	EE013-80003	EE013-81003	EE100-00139
18mm	0.94" (23.8)	1.06" (26.9)	0.16" (4.1)	EE013-80002*	EE013-81002	EE100-00137
30mm	1.44" (36.6)	1.66" (42.2)	0.19" (4.8)	EE013-80001*	EE013-81001	EE100-00138
47mm	2.00" (50.8)	2.20" (55.9)	0.20" (5.1)	EE013-80004	—	—

*Quantity one (1) per package; all others are shipped two (2) per package.

**CYLINDRICATOR® SENSOR
SPACER KITS**

Kits include two mounting bolts and O-Ring. Replacement O-Ring is EE972-19306 (Equivalent to Parker # 2-116V709-90). Specify spacer height.

NOTE: Please consult factory before using spacer kits with LPR Cylindricator® sensors.

Dimension "X"	Model No.
0.19"	EE972-01827
0.25"	EE972-01822
0.31"	EE972-01829
0.38"	EE972-01831
0.50"	EE972-01820

TEFLON® CAPS

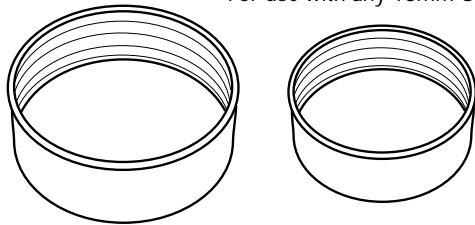
Repel weld slag;
increase sensor life.

Part No. EE505-60002

For use with any 18mm Shielded Sensor

Part No. EE505-60004

For use with any 18mm Unshielded Sensor



Part No. EE505-60003

For use with any 30mm Shielded Sensor

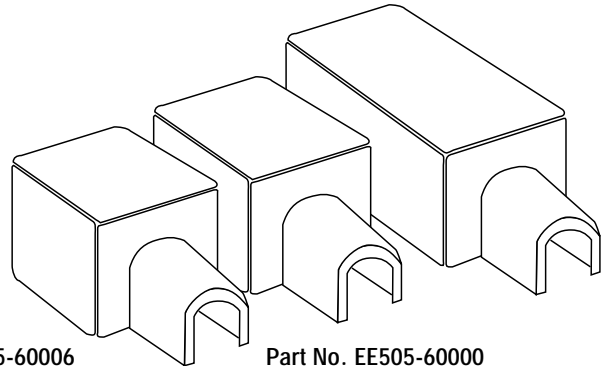
Part No. EE505-60005

For use with any 30mm Unshielded Sensor

WELD-SPLATTER RESISTANT COVERS

Part No. EE505-60001

For use with EE500-1 Rotatable
Rectangular Sensors



Part No. EE505-60006

For use with EE500-9
HammerHead Sensors

Part No. EE505-60000

For use with EE500-8 25mm
Extended Range Sensors

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Buying the Proper Proximity Sensor

Not All Proximity Sensors Are Created Equal...

Namco makes two grades of proximity sensors:

- Tough - Our "Standard Industrial Grade" line
- Incredibly Tough - Our WFI Automotive-Grade Line

Most industrial applications require a pretty rugged sensor; for example, a packaging machine or material handling application. For these jobs, Namco's Standard Industrial Grade products are well-suited. However, there are some applications where nothing but the most durable will do. For example, if you have lots of welding activity nearby, both physical and electronic characteristics must be upgraded.

To make sure you match your sensor selection to your application, call 1-800-NAMTECH.

Namco Standard Industrial Grade Sensor

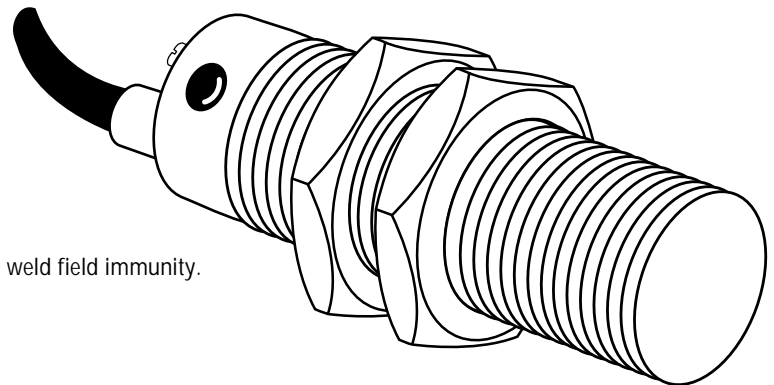
Liquid polyurethane used as encapsulant.

Single LED - on with target present.

Thermoplastic sensing face.

Value priced.

No weld field immunity.



Housings of either thermoplastic or chrome plated brass.

Current-limit type short circuit protection on some models (as indicated in selector chart).



Namco Weld Field Immune (WFI) Sensor

Circuitry to accept a broad range of input voltages. Predictable, consistent electrical performance independent of input impedance and voltage.

Housing must withstand 300 pound step test and/or 250 pound cantilevered load test per UL 508.

Special epoxy encapsulants are mechanically strong while maintaining electrical insulative properties.

Meets UL 508 requirements. Connectors, cables, and sensor tested for strength, flammability, insulation, torque, and pull out.

Wide variety of connector and cable models.

Standard latching short circuit protection in Namco sensors is patented fold-back regulator type; fast-acting and requires removal of power to prevent automatic restart. Prolonged shorts will not damage sensor electronics.

Non-Latching.

Namco WFI sensors are designed to operate within 1" of a resistance welding electrode carrying 20,000 Amperes RMS (45,000 Amperes peak) without changing state. All Namco WFI sensors pass the NEMA noise tests and exhibit no false turn-ons from walkie-talkies or other in-plant sources of RF Noise.

Weld-splatter resistant housings designed for use in welding environments.

Every Namco WFI sensor:

- 1) goes through 52 automatic testing steps;
- 2) is thermocycled between -20°C to +70°C;
- 3) is 100% functionally tested.

Two LED's: Green for "target sensed" and red for "power available" (AC/DC versions); Green for "power available" and amber for "target sensed" (DC versions).

Molded thermoset plastics for rectangular and extended range, hard coat for tubulars.



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Principles of Operation

Inductive

Proximity sensors are generally constructed with four main elements: (1) a coil and ferrite core assembly; (2) an oscillator; (3) a convertor/trigger circuit (detector) and; (4) an output device.

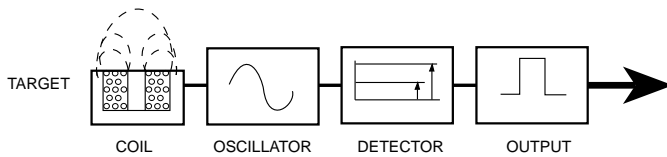


Figure 1

The oscillator creates a radio frequency field that is shaped and defined by the coil and core. As a target is placed in this field, eddy currents are set up in the surface of the target. The oscillator, being a limited power device, will lower its amplitude as the eddy currents are produced. The convertor/trigger circuit rectifies the AC sine wave signal to DC, compares the level against a preset reference, and actuates the sensor output if a target is present. Switching is clean, with none of the bounce of mechanical switches.

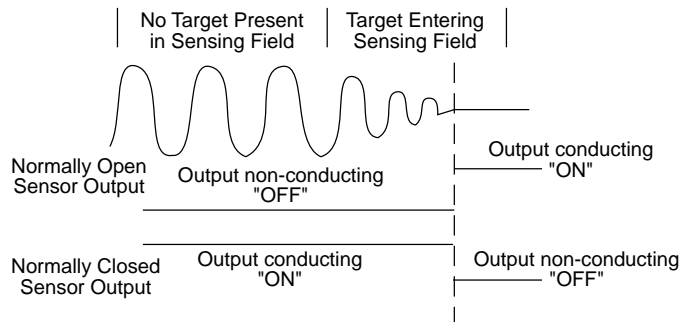


Figure 2

Capacitive

Essentially similar except that the coil is replaced by a sensing plate, and the oscillator is not running until the object to be detected is within range.

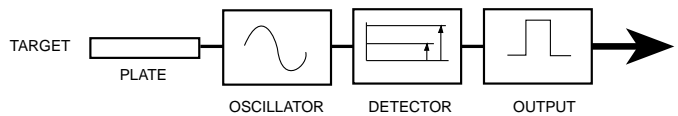


Figure 3

Capacitive sensors depend on the coupling between the sensing plate and earth ground. If a target is placed within range, the capacitance level will vary depending on target density, conductivity, and relative humidity. If the adjustment potentiometer is correctly set, the oscillator will be turned on when a target is within range.

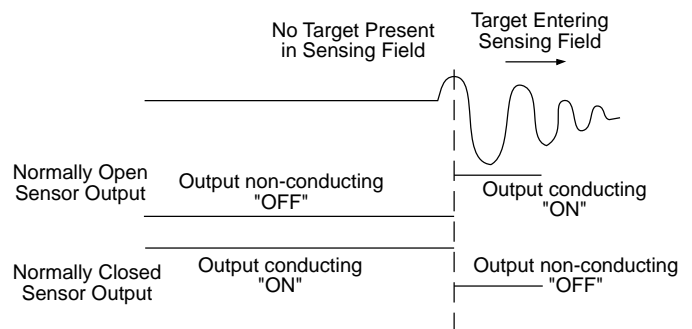


Figure 4

Important Note: Never use a metal body capacitive sensor in wet environments. Moisture between the sensing plate and the metal body will cause the sensor to "lock on." For wet environments, always use a plastic bodied sensor.

Inductive Sensor Selection

1. Target Identification

This is the most critical step in proper application of inductive and capacitive sensors. Most application problems stem from improper selection of a sensor for a particular target. This usually comes from a desire to "standardize" a design. Generally the following rules apply to all inductive sensors:

The sensor face should equal or be smaller than the target surface area. All manufacturers calibrate the range of a particular sensor with a "standard target." This standard target is always larger than the diameter of the sensor face. Although it is possible to sense targets smaller than the sensor face diameter, rated range cannot be achieved using a target that is smaller than the sensor face. The following changes in the sensing range will occur if the dimensions of the target are larger or smaller than the standard target specified.

Target size in %	150	125	100 (Standard Target)	75	50	25	12.5
Deviation from Sn in %	+10	+7	0	-7	-14	-27	-45

Figure 5

2. Air Gap Determination

When examining your application, remember that most shielded inductive sensors (Fig. 6) will have a maximum range that is approximately one third of the diameter of the sensing face.

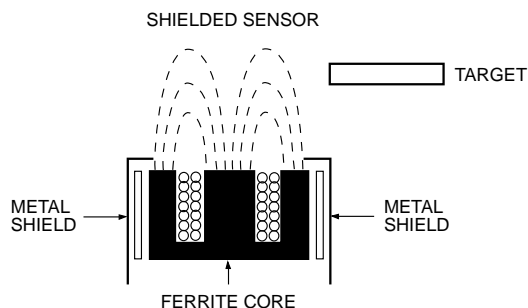


Figure 6

It is often necessary to allow a rather large air gap between the target and the sensor. When this is required, an unshielded sensor (Fig. 7) will be required. The unshielded sensor will generally have the plastic "nose" of the sensor projecting out of the metal barrel, or (plastic bodied types) it will not have a shielding ring around the core. These unshielded sensors will typically sense at ranges 3 to 50 percent greater than shielded types. A penalty is paid, however, as it is necessary to provide a metal-free area around the sensor that is much larger than the shielded types.

NONSHIELDED SENSOR

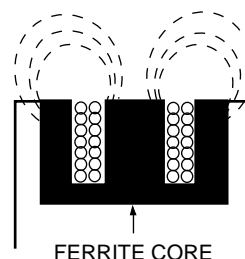


Figure 7

(See 3. Mounting Clearances)

Positioning of the sensor should allow the target to penetrate approximately 30% into the field to allow for manufacturing tolerances, resistance to vibration, and inaccuracies that are common to all initial start-ups.

When determining the air gap (sensing distance) required, it should be noted that an inductive sensor will produce its rated range only against a standard target of mild steel. Other materials will reduce the sensing range (SN) as follows:

- Mild Steel SN x 1.0
- Aluminum Foil SN x 1.0
- Stainless Steel SN x 0.85
- Brass SN x 0.5
- Copper SN x 0.46
- Aluminum SN x 0.4

*Continued on
next page.* ➡

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Example: If a sensor with a 5mm sensing range is used to sense a standard target made of copper, the sensing range of the sensor is reduced as indicated below:

$$5\text{mm} (0.46) = 2.3\text{mm} (\text{maximum})$$

When mounting a sensor it is always preferred to position the target so that it "slides by" the sensor face. This type of mounting will ensure that the sensor face is not damaged by contact with the target. If your application dictates a "head on" approach, it is essential that the target does not use the sensor face as a physical stop. Failure to provide clearance in either the slide-by or head-on modes will result in damage to the sensor and possible failure of the device.

Hysteresis (Fig. 8) must be allowed for as the target must move far enough away from the sensing field so that the sensor cannot detect it. If a target is placed within the hysteresis band, vibration of the target can cause the switch to turn on and off rapidly ("chatter"). All sensor manufacturers build in a certain amount of hysteresis to minimize chatter.

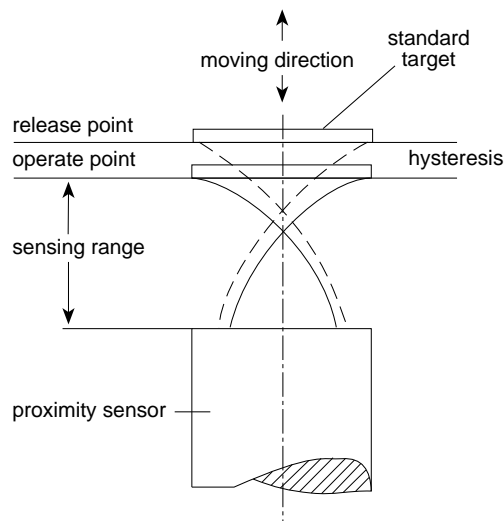
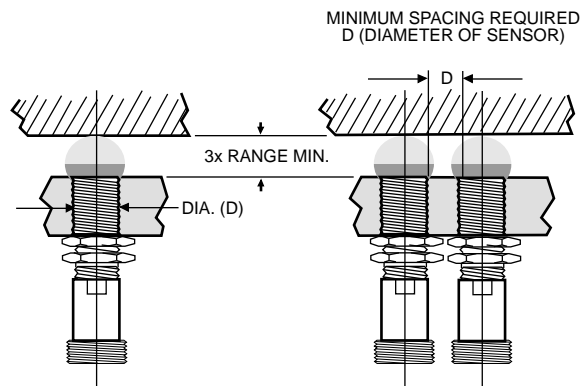


Figure 8

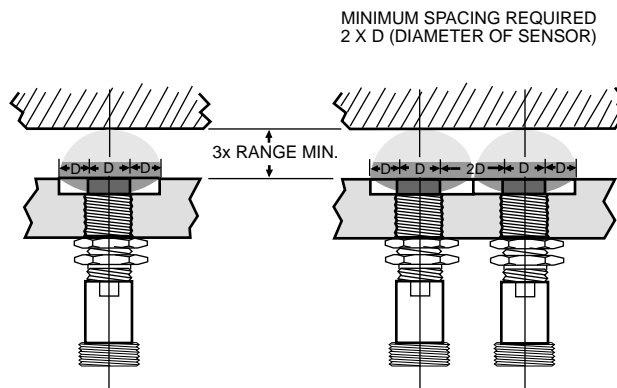
3. Mounting Clearances

Mounting of sensors should follow industry accepted practices as shown. Failure to properly position the sensor is the single largest cause of field problems.

SHIELDED SENSORS (FLUSH MOUNTABLE)



UNSHIELDED SENSORS REQUIRE METAL-FREE AREA



SENSORS MUST BE MOUNTED SUCH THAT SURROUNDING METAL IS NOT IN THE SENSING AREA.

OPPOSING SENSORS

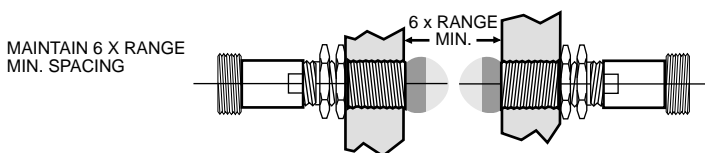


Figure 9

4. Housing Selection

After you have determined the target and air gap, it is then possible to select the style of housing for the application. Sensors are typically grouped according to range against a standard target. The most often used types are the metal barrel styles. These are great for general purpose uses but should not be used in areas where liquids are present. For wet environments, the all-plastic types are preferred. To determine your best specific type, consult the Enclosure Types below.

Various accessories are available for sealing, conduit, and mounting. Also, many sensors are available with quick disconnects. This is more expensive initially but can be justified if the sensor is placed on moving equipment where the cable is flexed often. The weak link then becomes the entry point of the cable to the housing. When failure occurs, it is necessary to replace the complete assembly because the cable failed. It's also easier to position the sensor mechanically, then complete the electrical wiring.

Industrial Control Equipment - UL 508
Table 6.1 – Enclosure Designations

Designation	Intended Use and Description	Designation	Intended Use and Description
1	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.	4X	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.
2	Indoor use to provide a degree of protection against limited amounts of falling water and dirt.	6	Indoor or outdoor use to provide against the entry of water during temporary, limited submersion; undamaged by the formation of ice on the enclosure.
3	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	6P	Indoor and outdoor use to provide a degree of protection against the entry of water during prolonged submersion at limited depths.
3R	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	11	Indoor use to provide by oil immersion a degree of protection of the enclosed equipment against the corrosion effects of corrosive liquids and gases.
3S	Outdoor use to provide a degree of protection against windblown dust, windblown rain, and sleet; external mechanisms remain operable while ice laden.	12, 12K	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids.
4	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	13	Indoor use to provide a degree of protection against lint, dust seepage, external condensation, and spraying of water, oil, and noncorrosive liquids.

Table 6.1 revised December 5, 1986

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*Continued on
next page.* ➡

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Electrical Considerations

Namco offers sensors that are suitable for direct connection to most common types of control systems. The most common types are listed below:

1. Relay Systems
2. Programmable Controllers
3. Custom Microprocessors
4. Output Devices (Solenoids)

When specifying a particular output type, at no time should the appropriate specifications of the particular sensor be exceeded or sensor failure may result.

A switch in a protective interlocking circuit should be used with at least one other device that will provide a redundant protective function, and the circuit should be so arranged that either device will interrupt the intended operation of the controlled equipment. (Proposed NEMA ICS 2-225.95 std.)

Namur Sensors

Namur refers to the standards committee of measurement and control of the chemical industry of Europe. Namco sensors comply with DIN 19234, and therefore are compatible with the Namur requirements.

This type of sensor contains only the "front end" of the typical proximity sensor coupled to an output transistor that will vary the current (not voltage) in proportion to the target distance (Fig. 10). This type of sensor is normally connected to an external amplifier which will provide the switch closure to an external control system. It is possible to interface these sensors to either custom external solid state relays or PLC (Programmable Logic Control) systems with the appropriate input card. When used with an approved intrinsically-safe control amplifier, Namur sensors can be used in hazardous areas. Please consult factory for application details.

When the target is not present, the sensor passes a small amount of current ($\geq 2.2\text{mA}$). The current decreases in a non-linear fashion as the target enters the sensing field. This action is similar to a variable resistor. (See Figure 10.)

RANGE vs. CURRENT
(TYPICAL)

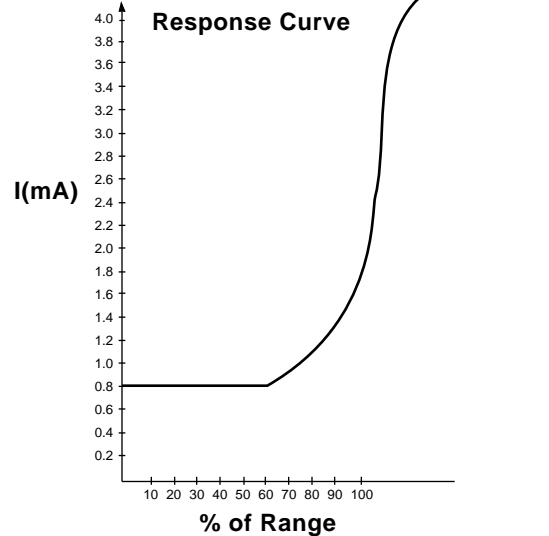
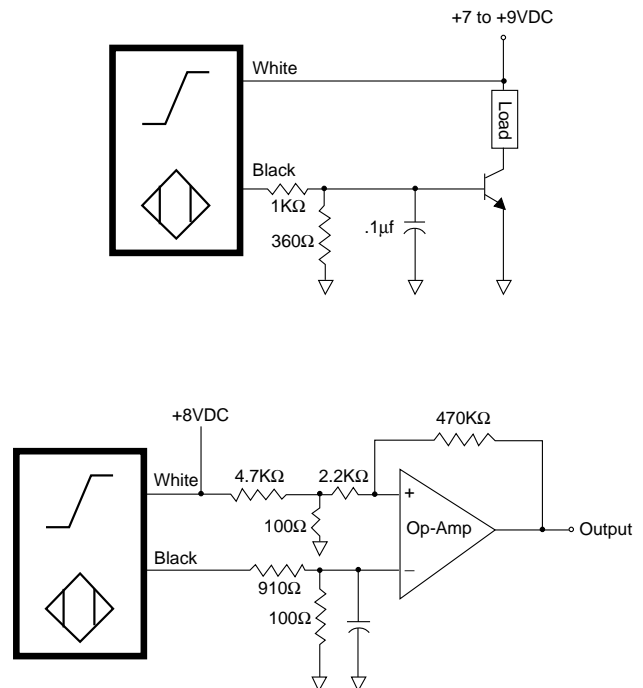


Figure 10

Suggested On/Off Output Circuits for NAMUR Sensors



DC Sensors

Available as either current sinking (NPN) or current sourcing (PNP), this type of sensor will provide the fastest output switching available.

The voltage range is typically 10-30 VDC with minimal drop across the output transistor for easy connection to programmable controllers. Most DC sensors include reverse polarity and short circuit protection as standard features.

Normally open output sensors are used in most applications. Normally closed output sensors can be made to order. Complimentary (one output "on," one output "off") output sensors (Fig. 11) can be used as a normally open and normally closed sensor at the same time. This convenient sensor can be used to replace a normally open sensor or a normally closed sensor. Simply hook up the desired output and either tape or cut off the load lead that is not being used.

NPN (SINKING) N.O. & N.C.

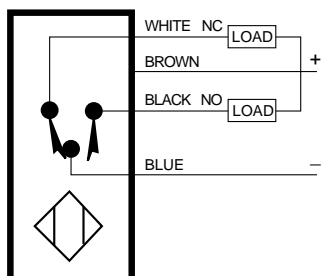


Figure 11

Dual output (NPN & PNP) sensors (Fig. 12) can have either output connected to a load, or each output connected to its own load, but not both to the same load. If the two outputs are each connected to separate loads as shown in Figure 12, the sum of the two load currents must not exceed the maximum load current of sensor (typically 200mA). This particular sensor output configuration is designed to minimize replacement inventories. It does not have complementary switching capabilities, i.e., both of the outputs switch either "on" or "off" at the same time.

NPN (SINKING) & PNP (SOURCING)

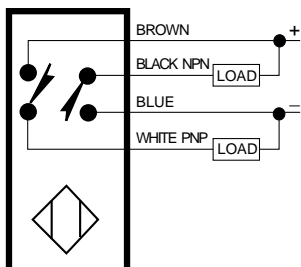


Figure 12

When connecting DC sensors to inductive loads, it is suggested that a diode be placed in the circuit to cancel any kickback that may damage the output of the sensor. (See Figure 13.)

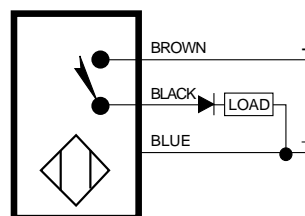


Figure 13

Series Connection:

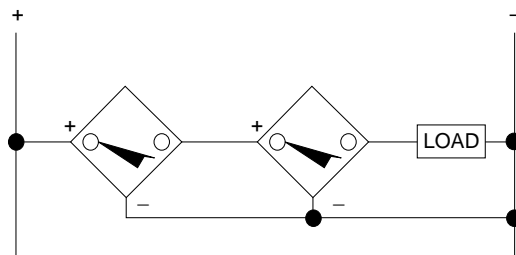
AND circuits can be made by series connection of normally open output sensors.

NAND circuits can be made by series connection of normally closed output sensors.

The maximum number of sensors that may be wired in series is equal to the lowest number of the following two equations:

$$\# \text{ Sensors} = \frac{\text{Supply Voltage} - \text{Min. Operating Voltage of Load}}{\text{Voltage Drop Across Each Sensor}}$$

$$\# \text{ Sensors} = \frac{\text{Max. Sensor Output Current} - \text{Load Current}}{\text{No Load Current of Sensor}}$$



PNP Output shown - for NPN Output reverse V_{supply} and sensor polarities.

Continued on
next page. →

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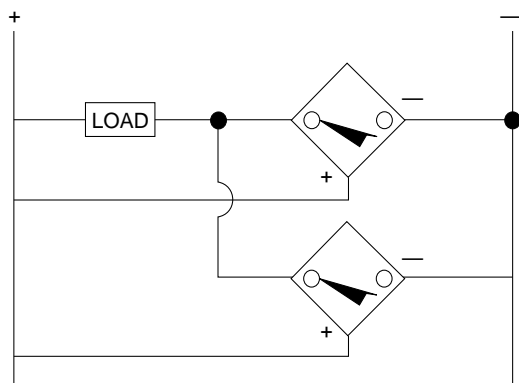
In a long series string, it is possible to exceed the current handling capacity of the last or first sensor due to the sensor current requirements plus the load. This problem can be circumvented by alternating types; i.e., PNP, NPN, PNP, etc. Wiring the sensors in this manner will allow an infinite number to be wired in series.

Parallel Connection:

OR circuits can be made by parallel connection of normally open output sensors.

NOR circuits can be made by parallel connection of normally closed output sensors.

The maximum number of sensors that may be wired in parallel is equal to the current capacity of the voltage supply used.



NPN Output shown - For PNP Output reverse V_{supply} and sensor polarities.

AC Sensors

AC sensors can also be connected to the same types of control systems as the DC types but are typically load powered. This configuration is a result of user demands for the high reliability of solid state sensors coupled to the requirement for minimal wiring.

In operation, the AC sensor will draw a small amount of current through the load with no target present. This current typically is less than 1.7mA allowing direct connection to programmable controller input cards with no shunt resistor required. This current must be allowed for when designing parallel logic circuits as the leakage currents may become large enough to actuate the load. This can be overcome by application of a properly sized shunt resistor.

Series Connection:

Note:

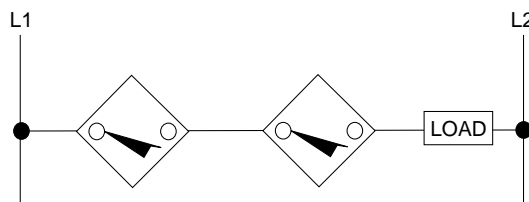
Connection of more than two AC sensors in series, is NOT recommended

AND circuits can be made by series connection of normally open output sensors.

NAND circuits can be made by series connection of normally closed output sensors.

The maximum number of sensors that may be wired in series:

$$\# \text{ Sensors} = \frac{\text{Supply Voltage} - \text{Min. Operating Voltage of Load}}{\text{Voltage Drop Across Each Sensor}}$$



When a target is placed in the field and the sensor actuates, the amount of voltage available to the load will be reduced by approximately 8-10 volts. This value is critical in series circuits. Calculations for each series circuit must be made to ensure that enough voltage is available to actuate the load. The same problem exists when attempting to use a two-wire AC sensor at low AC voltages. For instance, if a 20-250 VAC sensor is used at 24VAC, the voltage available to the load will be between 14-18 VAC.

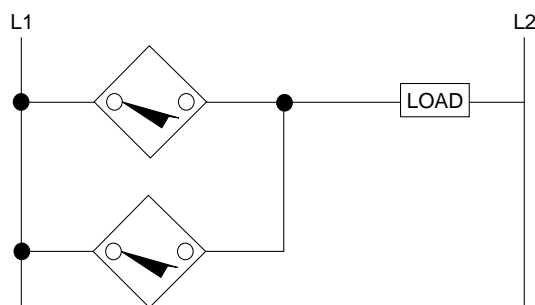
Parallel Connection:

OR circuits can be made by parallel connection of normally open output sensors.

NOR circuits can be made by parallel connection of normally closed output sensors.

The maximum number of sensors that may be wired in parallel is

$$\# \text{ Sensors} = \frac{\text{Holding Current of Load}}{\text{Leakage Current of Each Sensor}}$$



All AC sensors have switching speeds that are much lower than their DC counterparts. Typical switching speeds are 20 to 30 Hz.

Short circuit protection is a feature of many types of Namco sensors. This internal circuit will protect the sensor if the load inrush current exceeds 3 amperes. In the event of a large inrush current, the sensor will trip into "short circuit" mode. On standard ET/ER series sensors the LED does not illuminate. On WFI sensors both LEDs will flash, and the output current will be limited to approximately 2.5 mA. To restore the sensor it is necessary to remove power for approximately one second. The sensor will not function in SCP mode.

The short circuit protection feature is designed to protect the sensor and not the external circuit. The short circuit protection feature does not eliminate the need for branch circuit fusing.

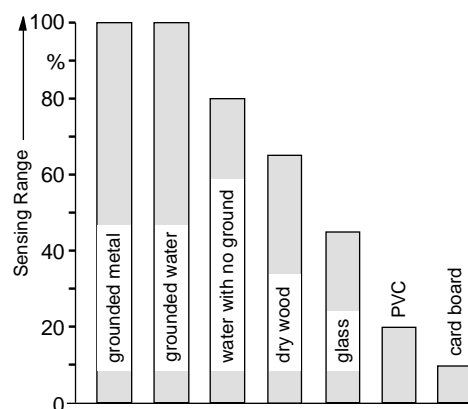
Capacitive Sensors

Capacitive sensors are unique in that they will sense most materials including non-metallics. The actual sensing is performed by a circuit containing an oscillator, detector stage, and an output stage similar to the inductive type sensor. The differences are (1) the oscillator is not running when a target is not present, and (2) the sensing portion of the sensor is a special plate in the sensing surface of the sensor. This plate also has an opposing connection-to-earth ground through the detection circuit. When an object is placed near the sensing plate, the dielectric constant of the material will allow coupling from the sensing plate through the air-to-earth ground thus starting the oscillator. To provide adjustment for the various types of materials and their different dielectric constants, an adjustment potentiometer is typically provided.

This change in dielectric constant is a requirement for accurate sensing. If a material has a very low dielectric

constant, the sensor must be in very close proximity to the material being sensed. Conversely, a material with a high dielectric constant can be sensed at a greater distance.

The diagram below shows the reduction created by different materials.



Materials with a high dielectric constant can be sensed through the walls of a container with a lower dielectric constant. Example: sensing water level in a boiler sight glass tube.

Application Cautions

1. The adjustment potentiometer is a non-linear device. Do not attempt to adjust the sensor beyond 2/3 of the maximum range obtained on a given material.
2. Never use a sensor with a metal housing in a damp environment. If the face of the metal housing sensor is splashed, the sensor will turn "On" and will not turn "Off" until the water is removed.
3. Because the capacitive sensor depends on coupling through the air, maximum range will be greater on hot, humid days. It may be possible to sense a particular material only on days when the humidity is high.
4. To determine if the material you wish to sense can be sensed reliably, Namco recommends actual testing. If this is not practical, consult our Applications Engineering Department.

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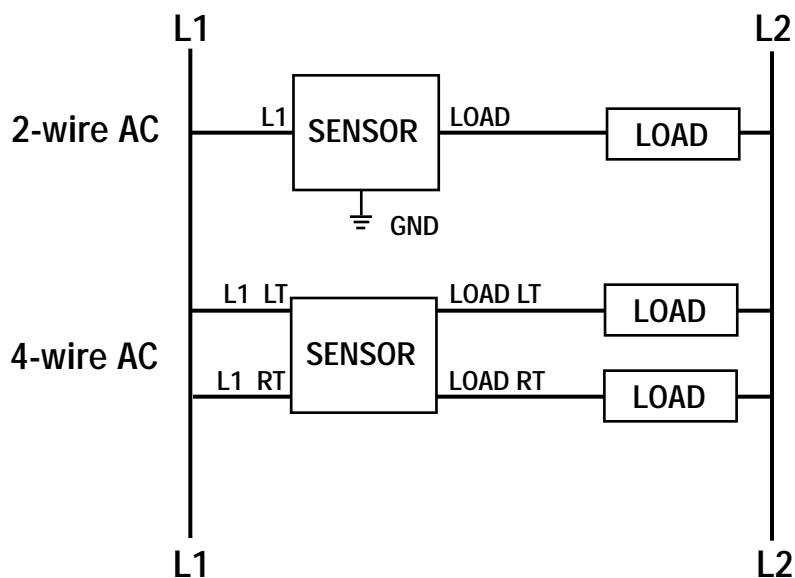
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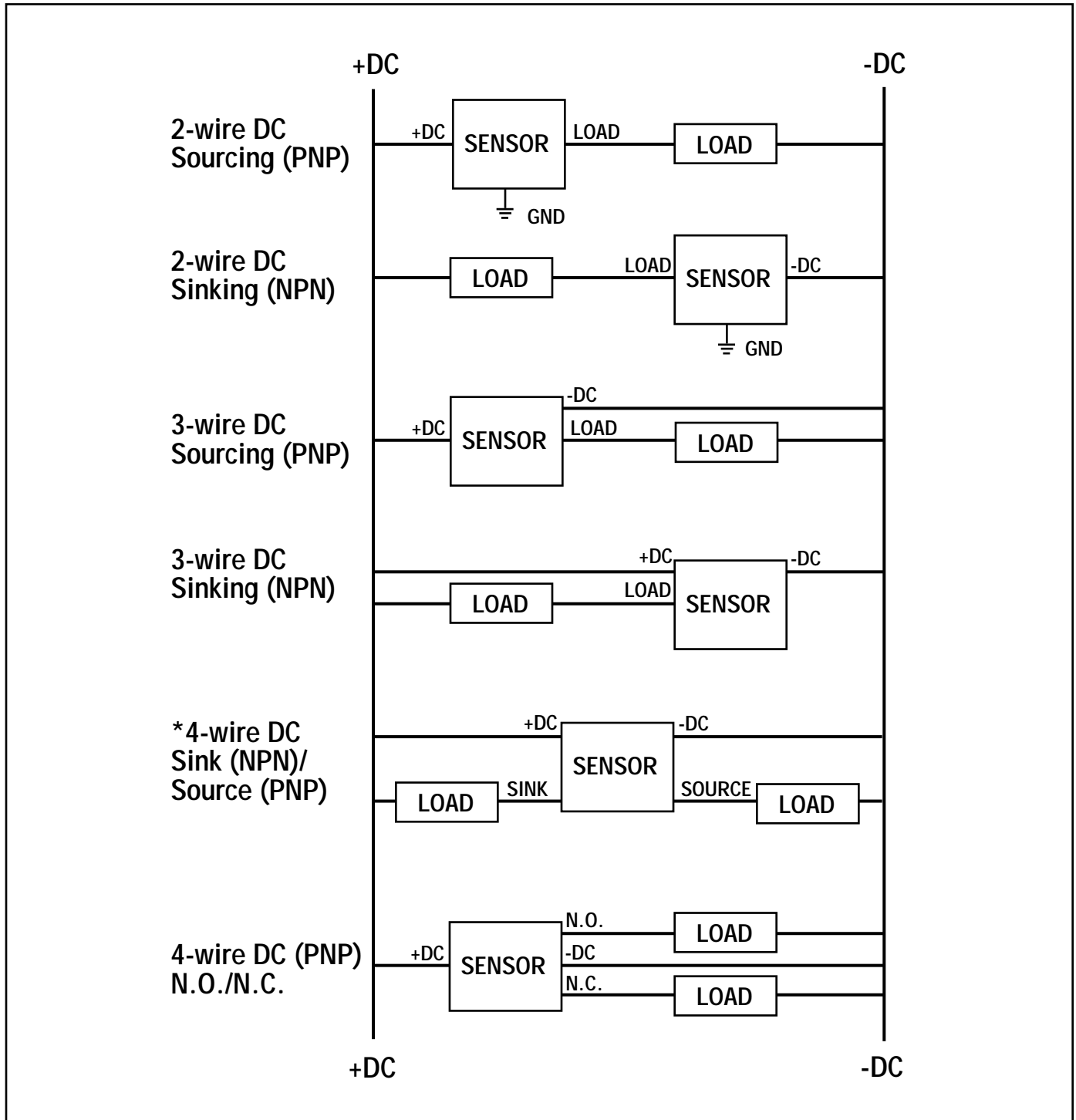
Notes:

1. These diagrams are valid for sensors with cables and connectors.
2. Sensors may or may not have ground connections or grounded housings. Refer to the specific connector or cable diagram for your particular sensor's model number to determine if it is grounded.
3. The markings on these wiring diagrams (L1, Load, etc.) are identical to those on the connector diagrams.
4. All switches are Normally Opened (N.O.) unless specifically marked Normally Closed (N.C.).
5. All switch outputs are Sourcing unless specifically marked Sink.

AC Wiring Diagrams



DC Wiring Diagrams



* Can be used as a single sink or source switch. When both outputs are used simultaneously, the sum of the load currents must not exceed maximum rating of sensor!

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Cylindicator Sensor Installation

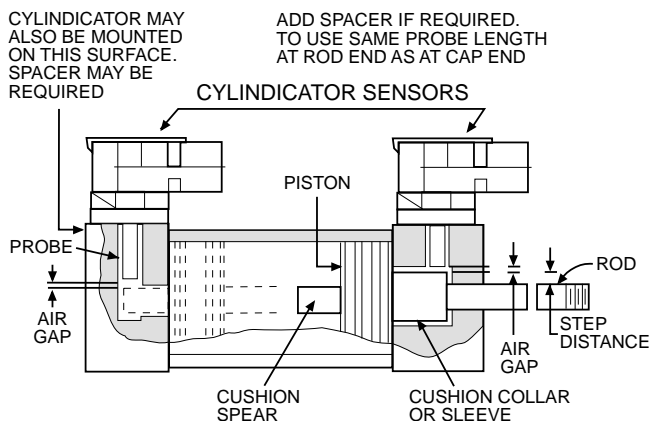


Figure 1

Proper operation of your Namco Cylindicator depends in large part on these factors:

Establishment of a proper air gap between the probe face and the target.

The air gap is the actual distance between the tip of the probe and the part of the piston which is the "target." The target can be the collar or cushion sleeve, cushion spear, or the end of the rod inside the cylinder. **This target must be close enough to actuate the Cylindicator Sensor but not so close as to actually contact the probe.**

Experience has shown an air gap of 0.025 inches to be optimum in most applications. The air gap should always be greater than 0.015 inches and less than 0.045 inches, including worst case tolerances. Gaps in excess of 0.045 inches are not recommended and could result in inconsistent operation.

Assuring a minimum "step distance" between the cushion collar and the piston rod.

Standard Namco Cylindicator Sensors have a nominal sensing range of 0.080 inches beyond the stated probe length. The minimum step distance (cushion to rod) must be greater than 0.095 inches to guarantee that the sensor will "drop out" when the target is no longer present. This minimum step distance accounts for mechanical tolerances, temperature effects, and hysteresis effects.

Sensing a known metallic target.

In all applications referred to in this publication, the target is assumed to be of a ferrous metal. Consult Namco if a different metal such as aluminum, brass, or stainless steel must be used as the sensing range is reduced.

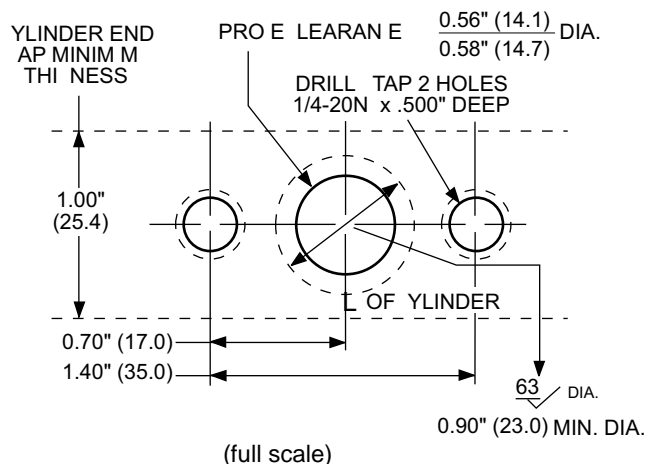
Mounting to a proper cylinder endcap.

The clearance hole for the sensing probe must be 0.560" diameter minimum/0.580" diameter maximum. The end block must be designed so that the probe tip is flush to 0.04" extended beyond surrounding metal within 0.5" of the probe side walls.

Other Tips:

- Never operate the cylinder at pressures which exceed the Cylindicator sensor's ratings.
- Do not exceed ambient temperature range.
- The Cylindicator Sensor must be positioned so that the target area (cushion spear, cushion collar, etc.) will completely cover the probe sensing face when the sensor is operated.
- Do not mount the Cylindicator Sensor on the bottom of the cylinder. Debris could accumulate around the probe which might cause damage or inconsistent operation.
- All Cylindicator Sensors are completely epoxy potted and as such contain no serviceable parts inside. Do not remove the cover or tamper with the cable or connector.
- Cylindicator Sensors must have the O-Ring probe seal that is supplied with each unit installed around the probe before mounting.
- Do not attempt to modify the probe by cutting, grinding, filing, etc.

Mounting Dimensions and Template



“Stroke To Go” vs. “Air Gap”

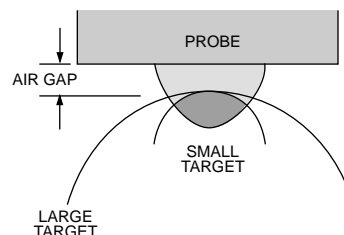
“Stroke To Go”

The amount of stroke remaining in the cylinder after the Cylindicator Sensor activates.

NOTE: If a cylinder is mechanically restrained from going full stroke — no target will be present for the switch to detect (no switch output).

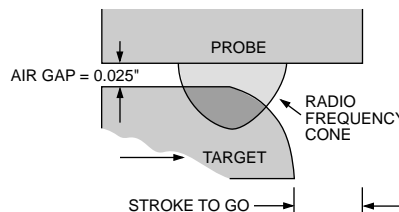
Target End View

Smaller diameter targets have less metal in the sensing field at a constant air gap. Loss of stroke-to-go is more pronounced on smaller bore cylinders as air gap increases.



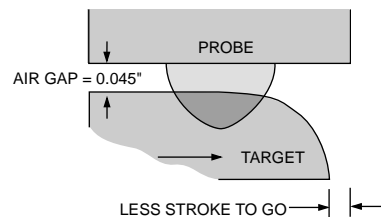
Switch Actuated

Recommended nominal air gap distance provides the stated maximum stroke to go.



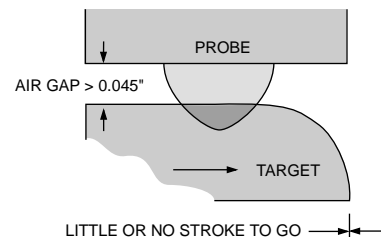
Switch Actuated

Variations from the recommended nominal air gap distance results in loss of stroke to go.



Switch Probably Not Actuated

Increased variations from the recommended nominal air gap distance results in little or no stroke to go and possible erratic operation.



**Loss of stated maximum stroke to go can prevent the proximity sensor from activating in plant equipment and tools with positive stops.*

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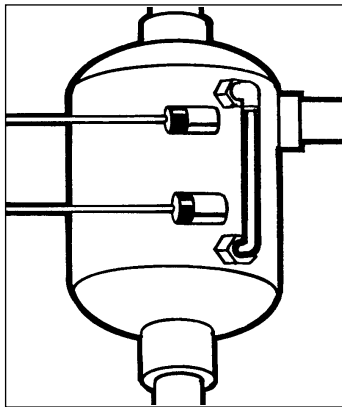
Namco offers a full line of capacitive sensors designed to sense non-metallic products. Capacitive proximity sensors can be adjusted so that they will ignore or "see through" an object in order to detect a second object behind it. As long as the object in the foreground is not metallic, the sensor will actually be able to sense products such as powders, granular material, and liquids even when they are hidden from view.

Capacitive sensors operate by detecting the change in capacitance between the capacitive sensor and the intended target. Capacitance is an electrical property between two separate materials, and its strength varies with distance and the properties of the materials. Namco's capacitive sensors have sensing ranges up to 70mm.

Namco capacitive proximity sensors are available in three housing styles and can detect many different liquid and solid materials including oil, water, soaps, beverages, chemicals, powders, and grains. Their versatility and range make them ideal for a variety of food industry applications. Detecting product level inside a hopper or storage tank is an easy task for the sensor as is sensing the contents of a sealed package to make sure it contains the proper amount of product. At the end of the production line Namco's capacitive sensors can be used to make sure cases are full of packaged product and to detect shipping pallets for automatic case loading applications.

How do I control liquid level in a tank?

Use a sight glass and two capacitive proximity sensors. The sight glass can be clear glass or any non-metallic material like PVC. The sensors detect the high and low liquid level through the wall of the sight glass or pipe. Whether the liquid is clear or not does not affect sensing.



Should I use a capacitive sensor with a metal or plastic body?

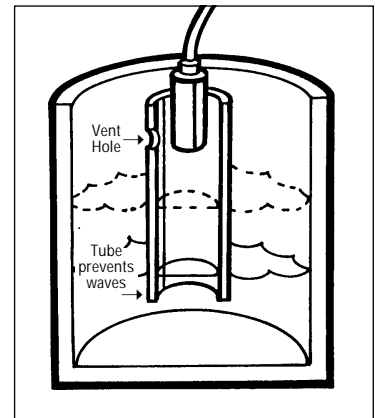
Generally, plastic body capacitive sensors are more suitable for applications where chemical or water resistance is desired. This would include food applications.

Metal body sensors are more appropriate where physical strength and rigidity are needed as well as in high vibration applications.

What if I have a metallic tank and no sight glass?

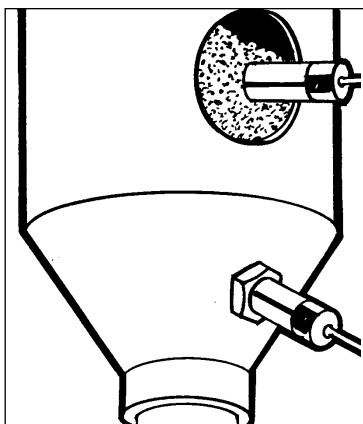
To sense liquid level in a metal tank, you'll need two capacitive sensors and mounting wells which project through the tank walls. The wells allow the sensors to project far enough into the tank to avoid side sensing of the tank walls. (Capacitive sensors do sense metal as well as non-metallic objects.)

Another common "high-level" or "tank full" application technique involves mounting the sensor inside a tube to prevent splashing and "waves" from falsely tripping the sensor. This technique is also used when a hole or sight glass is not possible.



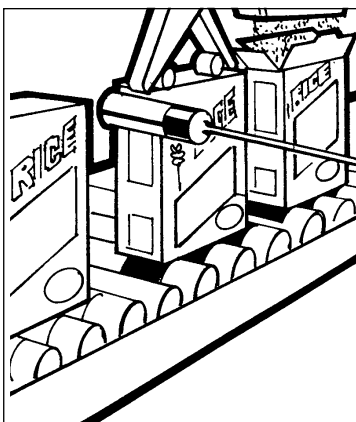
How can I sense dry bulk material in a hopper?

Again, you'll need two capacitive sensors--one for "high" level, one for "low" level. These can be mounted either of two ways: through a plastic window, or by mounting through the wall using the sensor's jam nuts.



Can sensors be used to insure my product is in its package?

Of course! Commonly found uses are for full-case detection as well as individual package checking. Detection is easy because the sensor "sees" through plastic, paper, or even cardboard boxes.



What about checking to make sure bottles have been filled?

Capacitive sensors have a number of uses in bottle filling and capping.

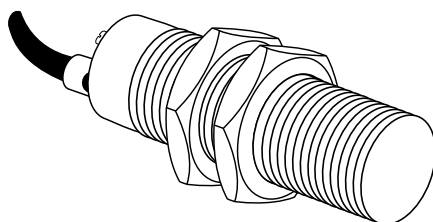
They can make sure empty bottles are continuously supplied to the filler. The line is shut down if there is no supply.

They can be used as a liquid level sensor to control the filling equipment.

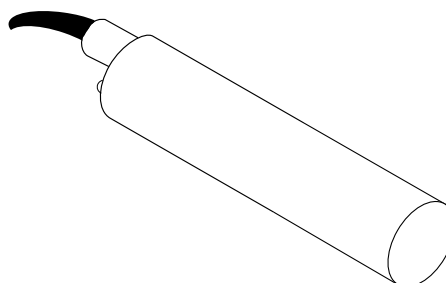
They can also be used to check that all containers have been capped.



Capacitive Proximity Sensors



Threaded Tubular Sensor



Smooth Tubular Sensor

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Axial Approach: The approach path of a target whose center is the same as the centerline of the sensing field.

Capacitive Sensor: A solid state switch which senses a changing dielectric mass. Usually adjustable and able to sense most materials.

Complementary Output: A form "C" type output (normally open and normally closed) which changes state simultaneously when the sensor is actuated.

Current Consumption (No Load Current): This is the current consumption of a proximity sensor when the output transistor is in the off state. It is indicated at the maximum voltage rate.

Current Sinking (NPN): A negative switching output in which the load current passes through the load first, then "sinks" through the sensor.

Current Sourcing (PNP): A positive switching output in which the current for the load is "sourced" through the sensor.

Differential: The difference between the operating point and the release point of a sensor.

Dwell Time: The minimum time needed for a particular target to be in the sensing field for the output to be energized or de-energized.

Eddy Currents: Small circular currents induced on the surface of a metallic target by an inductive sensor.

Hysteresis: The difference between the operating point and the release point of a sensor. (See Fig. 1)

Inductive Sensor: A solid state switch which emits a small directional radio frequency field. When a metallic target enters the field, eddy current losses are created thereby loading the oscillator. If this loading exceeds an internal setpoint, the output of the sensor is energized.

Interference Protection: All Namco proximity sensors feature an interference protection circuitry. This feature assures that voltage peaks or release interference caused by relays does not destroy the proximity sensor.

Leakage Current: The current which flows through the load when the sensor is non-energized. Also called burden or residual current.

LED: Namco proximity sensors feature a light emitting diode to indicate with a red LED that the sensor output is conducting. WFI proximity sensors have a red LED to show unit is powered up and a green LED to indicate target is present.

Maximum Load Current: This is the maximum load at which a proximity sensor may be operated continuously.

Minimum Load Current: The minimum current necessary to assure proper output operation.

Operate Point: The point at which a target is sensed. (See Fig. 1)

Release Point: The point at which the sensor returns to a non-energized state as the target leaves the sensing field. (See Fig. 1)

Repeatability: The relative variation in effective operating distance measured repeatedly over an established period of time during which environmental and electrical conditions, (i.e., applied voltage, temperature, relative humidity, mounting, etc.) are held constant.

Response Time: The time delay between when the target

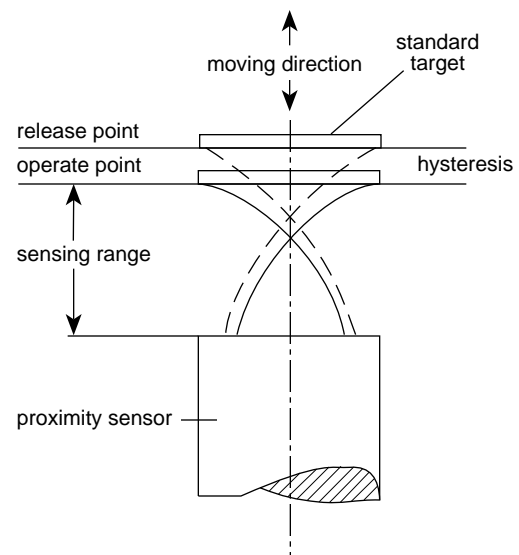


Figure 1

appears at the operate point and the output is energized.

Reverse Polarity Protection: Usually a diode inserted in one of the power leads of a D.C. Switch. This protects the internal circuitry if connections are accidentally reversed.

Sensing Range: The distance from the sensing face to a standard target at a specific temperature (usually 77°F). Most industrial type sensors usually will hold this range $\pm 10\%$ of rated sensing range. (See Fig. 1)

Shielded Sensor: A sensor which has a very directional sensing field. This allows the sensing face to be flush mounted in metal.

Short Circuit Protection (SCP): Internal circuitry which protects the sensor against accidental short circuits. SCP is not intended to protect other control circuit components or interconnecting wiring.

Standard Target: A mild steel plate 1mm thick, with sides equal to the diameter of the sensing face or 3 times rated sensing range, whichever is greater. (See Fig. 1)

Switching Frequency: The maximum speed at which a sensor will deliver discrete individual pulses as the target(s) enter and leave the sensing field. This value is always dependent on target size, distance from sensing face, speed of target and switch type. The catalog values given are obtained using a standard target.

Temperature Drift: The temperature drift indicates the change of the switching point caused by ambient temperature variations within the range of -13°F to $+158^{\circ}\text{F}$. The temperature of the measuring plate does not influence the switching point. The switching point at -13°F to $+158^{\circ}\text{F}$ may vary up to 10% compared to the point measured at $+68^{\circ}\text{F}$. (See Figure 2.)

Unshielded Sensor: A sensor which has an extended sensing range for its size. **Must not be flush mounted in metal unless a counterbore is cut such that the sensor is not influenced by the surrounding metal.**

Voltage Drop: The difference in voltage at the load measured with and without the sensor in a circuit. Must be taken into account when designing with any 2-wire device.

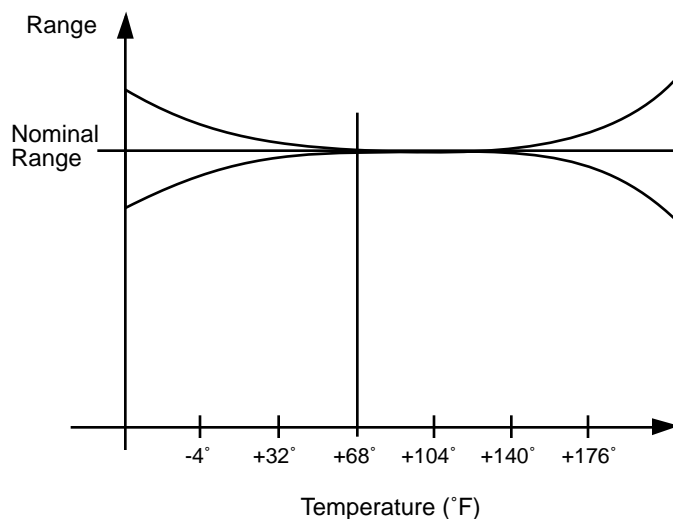


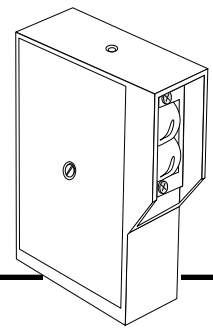
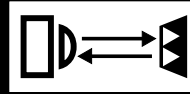
Figure 2

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- Modulated LED
- Choice of Outputs
- Diecast Aluminum Housing Epoxy Coated
- Tri-Color LED Indicator
- Optional Plug-In Time Delays
- NEMA 3, 4, 12 & 13 Design
- -20°C to +70°C

These beefed-up sensors are smart as well as tough. Die cast aluminum housings and totally sealed optics help make them ideal for severe environments. All

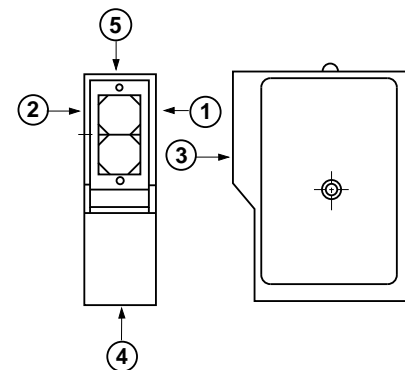
models use a modulated infrared LED emitter and receiver to ignore ambient light. Plug-in time delay modules offer wide flexibility in application options.

Designed for harsh industrial environments, the EP100 Series is especially equipped to alert you to potential problems. When other sensors run into alignment or dirty optic problems, you don't know about it until they fail. The EP100 uses a unique "tri-color" LED to indicate impending problems. When the LED glows:

- Green — stable operation
>70% reflected signal strength
- Yellow — marginal operation
40-70% reflected signal strength
- Red — insufficient reflected signal

Target Repeatability

For best repeatability, it is recommended to have target travel in direction (1) or (2). Traveling toward lens (3) will result in slightly higher tolerance on switch point. It is not recommended to have target travel in direction (4) and (5).



Supply Voltage	Power Consumption	Output Circuit Type	Model No.	Output Rating	Response Time On/Off	Maximum Switching Frequency	Leakage Current
RELAY OUTPUTS							
120 VAC	1.0 VA	DPDT	EP110-12001*	5A Resistive @ 250 VAC or 30 VDC	15mS/20ms	25 Hz	—
11-30 VDC	70 mA	DPDT	EP110-15001	5A Resistive @ 250 VAC or 30 VDC	15mS/20ms	25 Hz	—
TRANSISTOR OUTPUTS							
120 VAC	1.0 VA	NPN	EP110-12201*	25 mA @ 40 VDC	2mS/2ms	250 Hz	—
11-30 VDC	70 mA	NPN	EP110-15201	25 mA @ 40 VDC	2mS/2ms	250 Hz	—

* UL Listed and CSA Approved

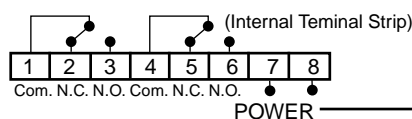
Common Sensor Characteristics

RETROREFLECTIVE HEAVY DUTY SENSORS	
Sensing Range	0-30 ft.*
Standard Retroreflector Target	4" x 4" square reflector
Lens	Glass
Light Source	Modulated Infrared LED
Light/Dark Operate — Selectable	yes
Optional Plug-in Timers	yes
NEMA Enclosure Types	3, 4, 12 & 13
Temperature Range	-20°C to +70°C
UL/CSA Certifications	yes
Sensitivity Adjustment	yes
Optic Heater	no
Cable Entry	1/2" - 14 NPT Conduit
Shipping Weight	18 oz.

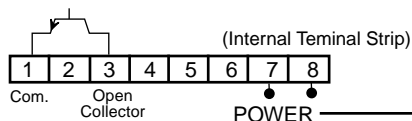
* Using EP175-13900, 4" x 4" square reflector

Circuit Drawings

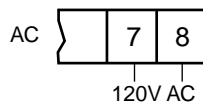
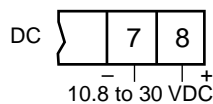
RELAY (DPDT) OUTPUTS



TRANSISTOR (NPN) OUTPUTS

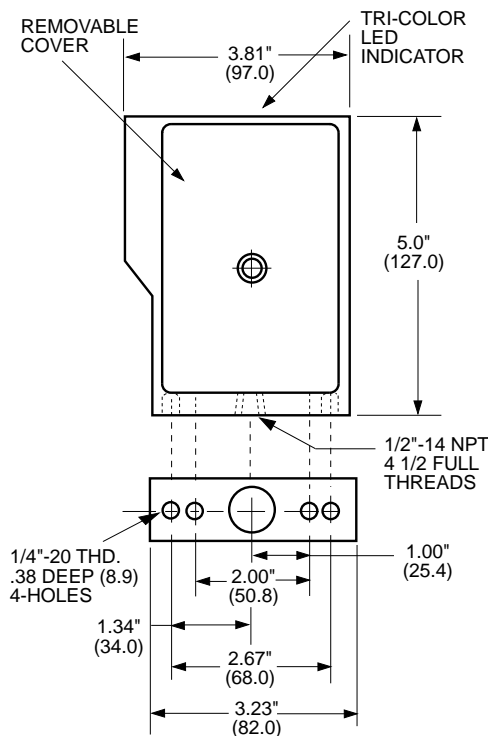


POWER INPUT:

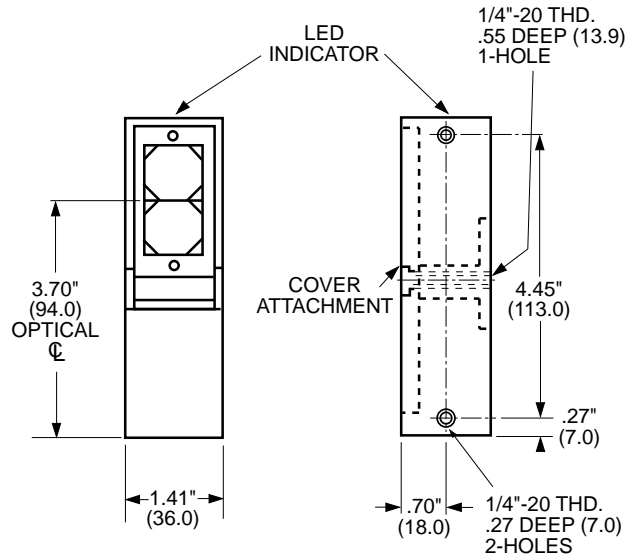


Dimensional Drawings

SIDE & BOTTOM VIEW



FRONT & REAR VIEW



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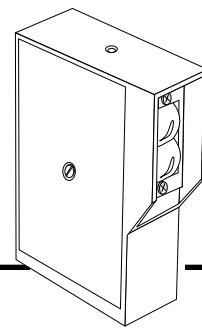
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- Diecast Aluminum Housing Epoxy Coated
- Tri-Color LED Indicator
- Optional Plug-In Time Delays
- NEMA 3, 4, 12 & 13 Design
- -20°C to +70°C

These beefed-up sensors are smart as well as tough. Die cast aluminum housings and totally sealed optics help make them ideal for severe environments. All models use a modulated infrared LED

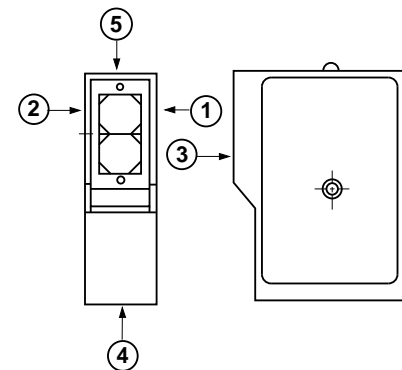
emitter and receiver to ignore ambient light. Plug-in time delay modules offer wide flexibility in application options.

Designed for harsh industrial environments, the EP100 Series is especially equipped to alert you to potential problems. When other sensors run into alignment or dirty optic problems, you don't know about it until they fail. The EP100 uses a unique "tri-color" LED to indicate impending problems. When the LED glows

- Green — stable operation
 >70% reflected signal strength
- Yellow — marginal operation
 40-70% reflected signal strength
- Red — insufficient reflected signal

Target Repeatability

For best repeatability, it is recommended to have target travel in direction (1) or (2). Traveling toward lens (3) will result in slightly higher tolerance on switch point. It is not recommended to have target travel in direction (4) and (5).



Supply Voltage	Power Consumption	Output Circuit Type	Fixed Range			Adjustable Range	Output Rating	Response Time (On/Off)	Maximum Switching Frequency	Leakage Current
			1.0'	2.5'	6.5'					
RELAY OUTPUTS										
120 VAC	1.0 VA	DPDT	EP130-12003*	EP130-12002*	EP130-12001*	—	5A Resistive @ 250 VAC or 30 VDC	20ms/25ms	25 Hz	—
11-30 VDC	70 mA	DPDT	EP130-15003	EP130-15002	EP130-15001	—	5A Resistive @ 250 VAC or 30 VDC	20ms/25ms	25 Hz	—
110/220 VAC	4.0 VA	SPDT	—	—	—	EP130-12004	50 W - 250 VDC 60 VA - 250 VAC	70ms	7 Hz	—
11-30 VDC ± 10%	90 mA	SPDT**	—	—	—	EP130-15004	50 W-250 VDC 60 VA - 250 VAC	70ms	7 Hz	—
TRANSISTOR OUTPUTS										
120 VAC	1.0 VA	NPN	EP130-12203*	EP130-12202*	EP130-12201*	—	25 mA @ 40 VDC	60ms/10ms	60 Hz	—
11-30 VDC	70 mA	NPN	EP130-15203	EP130-15202	EP130-15201	—	25 mA @ 40 VDC	60ms/10ms	60 Hz	—
11-30 VDC ± 10%	90 mA	PNP**	—	—	—	EP130-15004	100mA	70ms	7 Hz	—

* UL Listed and CSA Approved

** Relay/Transistor (PNP) outputs on EP130-15004.

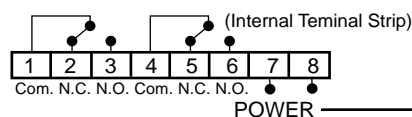
Common Sensor Characteristics

DIFFUSE PROXIMITY HEAVY DUTY SENSORS		
	Fixed Range	Adjustable Range
Sensing Ranges	1.0, 2.5, 6.5 ft.*	100-800 mm Adjustable*
Standard Target	White Bond Paper	
Lens	Glass	
Light Source	Modulated Infrared LED	
Light/Dark Operate — Selectable	yes	
Optional Plug-in Timers	yes	
NEMA Enclosure Type	3, 4, 12 & 13	
Temperature Range	-20°C to +70°C	-20°C to +60°C
UL/CSA Certifications	yes	
Sensitivity Adjustment	yes	
Optic Heater	no	
Cable Entry	1/2" - 14 NPT Conduit	
Shipping Weight	16 oz.	18 oz.

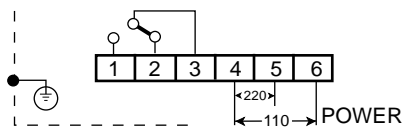
*Using White Bond Paper

Circuit Drawings

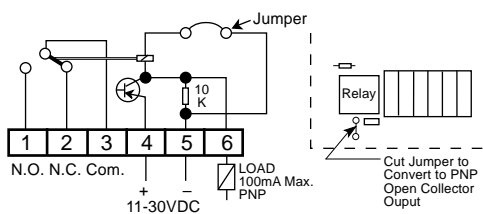
RELAY (DPDT) OUTPUTS



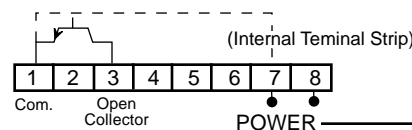
AC OUTPUTS ADJUSTABLE RANGE (SPDT)/AC POWER



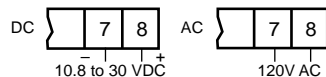
DC OUTPUTS ADJUSTABLE RANGE (SPDT/PNP)/DC POWER



TRANSISTOR (NPN) OUTPUTS

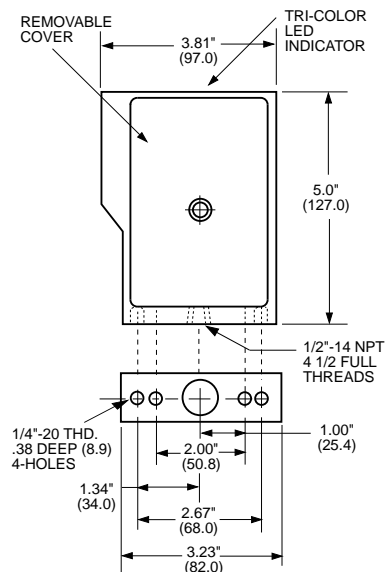


POWER INPUT:

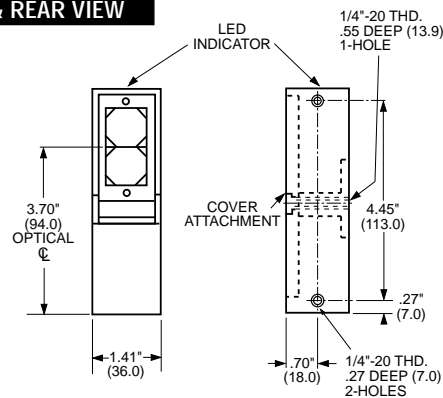


Dimensional Drawings

SIDE & BOTTOM VIEW



FRONT & REAR VIEW



Tolerance vs. Range

For Adjusted Range Diffuse Scanner EP130-12004 & EP130-15004

Adjusted Range	Total Sensing Range From:	Max. Range of White Target When Range is Set On Black Target	
		Black Paper	White Paper
3.94" (100mm)	1.97" to 3.94" (50mm to 100mm)	3.94" (100mm)	4.02" (102mm)
11.80" (300mm)	3.94" to 11.80" (100mm to 300mm)	11.80" (300mm)	12.20" (310mm)
19.68" (500mm)	4.72" to 19.68" (120mm to 500mm)	19.68" (500mm)	21.26" (540mm)
31.50" (800mm)	5.90" to 31.50" (150mm to 800mm)	31.50" (800mm)	31.50" (800mm)

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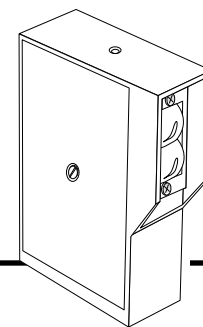
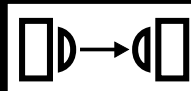
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Heavy Duty

Photoelectric Sensors

Thru-Beam & Fiber Optic



Photoelectric Sensors

- Modulated LED
- Choice of Outputs
- Diecast Aluminum Housing Epoxy Coated
- Tri-Color LED Indicator
- Optional Plug-In Time Delays
- 400 Ft. Range Thru-Beam
- Sealed Heated Optics Thru-Beam
- NEMA 3, 4, 12 & 13 Design
- -20°C to +70°C

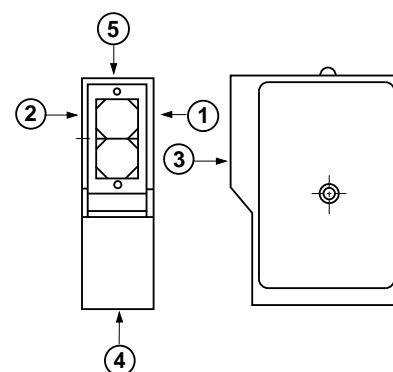
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- Yellow — marginal operation
 40-70% reflected signal strength
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Target Repeatability

For best repeatability, it is recommended to have target travel in direction (1) or (2). Traveling toward lens (3) will result in slightly higher tolerance on switch point. It is not recommended to have target travel in direction (4) and (5).



Supply Voltage	Power Consumption	Output Circuit Type	Thru-Beam		Fiber Optic	Output Rating	Response Time On/Off	Maximum Switching Frequency	Leakage Current
			Emitter	Receiver					
110/220 VAC	3.5 VA	—	EP120-12501	—	—	—	—	—	—
24 VDC ± 10%	35 mA	—	EP120-15501	—	—	—	—	—	—
RELAY OUTPUTS									
120 VAC	1.0 VA	DPDT	—	—	EP140-12001	5A Resistive @ 250 VAC or 30 VDC	20mS/25ms	25 Hz	—
110/220 VAC	4.5 VA	SPDT	—	EP120-12701	—	50W - 250 VDC 60 VA - 250 VAC	30mS/150ms	6 Hz	—
11-30 VDC	70 mA	DPDT	—	—	EP140-15001	5A Resistive @ 250 VAC or 30 VDC	20mS/25ms	20 Hz	—
24 VDC ± 10%	100 mA	SPDT**	—	EP120-15701	—	50W - 250 VDC 60 VA - 250 VAC	—	20 Hz	—
TRANSISTOR OUTPUTS									
11-30 VDC	70 mA	NPN	—	—	EP140-15201	25 mA @ 40 VDC	6mS/10ms	60 Hz	—
24 VDC ± 10%	100 mA	PNP**	—	EP120-15701	—	100 mA	—	100 Hz	—

* UL Listed

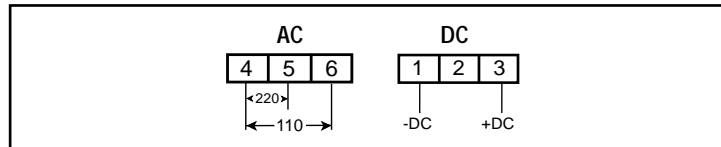
** Relay/Transistor (PNP) outputs on EP120-15701

Common Sensor Characteristics

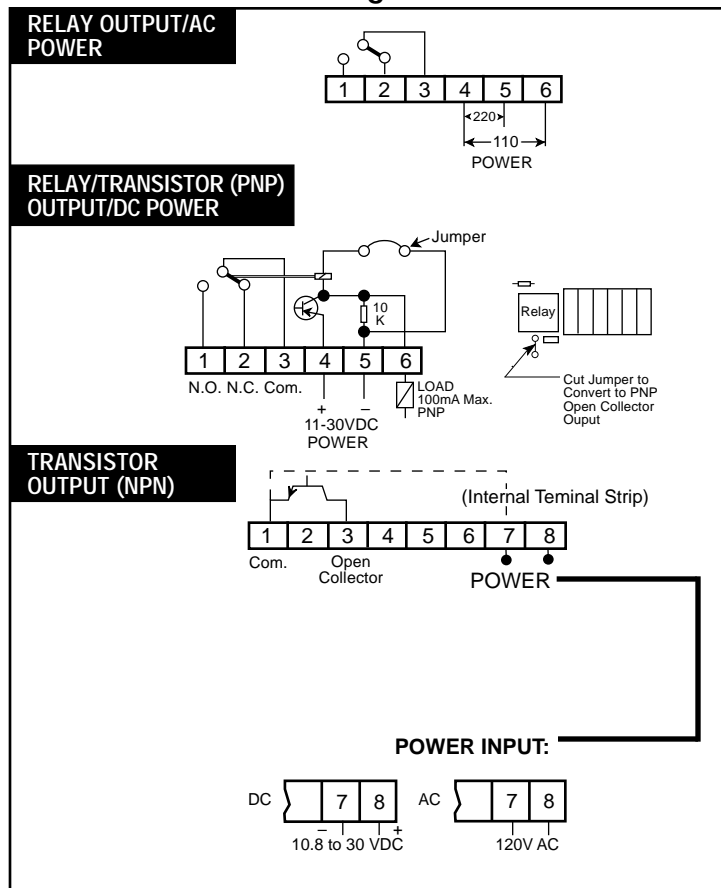
THRU-BEAM & FIBER OPTIC HEAVY DUTY SENSORS		
	Thru-Beam	Fiber Optic
Sensing Range	0-400 ft.	See Photoelectric Accessories section
Lens	Glass	
Light Source	Modulated Infrared LED	
Light/Dark Operate — Selectable	no	yes
Optional Plug-in Timers*	yes	
NEMA Enclosure Type	3, 4, 12 & 13	
Temperature Range	-30°C to +60°C	-20°C to +70°C
UL/CSA Certifications	no	yes
Sensitivity Adjustment	no	yes
Optic Heater	yes	no
Cable Entry	1/2" - 14 NPT Conduit	
Shipping Weight	18 oz.	20 oz.

* Refer to Photoelectric Accessories section

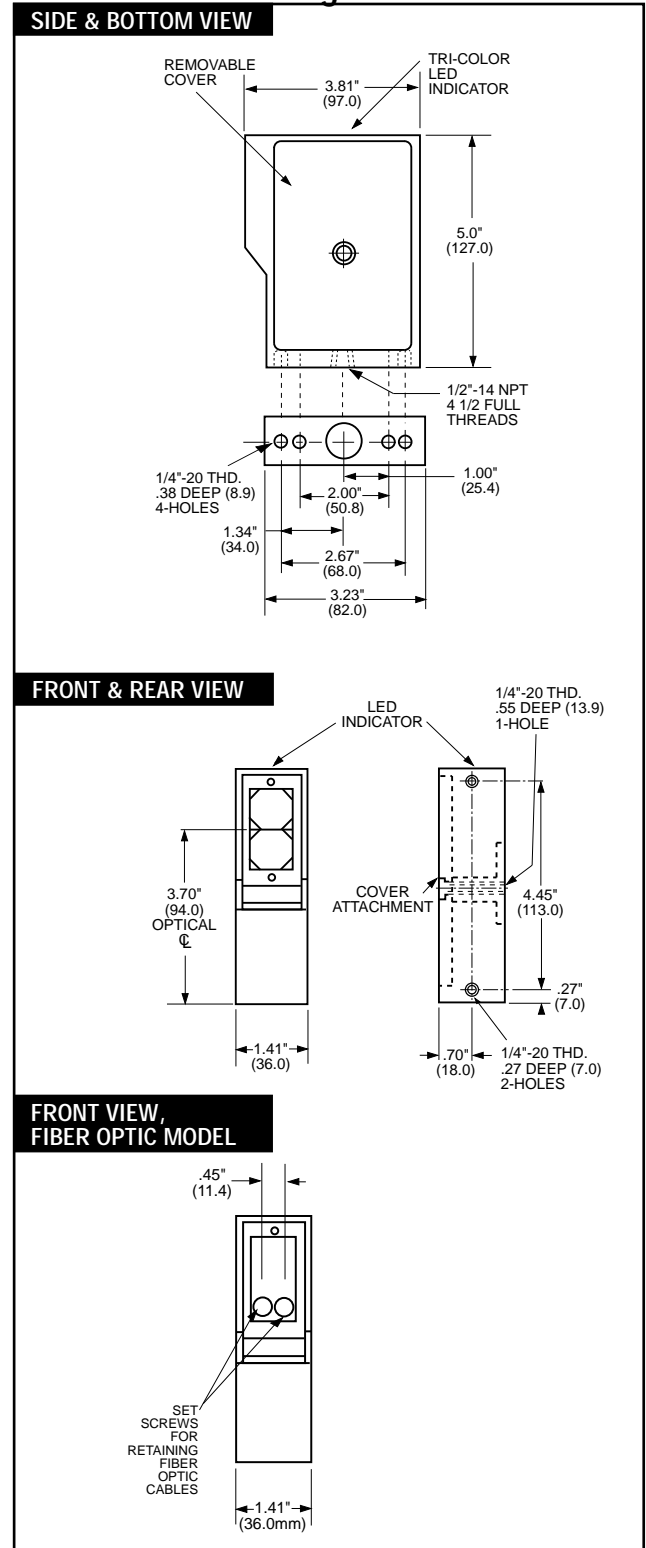
Emitter Circuit Drawings



Receiver Circuit Drawings



Dimensional Drawings



NAMCO

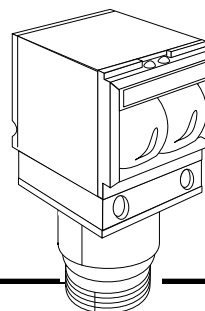
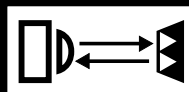
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Compact

Photoelectric Sensors

Retro-Reflective



Photoelectric Sensors

- Programmable Controller Compatible
- NPN/PNP wire selectable
- Integral yoke bracket provides four 90°-indexed mounting positions
- Light/dark operate user selectable for optimum flexibility and minimum inventory
- Sensitivity gain adjust (all models)
- 2 wire AC, 3 wire AC, or 4 wire DC circuit types
- Dual LED status indicators

If you need a reliable photoelectric sensor, you can't do much better than the EP200. Only 2.45 inches high, it fits in the tightest spots. For easy installation, its U-shaped yoke slips off allowing you to rotate the sensor in 90° increments.

A Rynite® plastic housing holds the surface mount electronics which are themselves encapsulated in epoxy. A wide variety of configurations are available to fit your specific needs. In its retroreflective version, it is great for long range jobs...up to 30 feet. Polarized versions are immune from "proxing" or false signals from highly reflective objects like aluminum cans, shrink wrap, bottles, foil, etc.

The EP200 series of sensors is backed by Namco's Lifetime Replacement Program.

LED Functions

PHOTOELECTRIC SWITCH FUNCTION				
Type	Sensor Receiver Recognizes	Status Output	Status LED	
			Ready	Target
L.O.	DARK	OPEN	ON	OFF
L.O.	LIGHT	CLOSED	OFF	ON
D.O.	LIGHT	OPEN	ON	OFF
D.O.	DARK	CLOSED	OFF	ON



Termination Type	Power Consumption	Output Circuit Type	Non-Polarized Model No. (Plastic Lens)	Polarized Model No. (Glass Lens)	Output Rating	Leakage Current	Voltage Drop	Maximum Switching Frequency	Response Time On/Off
2-WIRE AC 20-150V									
3-pin Mini	0.3W @ 120V	2W	EP210-24400	EP210-24401	500mA	1.7mA	≤ 10V	15Hz	30ms
3-pin Micro	0.3W @ 120V	2W	EP210-24420	EP210-24421	500mA	1.7mA	≤ 10V	15Hz	30ms
6' Cable	0.3W @ 120V	2W	EP210-24410	EP210-24411	500mA	1.7mA	≤ 10V	15Hz	30ms
3-WIRE AC 85-132V									
3-pin Mini	0.7W @ 120 VAC	3W	EP210-24600	EP210-24601	500mA	—	≤ 2.5V	33Hz	15ms
4-pin Micro	0.7W @ 120 VAC	3W	EP210-24620	EP210-24621	500mA	—	≤ 2.5V	33Hz	15ms
6' Cable	0.7W @ 120 VAC	3W	EP210-24610	EP210-24611	500mA	—	≤ 2.5V	33Hz	15ms
4-WIRE DC 10-30V									
4-pin Mini	0.9W @ 30 VDC	4W, NPN & PNP	EP210-24500	EP210-24501	200mA	—	NPN @ 100mA: 0.8V PNP @ 100mA: 2.0V	250Hz	2ms
4-pin Euro	0.9W @ 30 VDC	4W, NPN & PNP	EP210-24520	EP210-24521	200mA	—	NPN @ 100mA: 0.8V PNP @ 100mA: 2.0V	250Hz	2ms
6' Cable	0.9W @ 30 VDC	4W, NPN & PNP	EP210-24510	EP210-24511	200mA	—	NPN @ 100mA: 0.8V PNP @ 100mA: 2.0V	250Hz	2ms

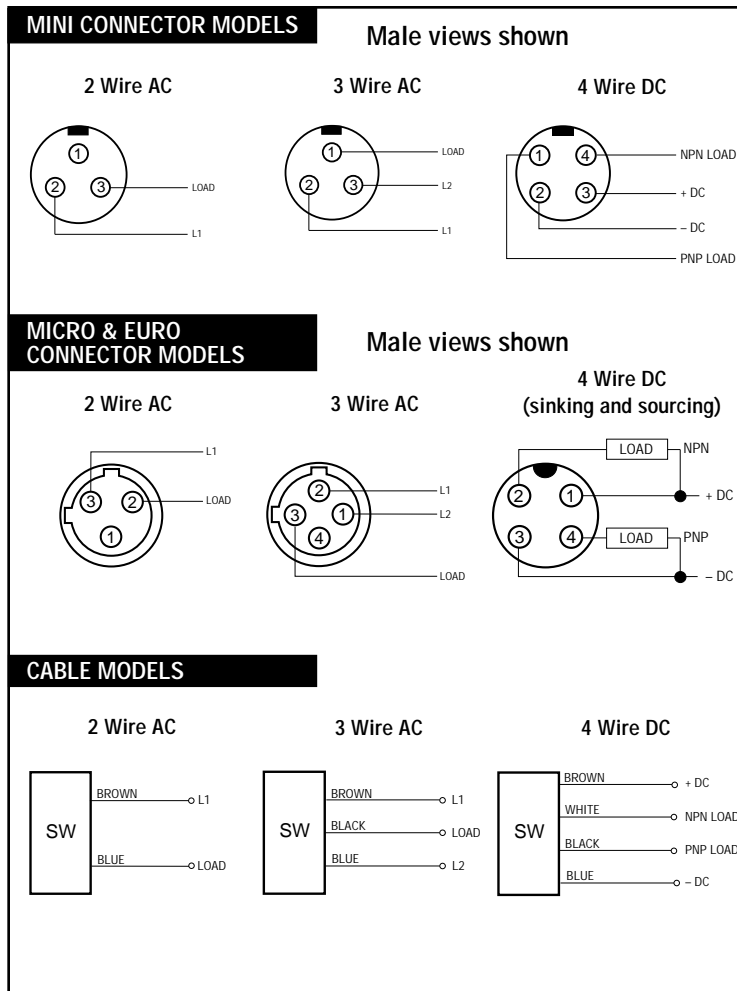
Common Sensor Characteristics

COMPACT RETRO-REFLECTIVE SENSORS		
	Polarized	Non-Polarized
Sensing Range	15 feet*	30 feet*
Standard Target	3.23" diameter reflector	
Light Source (LED)	Visible	Modulated Infrared
Light/Dark Operate — Selectable	yes	
Sensitivity Adjustment	yes	
Ambient Temperature Range	-20°C to +70°C	
Reverse Polarity Protected	4W DC only	
Short Circuit Protected	no	
NEMA Enclosure Type	3, 4, 5, 12, 13	
Dual LED Indicators	yes	
Plastic Housing Material	Rynite®	
Shipping Weight	16 oz.	

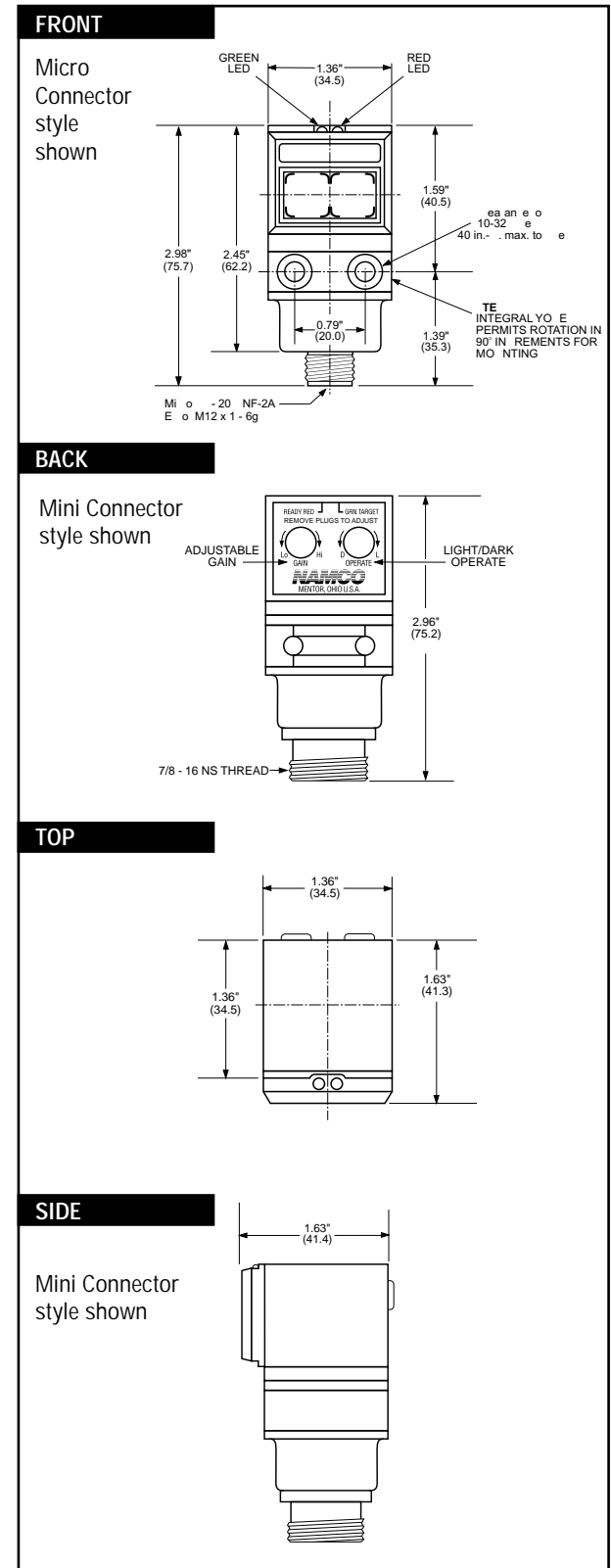
* Using EP175-23200, 3.23" dia. reflector.

® Thermal Plastic Polyester Resin, Registered Trademark of E.I. DuPont

Circuit Drawings



Dimensional Drawings



NAMCO

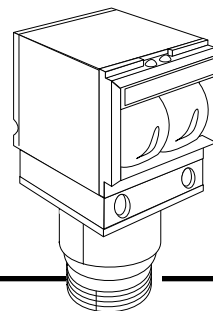
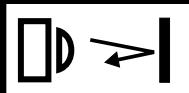
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Compact

Photoelectric Sensors

Diffuse Proximity



Photoelectric Sensors

- Programmable Controller Compatible
- NPN/PNP wire selectable
- Integral yoke bracket provides four 90°-indexed mounting positions
- Light/dark operate user selectable for optimum flexibility and minimum inventory
- Sensitivity gain adjust (all models)
- 2 wire AC, 3 wire AC, or 4 wire DC circuit types
- Dual LED status indicators

If you need a reliable photoelectric sensor, you can't do much better than the EP200. Only 2.45 inches high, it fits in the tightest spots. For easy installation, its "U"-shaped yoke slips off, allowing you to rotate the sensor in 90° increments.

A wide variety of configurations are available to fit your specific needs. Diffuse proximity sensing should be used when the following conditions exist: (1) the object itself is sufficiently reflective to return incident light to the receiver photodiode; (2) the installation of a reflector on the opposite side of the object is impractical.

The EP200 series of sensors is backed by Namco's Lifetime Replacement Program.

LED Functions

PHOTOELECTRIC SWITCH FUNCTION				
Type	Sensor Receiver Recognizes	Status Output	Status LED	
			Ready	Target
L.O.	DARK	OPEN	ON	OFF
L.O.	LIGHT	CLOSED	OFF	ON
D.O.	LIGHT	OPEN	ON	OFF
D.O.	DARK	CLOSED	OFF	ON

Termination Type	Power Consumption	Output Circuit Type	Model No.	Output Rating	Leakage Current	Voltage Drop	Response Time On/Off	Maximum Switching Frequency
2-WIRE AC 20-150V								
3-pin Mini	0.3W @ 120 VAC	2W	EP230-24400	500mA	1.7mA	≤10V	30ms	15 Hz
3-pin Micro	0.3W @ 120 VAC	2W	EP230-24420	500mA	1.7mA	≤10V	30ms	15 Hz
6' Cable	0.3W @ 120 VAC	2W	EP230-24410	500mA	1.7mA	≤10V	30ms	15 Hz
3-WIRE AC 85-132V								
3-pin Mini	0.7W @ 120 VAC	3W	EP230-24600	500mA	—	≤2.5V	15ms	33 Hz
4-pin Micro	0.7W @ 120 VAC	3W	EP230-24620	500mA	—	≤2.5V	15ms	33 Hz
6' Cable	0.7W @ 120 VAC	3W	EP230-24610	500mA	—	≤2.5V	15ms	33 Hz
4-WIRE DC 10-30V								
4-pin Mini	0.9W @ 30 VDC	4W, NPN & PNP	EP230-24500	200mA	—	0.8V: NPN @ 100mA 2.0V: PNP @ 100mA	2ms	250 Hz
4-pin Euro	0.9W @ 30 VDC	4W, NPN & PNP	EP230-24520	200mA	—	0.8V: NPN @ 100mA 2.0V: PNP @ 100mA	2ms	250 Hz
6' Cable	0.9W @ 30 VDC	4W, NPN & PNP	EP230-24510	200mA	—	0.8V: NPN @ 100mA 2.0V: PNP @ 100mA	2ms	250 Hz

Common Sensor Characteristics

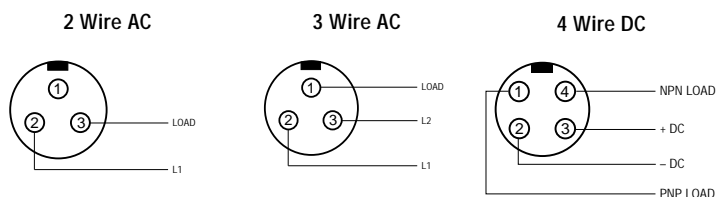
DIFFUSE PROXIMITY COMPACT SENSORS	
Sensing Range	30"*
Standard Target	White Bond Paper
Light Source	Modulated Infrared LED
Light/Dark Operate — Selectable	yes
Sensitivity Adjustment	yes
Ambient Temperature Range	-20°C to +70°C
Reverse Polarity Protected	4W DC only
Short Circuit Protected	no
NEMA Enclosure Type	3, 4, 5, 12, 13
Dual LED Indicators	yes
Plastic Housing Material	Rynite®
Shipping Weight	6 oz.

* Using White Bond Paper

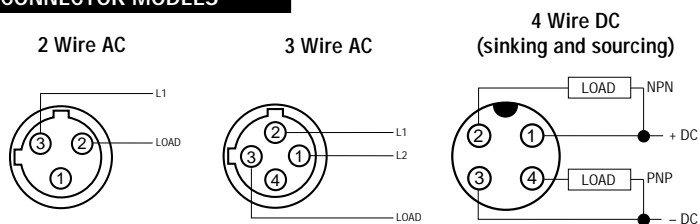
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Circuit Drawings

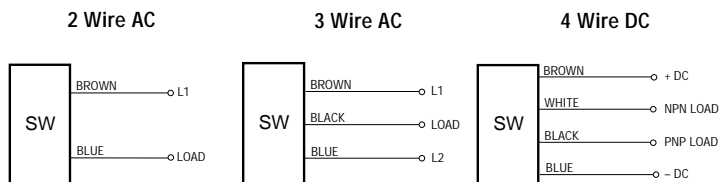
MINI CONNECTOR MODELS



MICRO & EURO CONNECTOR MODELS

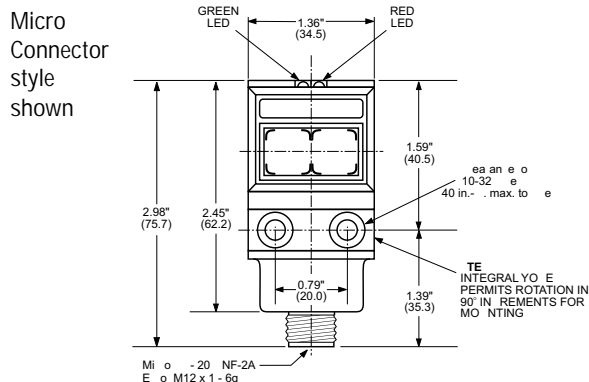


CABLE MODELS

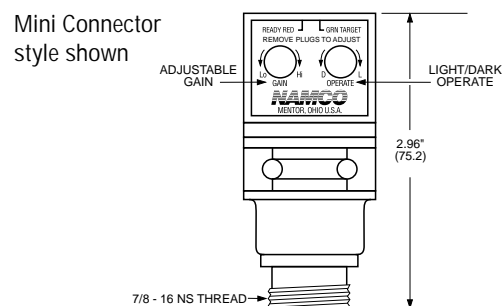


Dimensional Drawings

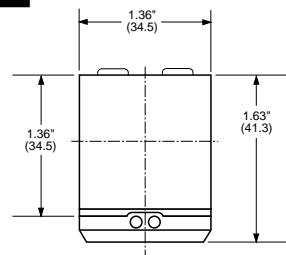
FRONT



BACK

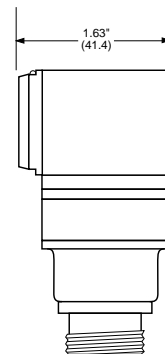


TOP



SIDE

Mini Connector style shown



Photoelectric Sensors

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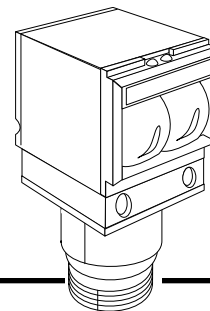
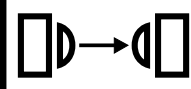
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Compact

Photoelectric Sensors

Thru-Beam & Fiber Optic



Photoelectric Sensors

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LED Functions

PHOTOELECTRIC SWITCH FUNCTION				
Type	Sensor Receiver Recognizes	Status Output	Status LED	
			Ready	Target
L.O.	DARK	OPEN	ON	OFF
L.O.	LIGHT	CLOSED	OFF	ON
D.O.	LIGHT	OPEN	ON	OFF
D.O.	DARK	CLOSED	OFF	ON



Termination Type	Power Consumption	Output Circuit Type	Thru-Beam		Fiber Optic	Output Rating	Leakage Current	Voltage Drop	Response Time On/Off	Maximum Switching Frequency
			Emitter	Receiver						
2-WIRE AC/DC*										
3-pin Mini	0.9W @ 120 V	2W	EP220-23400	—	—	—	—	—		—
3-pin Micro	0.9W @ 120 V	2W	EP220-23420	—	—	—	—	—		—
6' Cable	0.9W @ 120 V	2W	EP220-23410	—	—	—	—	—		—
2-WIRE AC 20-150V										
3-pin Mini	0.3W @ 120 VAC	2W	—	EP220-24400	EP240-24400	500mA	1.7mA	≤10V	30ms	15 Hz
3-pin Micro	0.3W @ 120 VAC	2W	—	EP220-24420	EP240-24420	500mA	1.7mA	≤10V	30ms	15 Hz
6' Cable	0.3W @ 120 VAC	2W	—	EP220-24410	EP240-24410	500mA	1.7mA	≤10V	30ms	15 Hz
3-WIRE AC 85-132V										
3-pin Mini	0.7W @ 120 VAC	3W	—	EP220-24600	EP240-24600	500mA	—	≤2.5V	15ms	33 Hz
4-pin Micro	0.7W @ 120 VAC	3W	—	EP220-24620	EP240-24620	500mA	—	≤2.5V	15ms	33 Hz
6' Cable	0.7W @ 120 VAC	3W	—	EP220-24610	EP240-24610	500mA	—	≤2.5V	15ms	33 Hz
4-WIRE DC 10-30V										
4-pin Mini	0.9W @ 30 VDC	4W, NPN & PNP	—	EP220-24500	EP240-24500	200mA	—	0.8V: NPN @ 100mA 2.0V: PNP @ 100mA	2ms	250 Hz
4-pin Euro	0.9W @ 30 VDC	4W, NPN & PNP	—	EP220-24520	EP240-24520	200mA	—	0.8V: NPN @ 100mA 2.0V: PNP @ 100mA	2ms	250 Hz
6' Cable	0.9W @ 30 VDC	4W, NPN & PNP	—	EP220-24510	EP240-24510	200mA	—	0.8V: NPN @ 100mA 2.0V: PNP @ 100mA	2ms	250 Hz

* 20-150 VAC / 10-180 VDC

► Fiber optic cables not included with fiber optic sensors.

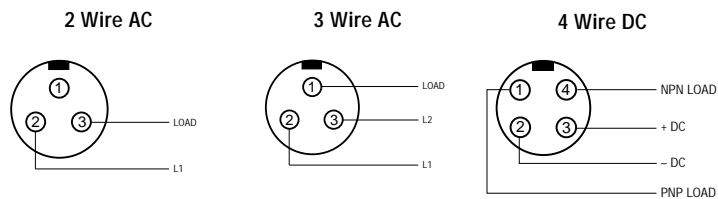
Common Sensor Characteristics

THRU-BEAM & FIBER OPTIC SENSORS		
	Thru-Beam	Fiber Optic
Sensing Range	200 feet	See Photoelectric Accessories section
Light/Dark Operate — Selectable	yes	
Light Source	Modulated Infrared LED	
Sensitivity Adjustment	yes	
Ambient Temperature Range	-20°C to +70°C	
Reverse Polarity Protected	4W DC only	
Short Circuit Protected	no	
NEMA Enclosure Type	3, 4, 5, 12, 13	
Dual LED Indicators	yes	
Plastic Housing Material	Rynite®	
Shipping Weight	6 oz.	

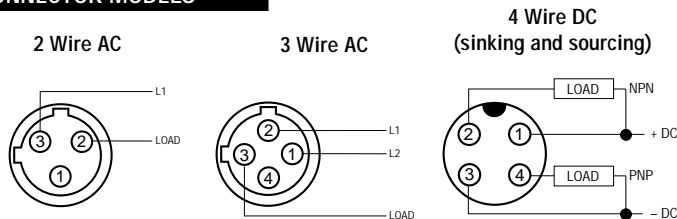
® Thermal Plastic Polyester Resin, Registered Trademark of E. I. DuPont

Circuit Drawings

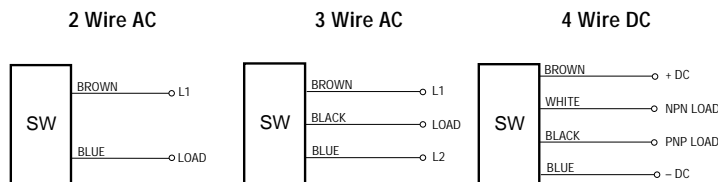
MINI CONNECTOR MODELS



MICRO & EURO CONNECTOR MODELS



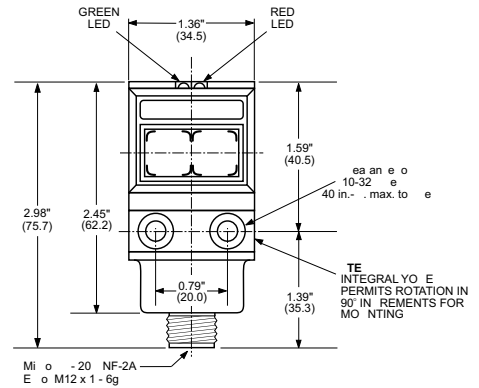
CABLE MODELS



Dimensional Drawings

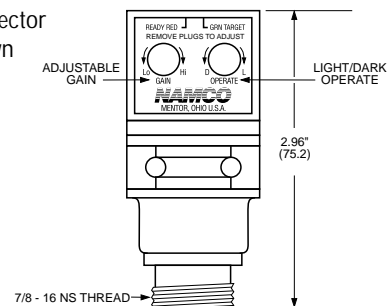
FRONT

Micro Connector style shown



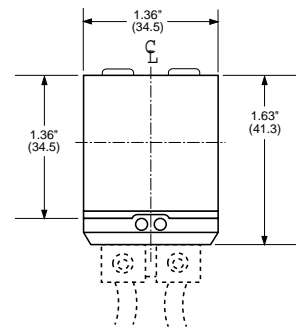
BACK

Mini Connector style shown



TOP

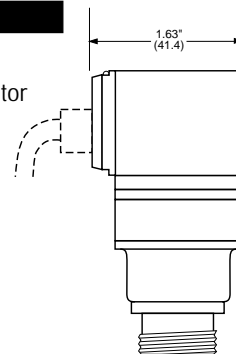
Dashed lines represent Fiber Optic version



SIDE

Mini Connector style shown

Dashed lines represent Fiber Optic version



NAMCO

Namco Controls Corporation

Mayfield Village, OH 44143

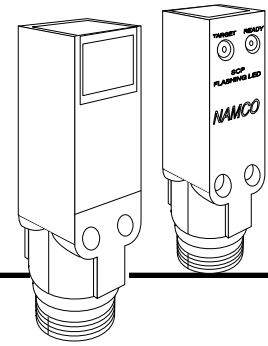
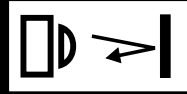
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For technical assistance, call 1-800-NAMTECH

Weld Field Immune

Photoelectric Sensors

Diffuse Proximity



- Side and end-sensing types available
- 2-wire AC, 3-wire AC, or 3-wire DC circuit types
- Short circuit protected
- Dual LED indication
- Weld Field Immune

The EP570 series sensor is an economical, reliable photoelectric sensor for nearly all applications. Programmable controller compatible, these are very good sensors for automotive body and assembly tooling or material handling tasks. Tough housing contains the latest in surface mount electronics technology for trouble-free use.

These sensors are appropriate for more demanding applications such as metal stamping. They use the same proven short circuit protected electronics found on Namco's Heavy Industry sensors.

Photoelectric Sensors

Termination Type	Power Consumption	Output Circuit Type	Sensing Position	Model No.	Output Rating	Leakage Current	Voltage Drop	Response Time On/Off	Maximum Switching Frequency
2-WIRE AC/DC 20-230V									
3-pin Mini	0.44W @ 230V	2W	End	EP570-11400	4-400mA	≤1.7mA	≤10V	20ms	25 Hz
3-pin Mini	0.44W @ 230V	2W	Side	EP570-21400	4-400mA	≤1.7mA	≤10V	20ms	25 Hz
4-pin Mini	0.44W @ 230V	2W	End	EP570-11410	4-400mA	≤1.7mA	≤10V	20ms	25 Hz
4-pin Mini	0.44W @ 230V	2W	Side	EP570-21410	4-400mA	≤1.7mA	≤10V	20ms	25 Hz
3-pin Micro	0.44W @ 230V	2W	End	EP570-11430	4-400mA	≤1.7mA	≤10V	20ms	25 Hz
3-pin Micro	0.44W @ 230V	2W	Side	EP570-21430	4-400mA	≤1.7mA	≤10V	20ms	25 Hz
3-WIRE AC 85-132V									
4-pin Mini	≤ 1W @ 120V	3W	End	EP570-11510	200mA	—	≤3V	20ms	25 Hz
4-pin Mini	≤ 1W @ 120V	3W	Side	EP570-21510	200mA	—	≤3V	20ms	25 Hz
3-WIRE DC 10-30V									
4-pin Mini	0.9W @ 30V	3W, PNP	End	EP570-11010	200mA	—	≤3.5V	2.5ms	200 Hz
4-pin Mini	0.9W @ 30V	3W, PNP	Side	EP570-21010	200mA	—	≤3.5V	2.5ms	200 Hz
4-pin Micro	0.9W @ 30V	3W, PNP	End	EP570-11040	200mA	—	≤3.5V	2.5ms	200 Hz
4-pin Micro	0.9W @ 30V	3W, PNP	Side	EP570-21040	200mA	—	≤3.5V	2.5ms	200 Hz

Protected by the
NAMCO
Lifetime Replacement Program

Common Sensor Characteristics

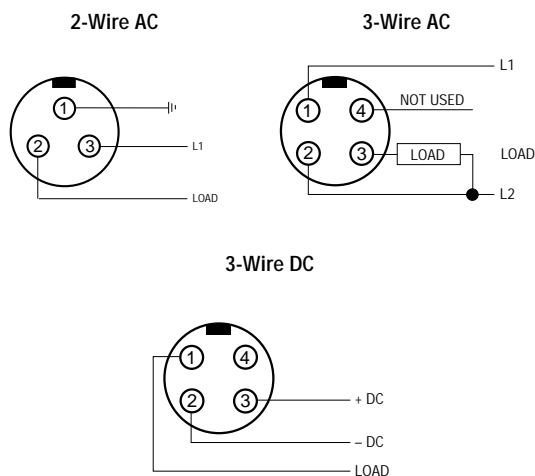
WELD FIELD IMMUNE DIFFUSE PROXIMITY SENSORS	
Sensing Range	2.8" ± 0.20"
Standard Target	White Bond Paper
Light Source	Modulated Infrared LED
Light/Dark Operate	Light Operate Only
Sensitivity Adjustment	no
Ambient Temperature Range	-20° C to + 70° C
Reverse Polarity Protected	3W DC Only
Short Circuit Protected	yes
NEMA Enclosure Type	1, 12, 13
Dual LED Indicators	yes
Plastic Housing Material	Rynite®
Shipping Weight	5 oz.

*Using White Bond Paper

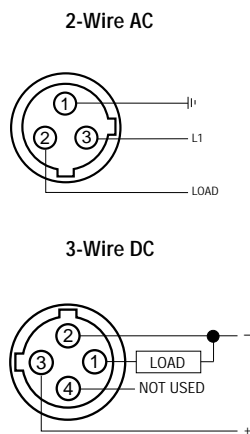
® Thermal Plastic Polyester Resin, Trademark of E. I. Dupont

Circuit Drawings

MINI CONNECTOR MODELS

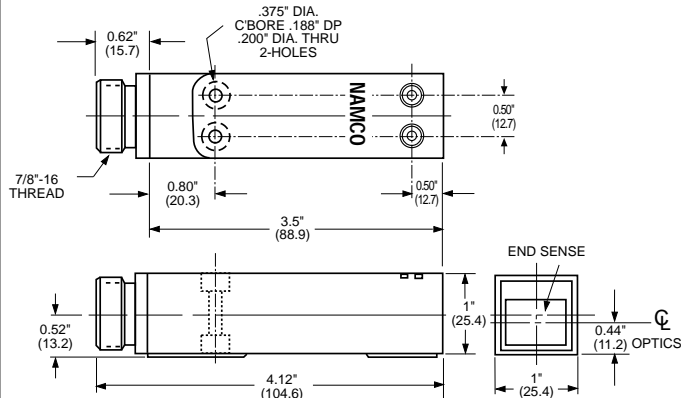


MICRO CONNECTOR MODEL

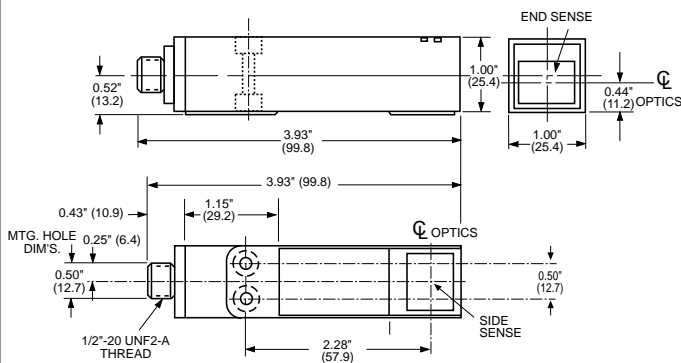


Dimensional Drawings

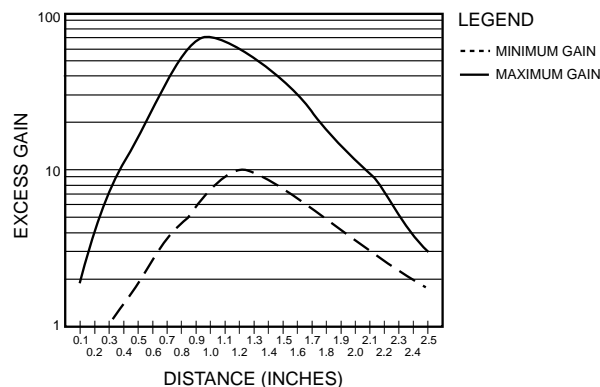
MINI CONNECTOR MODEL



MICRO CONNECTOR MODEL



EP570 Excess Gain



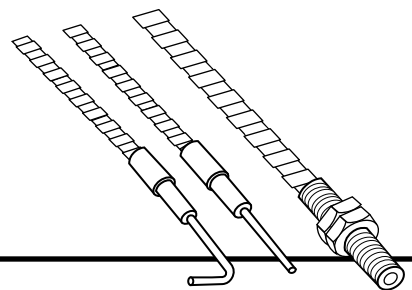
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Fiber Optic Cables

Photoelectric Sensors Accessories



- Choice of Sensor Head
- Glass
- PVC or Stainless Steel Jacket
- Sealed Construction
- 3 or 6-Foot Lengths, Standard

Fiber optic cables transmit light from a control unit to an object and then return the reflected light back to the control unit producing an electrical signal. Because of their small size, fiber optic cables may be installed in areas that were inaccessible with other types of sensors. They are very flexible, vibration proof, submersible, and may be used in high temperature areas. Small part detection or counting is accomplished easily to replace unreliable methods such as weighing.

Special applications are easier to accomplish by specifying different tips rather than an entirely new photoelectric control.

Design Features

Optical glass fibers are encased in either a PVC jacket or, for added protection, a flexible armored stainless steel jacket to resist cuts or abrasion. The tips are constructed from stainless steel, brass, or aluminum for long life. The cables are sealed and may be used in "wash down" or submerged applications. Standard lengths are 3 feet and 6 feet. Consult factory for other lengths.

The addition of fiber optic cables greatly increases the flexibility of Namco's photoelectric sensors. These cables are used for EP140 and EP240 Series Switches.

Jacketed Cables

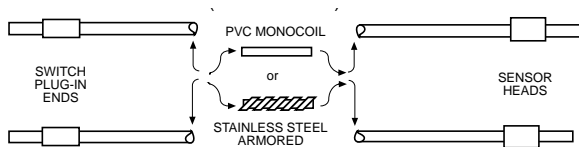
Sensor Head	Bundle Diameter	PVC		Stainless Steel		Approx. Range	
		3' Cable Model No.	6' Cable Model No.	3' Cable Model No.	6' Cable Model No.	Sensitivity Adjustment	
						Minimum	Maximum
SINGLE CABLES							
Hypo Tip	.062	EP181-11020	EP181-11021	EP181-12020	EP181-12021	0.62"	3.00"
Hypo Tip 90°	.062	EP181-11030	EP181-11031	EP181-12030	EP181-12031	0.62"	3.00"
Hypo Tip Bendable	.062	EP181-11120	EP181-11121	EP181-12120	EP181-12121	0.62"	3.00"
Flair Tip Narrow	.062	EP181-11050	EP181-11051	EP181-12050	EP181-12051	0.75"	3.50"
Tight 90° Tip	.094	EP181-11060	EP181-11061	EP181-12060	EP181-12061	4.00"	13.00"
Plain Tip	.125	EP181-11000	EP181-11001	EP181-12000	EP181-12001	5.00"	18.00"
Threaded Tip	.125	EP181-11010	EP181-11011	EP181-12010	EP181-12011	5.00"	18.00"
Flair Tip Wide	.125	EP181-11040	EP181-11041	EP181-12040	EP181-12041	3.25"	13.50"
Plain 90° Tip	.125	EP181-11080	EP181-11081	EP181-12080	EP181-12081	5.00"	18.00"
BIFURCATED CABLES							
Hypo Tip	.062	EP181-21020	EP181-21021	EP181-22020	EP181-22021	0.03"	0.53"
Hypo Tip 90°	.062	EP181-21030	EP181-21031	EP181-22030	EP181-22031	0.03"	0.53"
Hypo Tip Bendable	.062	EP181-21120	EP181-21121	EP181-22120	EP181-22121	0.03"	0.53"
Flair Tip Narrow	.062	EP181-21050	EP181-21051	EP181-22050	EP181-22051	0.00"	0.25"
Tight 90° Tip	.094	EP181-21060	EP181-21061	EP181-22060	EP181-22061	0.28"	1.12"
Plain Tip	.125	EP181-21000	EP181-21001	EP181-22000	EP181-22001	0.38"	1.50"
Threaded Tip	.125	EP181-21010	EP181-21011	EP181-22010	EP181-22011	0.38"	1.50"
Flair Tip Wide	.125	EP181-21040	EP181-21041	EP181-22040	EP181-22041	0.28"	1.12"
Plain 90° Tip	.125	EP181-21080	EP181-21081	EP181-22080	EP181-22081	0.38"	1.50"

NOTE:

	<u>PVC</u>	<u>Stainless Steel</u>
Sheathing O.D.	0.238"	0.234"
Minimum Bend Radius:	0.595"	0.585"
Temperature Range:	-40°F to +235°F	-40°F to +525°F

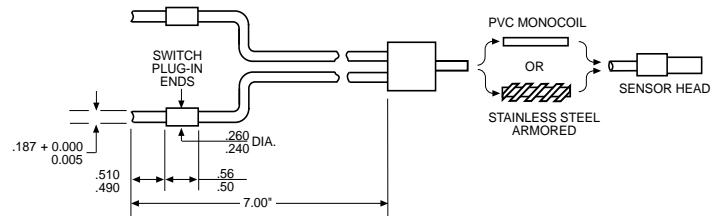
Cable Types

SINGLE CABLE (for Thru-Beam Sensing)



(Order Quantity of Two)

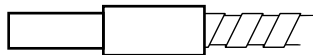
BIFURCATED CABLE (for Diffuse Sensing)



(Order Quantity of One)

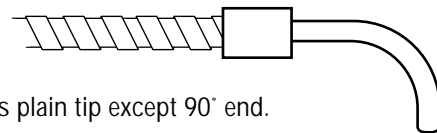
Common Cable Applications

PLAIN TIP



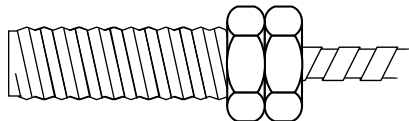
For general purpose use: may be fixed in-place with set screw; most common tip; furthest "Prox" thru-beam range.

PLAIN TIP 90°



Same as plain tip except 90° end.

THREADED TIP



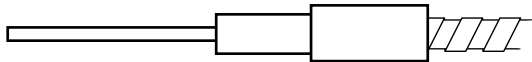
Same as Plain Tip but with brass threaded end; two jam nuts are furnished.

TIGHT TIP 90°



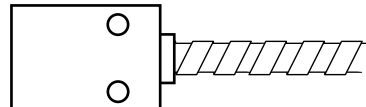
Tight 90° for use in close quarters; may be mounted on chute from vibrator feeder to monitor parts in automatic assembly operations.

HYPOTIP



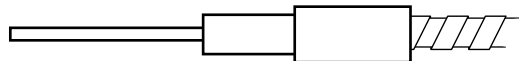
For very small parts or inaccessible areas: diffuse cable could "see" the edge of this page.

FLARE TIP WIDE



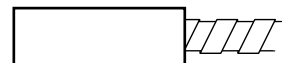
Used for edge control – detects very thin edges. With diffuse cable sensing, very small parts are detected when passed any place in front of the bundle height. Diffuse type also used for register marks detection.

HYPOTIP BENDABLE



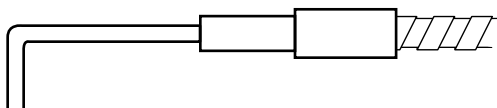
Same as standard hypo tip but tip may be bent to suit; min. bend 1/4"R. and not closer than 1/2" from either end.

FLARE TIP NARROW



Same as flare tip wide except smaller bundle height.

HYPOTIP 90°



Same as standard hypo tip but with 90° bend. May be mounted very close along side narrow conveyor while viewing across it.

NAMCO

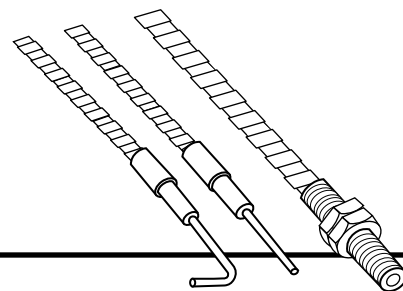
Namco Controls Corporation
Mayfield Village, OH 44143

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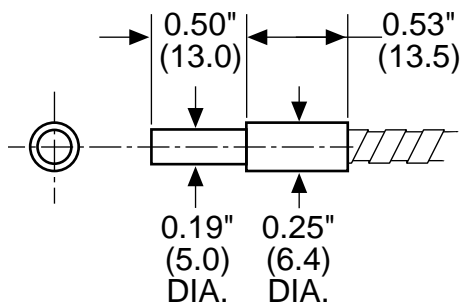
Fiber Optic Cables

Photoelectric Sensors Accessories

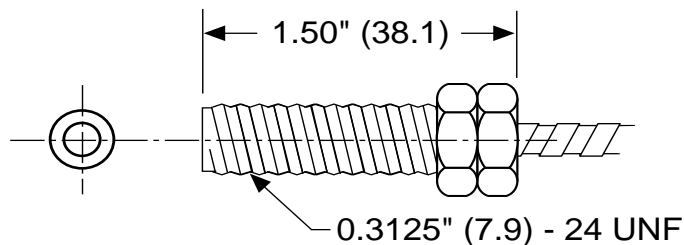


Dimensional Drawings

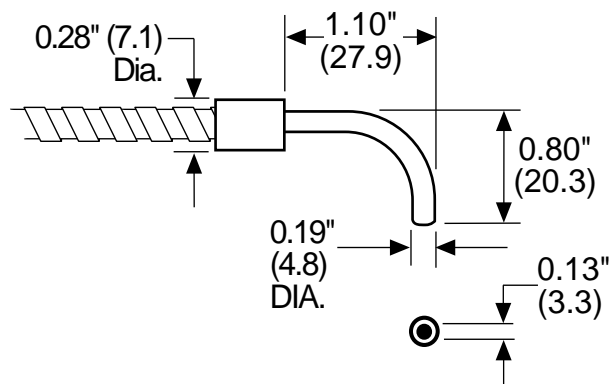
PLAIN TIP



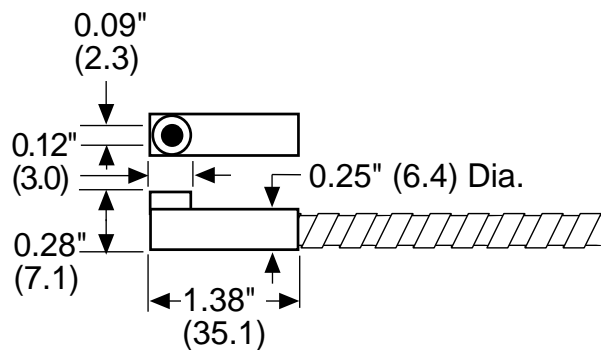
THREADED TIP



PLAIN TIP 90°



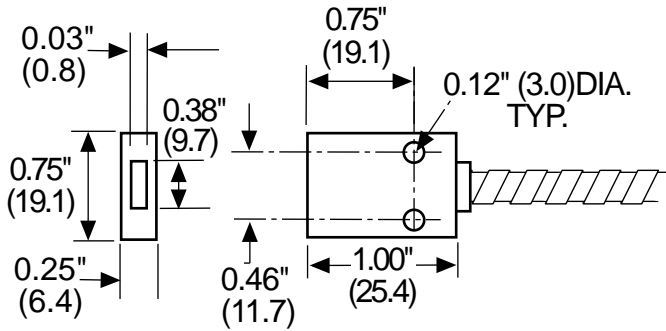
TIGHT TIP 90°



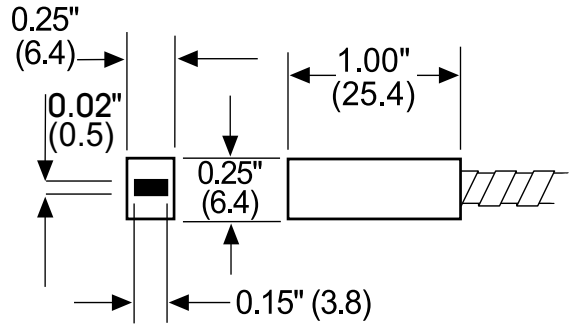
Photoelectric Sensors

Dimensional Drawings

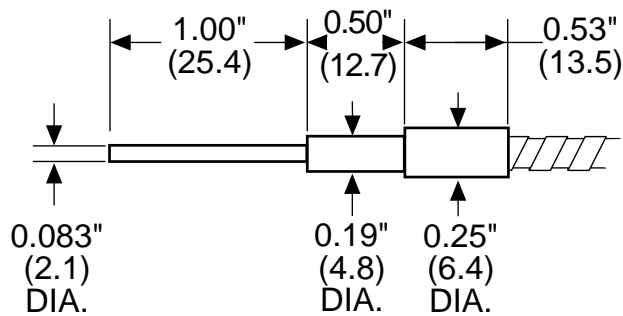
FLARE TIP WIDE



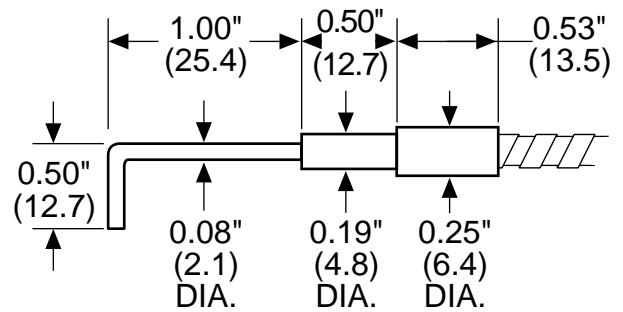
FLARE TIP NARROW



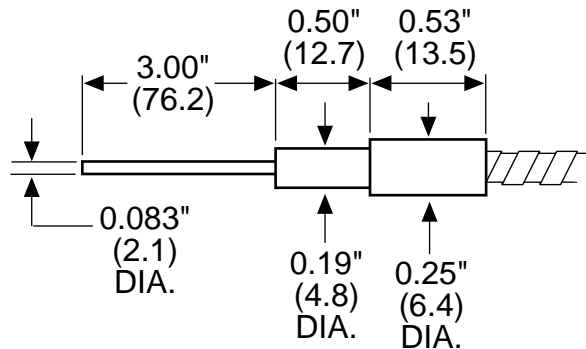
HYPOTIP



HYPOTIP 90°



HYPOTIP BENDABLE



NAMCO

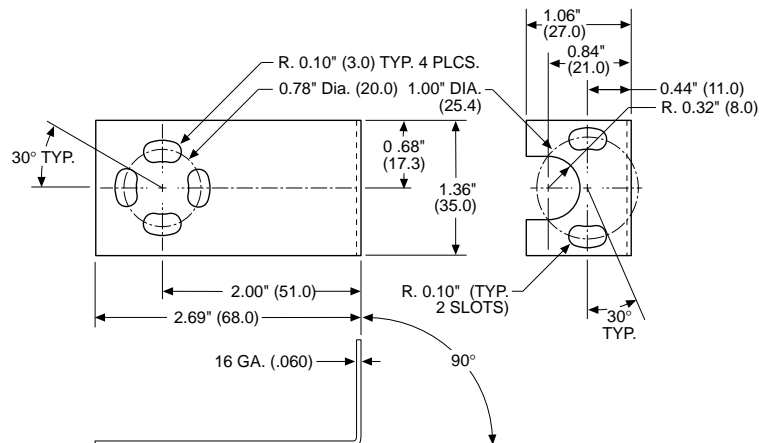
Namco Controls Corporation

Mayfield Village, OH 44143

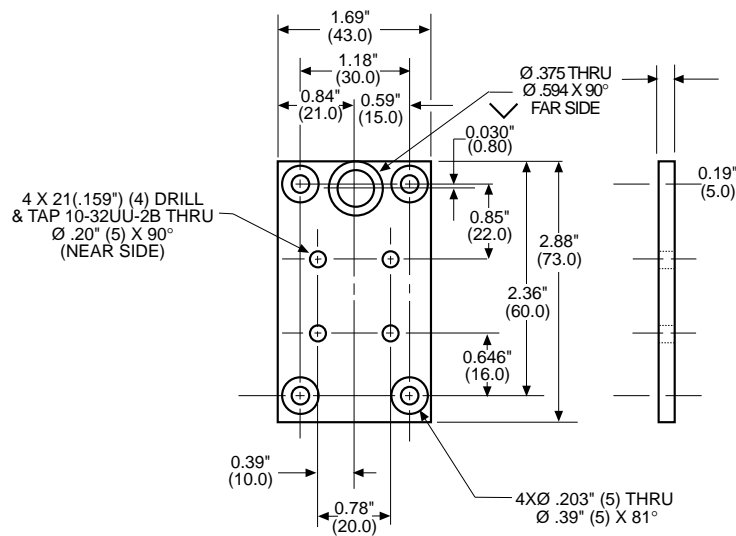
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For technical assistance, call 1-800-NAMTECH

BRACKETS FOR EP200 SERIES

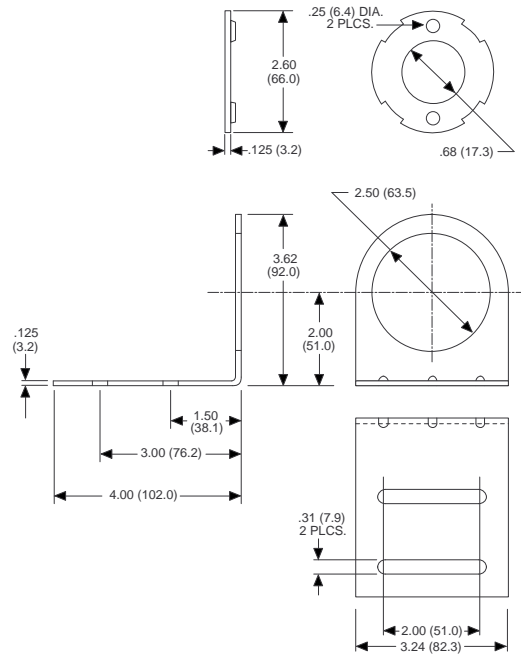


Part No. EP180-20010
Material: Cadmium Plated Steel



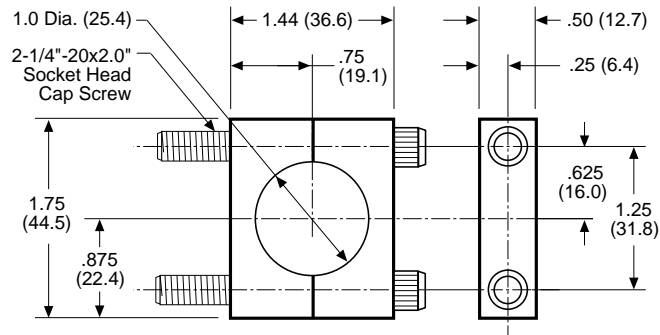
Part No. EP180-20011
Material: Aluminum Clear Anodized

BRACKET FOR TRI-COLOR UNITS



Part No. EP180-40000 (Swivel)
Material: Cadmium Plated Steel

BRACKET FOR EP570 SERIES



Part No. EP180-50000
(Used with EP570)
Material: Cadmium Plated Steel

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Reflectors

Photoelectric Sensor Accessories

The reflector is 50% of a retro-reflective system. Namco tests each reflector to insure its performance. Constructed from a sealed plexiglass assembly, they will operate in most environments. For harsh environments such as solvents or strong chemicals use glass reflectors on next page.

To reduce the effective area of a reflector, mask it with tape or metal shields - NEVER CUT A REFLECTOR. (Exception : EP175-31200 tape)

All Namco Retro-Reflective Units are rated with EP175-13900 (4" x 4") reflector. See chart for additional range information.

Namco High Temperature Reflectors are the same high quality as general purpose types but are designed to withstand environments beyond the norm such as applications requiring "wash down" or in areas where solvents such as toluene or trichloroethylene are present. Temperatures of up to 120°C present no problem.

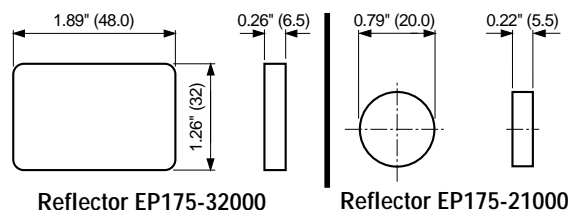
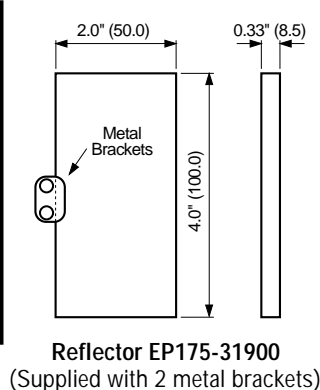
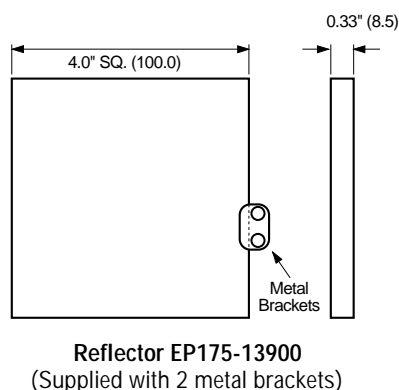
Namco also offers a metal reflector that will withstand a constant temperature of 480°C (900°F).

Recommended Ranges for Various Reflectors*

Reflector Model No.	SERIES	
	EP110	EP210
EP175-13900	0-30.0 ft.	0-10.0 ft.
EP175-31900	0-27.0 ft.	0-8.5 ft.
EP175-21000	1.5-9.0 ft.	0.3-3.0 ft.
EP175-23200	1.5-22.5 ft.	0.3-8.0 ft.
EP175-22400	0-20.0 ft.	0.3-6.0 ft.
EP175-31200	0.75-15.0 ft.	0.3-4.0 ft.
EP175-37100	0-20.0 ft.	0-7.0 ft.
EP175-32000	0-15.0 ft.	0-6.0 ft.
EP175-22600	0-15.0 ft.	0-6.0 ft.
EP175-23201	1.5-22.5 ft.	0.3-8.0 ft.
EP175-14000	0-12.0 ft.	0-4.0 ft.

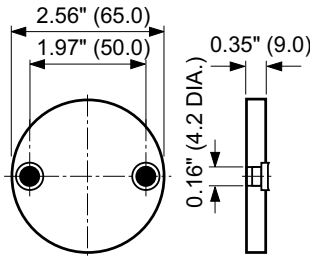
* Rated with clean environment, lens & reflector.

GENERAL PURPOSE REFLECTOR (Adhesive or Bracket mount)

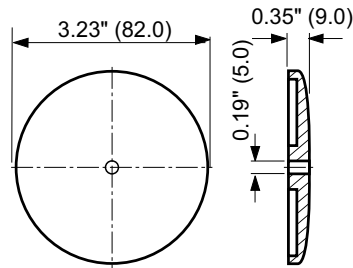


Material: Plastic PMMA 8N (Plexiglass)
Temperature Range: -20°C to +60°C
Mounting: with glue, double face tape, or with brackets

GENERAL PURPOSE REFLECTOR (with Mounting Holes)



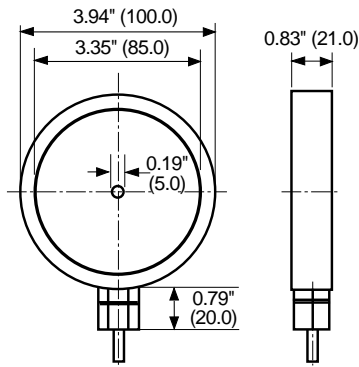
Reflector EP175-22600
Mounting holes for #6 screws



Reflector EP175-23200
Mounting hole for #8 screws

Material: Plastic PMMA 8N (Plexiglass)
Temperature Range: -20°C to +60°C
Mounting: with glue or screws

HEATED REFLECTOR



EP175-23201
Heated Reflector

Material: Plastic PMMA 8N (Plexiglass)
Temperature Range: -20°C to +60°C
Cable Length: 2M (6.6 ft.)
Input: 110VAC/2.0VA
Designed to operate in high humidity, fog, freezers, or outdoors and will keep reflective surface clear allowing proper performance. Shipped with EP175-23200 reflector. (Other voltages available.)

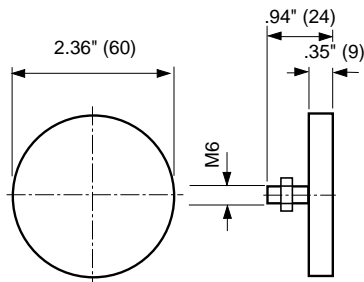
REFLECTIVE TAPE

EP175-31200

- Adhesive backed reflective tape
- 1" x 12" mylar coated, honey combed sealed

Application Note: When cutting to size, allow for loss of reflective surface at cut edge.

HIGH TEMPERATURE GLASS



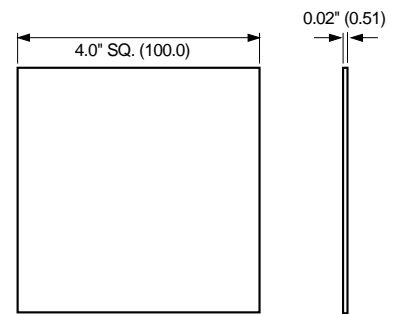
Reflector EP175-22400

Material: Glass
Temperature Range: -20°C to +120°C
Mounting: stud with nut

HIGH TEMPERATURE METAL

Namco High Temperature Reflectors are the same high quality as general purpose types but are designed to withstand environments beyond the norm. Applications requiring "wash down" or in areas where solvents such as toluene or trichloroethylene are present. Temperatures of 120°C present no problem. Totally encased, glass corner-cube elements allow this type of performance.

Namco now offers a metal reflector that will withstand a constant temperature of 480°C (900°F).



Reflector EP175-14000

Material: Aluminum .020 thk. (51mm)
Temperature Range: -20°C to +480°C (900°F)
Intermittent to +540°C (1000°F)
Mounting: May be cut to size and attached with screws or clamps. May be cleaned with detergent and rinsed with water.

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Plug-In Time Delays

Photoelectric Sensor Accessories

Model No.	Delay	ON Delay*	OFF Delay**	Description
EP115-00020	Adjustable ON & OFF; Retriggerable	250 ms to 10 sec.	250 ms to 10 sec.	Shifts Output signal.
EP115-00040	Adjustable ON	250 ms to 10 sec.	None	Output and Input turn OFF at the same point (signal removal).
EP115-00060	Adjustable OFF	None	250 ms to 10 sec.	Output turns ON with Input (catches and stretches short input signals).
EP115-00080	Adjustable ON; Adjustable One Shot (Single Pulse)	100 ms to 5 sec.	Output pulse duration: 100 ms to 5 sec.	Provides uniform Output signal for different Input signals (pulse starts at the end of ON delay period).

* Input signal must be longer than ON delay setting. Shorter input signals will be ignored.

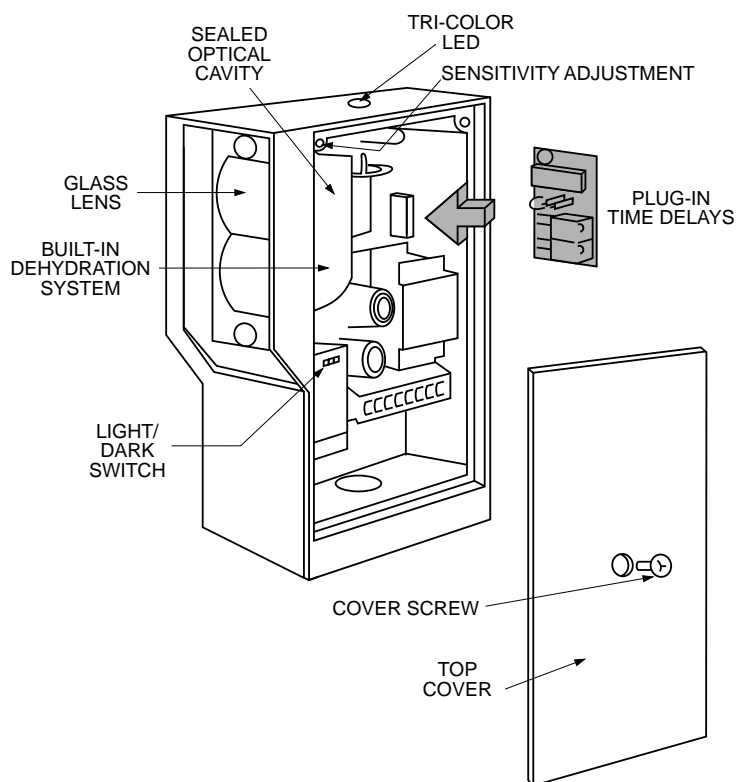
** Input signal must be OFF longer than OFF delay setting.

► When ordering factory installed time-delay units, specify model number to be installed with required time delay.

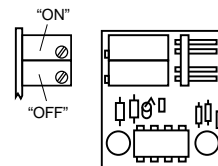
► Consult factory for plug-in "Under Speed" logic boards. Switch output is held unless speed drops below present pulse rate.

Plug-In Time Delays/Installation

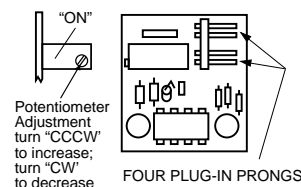
PLUG-IN TIME DELAY FEATURES



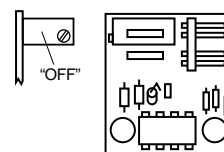
EP115-00020 – DUAL "ON" & "OFF" DELAY



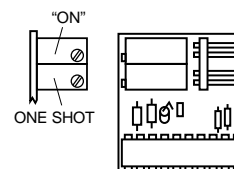
EP115-00040 – "ON" DELAY



EP115-00060 – "OFF" DELAY

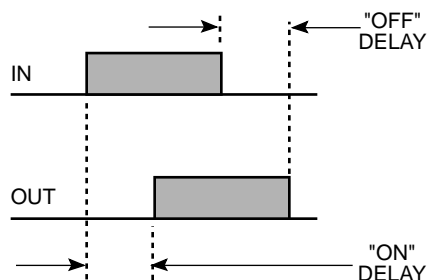


EP115-00080 – DELAYED ONE SHOT

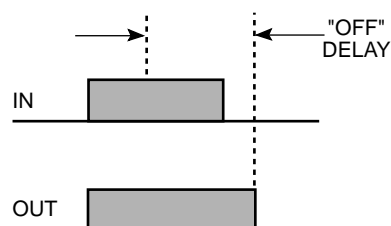


Plug-In Time Delay Graphics

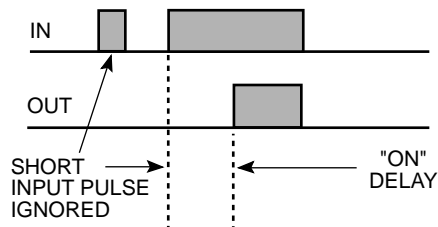
ADJUSTABLE "ON" & "OFF"



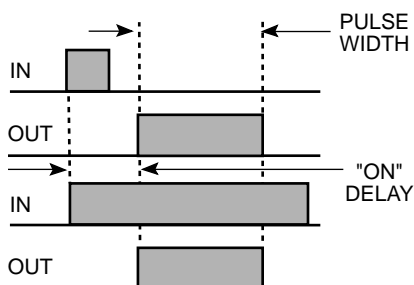
ADJUSTABLE "OFF"



ADJUSTABLE "ON"



ADJUSTABLE "ON" ONE SHOT
SINGLE PULSE



Specifications

PLUG-IN TIME DELAYS

Retriggerable	Timing function will re-start if another object is sensed prior to completion of initial delay setting.
Non-Retriggerable	Timing function will not re-start until full cycle is completed.

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
Photoelectric Performance

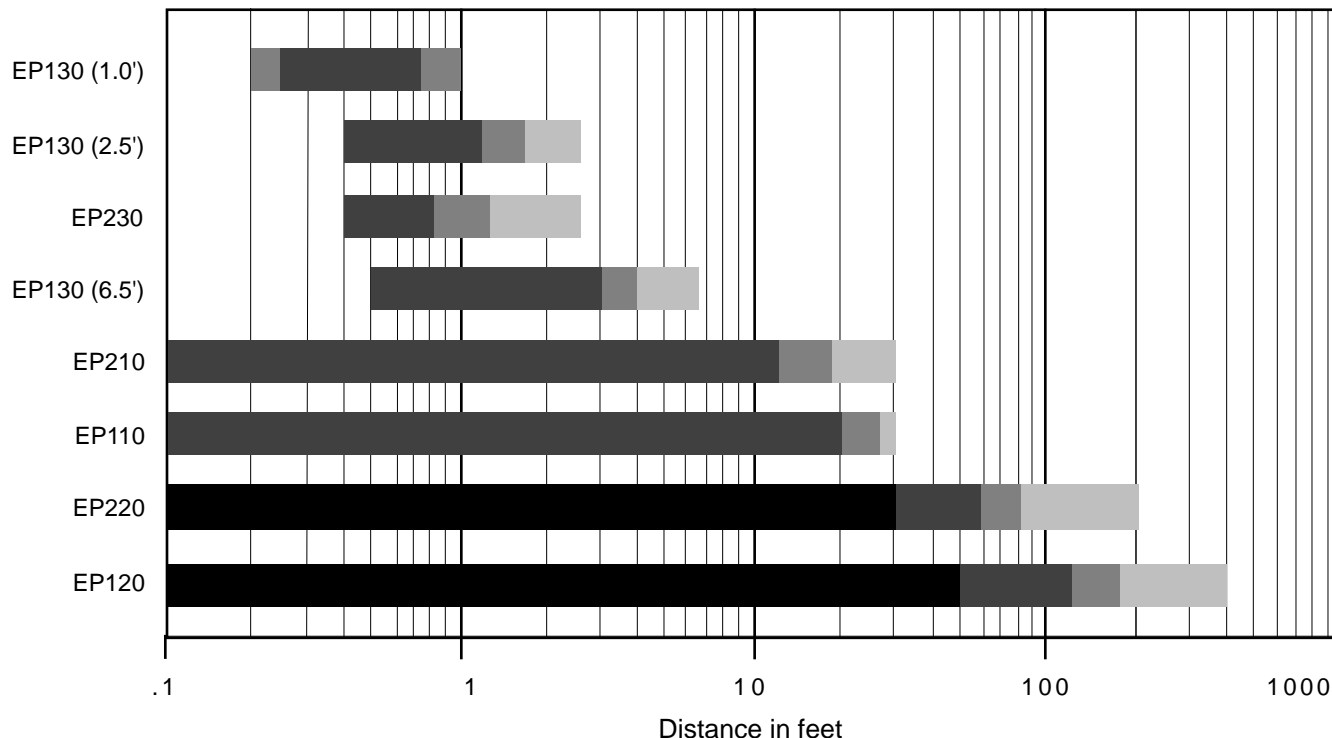
The selection of the proper photoelectric sensor for an application is critical for reliable, trouble-free operation. The graphs shown below are meant to be a guide for matching a type of environment to the sensor types most likely to perform in that environment.

Fiber optic sensor types are not shown due to the different performance characteristics of the many styles of fiber optic cables.

These charts were derived from the Excess Gain Curves for each product. Excess Gain Curves for specific sensors are available on request from Namco Controls.

If you have any questions regarding the suitability of a Namco photoelectric sensor for your application, call our toll-free Technical Assistance Hotline at 1-800-NAMTECH (1-800-626-8324).

-  Suitable for use at these ranges in "clean" environments with no dirt, dust, or water accumulation on the lenses.
-  Can be used at these ranges in slightly dirty environments; lenses should be cleaned regularly. Typical of warehouse or light industrial installations.
-  At these ranges, the sensor can be used in moderately dirty applications where there is visible contamination of lenses or reflectors. Lenses should be cleaned regularly. Most industrial applications fit this category.
-  Suitable for use in extremely dirty environments, or where heavy smoke, steam, or dust is present or when lenses will be cleaned only rarely. Typical environments are steel or paper mills.



NOTE: EP570 – See Excess Gain Chart in Photoelectric WFI Sensors section.

Photoelectric Sensors

Evolution of Photoelectrics

As photoelectrics have evolved, increasing emphasis has been placed on offering user-oriented values. Indicator lamps have been incorporated to signal sensing status; circuits have been expanded to include a solution for every wiring application; and with the implementation of surface mount technology, the features-to-size ratio has improved.

Sensor Light Sources

The first photoelectrics used incandescent light sources. These early products were susceptible to ambient light conditions and limited in application. With the introduction of light emitting diodes ("L.E.D.'s"), the opportunity for applying photoelectric sensors expanded. By modulating (pulsing) the L.E.D. and tuning the receiving photodiode to respond only to this rate of change, immunity to ambient light is improved. Further enhancements have been achieved by incorporating transmission filters to improve the signal-to-noise ratio associated with ambient light.

Reflectors are used in some sensing modes to provide an effective method for returning the emitted light beam to the receiving photodiode. While the most fundamental reflector returns the incident light back to the source only when the incident light strikes the reflector at 90 degrees to the surface of the reflector, the more commonly used "corner cube" retro-reflector will return the incident light to the receiving photodiode over a wide range of incident angles, making alignment angle with respect to the sensor significantly less critical.

Polarizing a light source orients the emitted rays into one plane. If a receiving photodiode is polarized in the same plane as the received light, it will detect the light. In sensing modes where retro-reflectors are used, the retro-reflector shifts the incident light 90 degrees. Photoelectric sensors designed for this mode of sensing are polarized to expect a shift of the incident light by the retro-reflector. Any light returned by specular reflection (from shiny objects) is not shifted and is intentionally undetected by the receiver.

Photoelectric controls are applicable in a wide range of industrial situations because of their long life, versatility, safety, and reliability. Namco's sensors have been tested and proven over many years of operation in all types of environments. Their precision optics can detect objects that cannot be detected by conventional photoelectrics. Namco photoelectric sensors are available in incandescent or LED and feature rugged construction, long-life LED output indication, and insensitivity to ambient light. They also offer time delays, logic delay systems, short circuit protection, and reverse polarity protection. All electronic circuitry is solid state. DC units may be operated from plant power supply or from optional relay/power pack combinations.

Performance

The performance of photoelectrics is dependent on environmental conditions; e.g., air contamination, steam, fog, oil spray. Excess gain is merely a statement of how much extra gain the sensor has over the minimum it needs to communicate in ideal conditions at a given range. The higher the excess gain for a given distance, the more likely the photoelectric is to be able to penetrate through the contamination to reach and be detected by the corresponding receiving photodiode. Since most applications are less than ideal, photoelectrics should be selected with ample excess gain for the intended range.

Output Options

Most of the photoelectrics offered in this catalog are self-contained in that no external stages of circuitry are required to operate the sensors. Newer circuit types include 2-wire AC for ease of installation and lowest cost installation, 3-wire AC for load current independent of input current, and 4-wire DC for user selectable sink (NPN) or source (PNP) connection. All of these are Programmable Logic Controller compatible.

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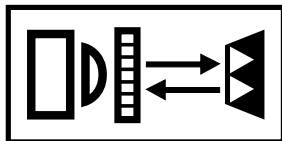
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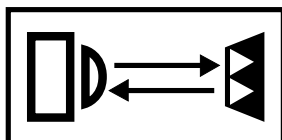
For technical assistance, call 1-800-NAMTECH

Sensing Modes

Photoelectric Sensors



Retro-Reflective Sensing Mode



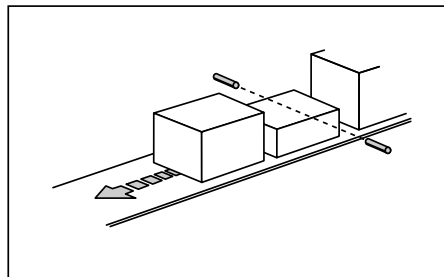
Retro-reflective sensing is particularly effective in applications that offer the

following conditions: (1) the object to be sensed is generally opaque; (2) a reflector can be easily installed so that the object must pass between the sensor and the reflector; or (3) the object may be detected by adding reflective tape to the object.

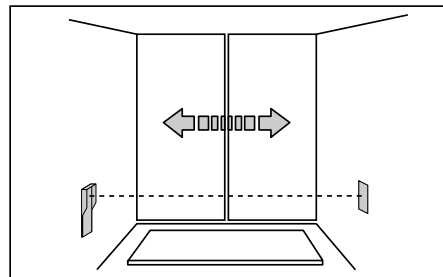
Available ranges of retro units are generally a fraction of the range of comparable size thru-beam units.

In the retro-reflective mode, a single sensor is used to both send and receive light directed to a reflector. Objects passing between the sensor unit and its corresponding reflector interrupt the light beam and signal the sensor to provide the indicated output. Using corner cube reflectors enables the light signal to be returned to the sensor over a wide range of incident angles.

Retro-reflective sensing is popular for its simplicity of installation, and if properly equipped with polarizing options, is independent of target material/color/texture. Operates at distances of up to 30 feet.



Thru-Beam Sensing Modes



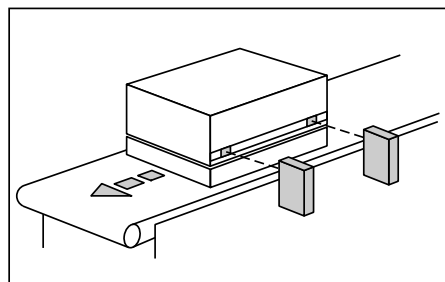
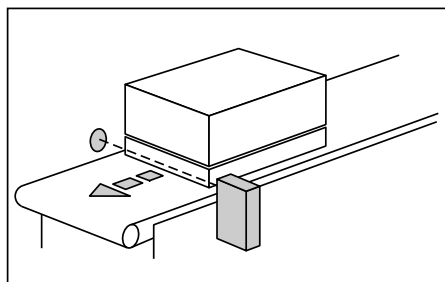
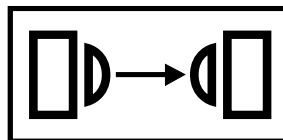
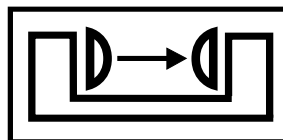
Thru-Beam (Opposed) Sensing Mode

Thru-beam sensing should be employed wherever longer sensing ranges (up to 400 ft.) are required and where harsh or dirty environments require more powerful performance or individually mounted transmitted receiver units.

Thru-beam configurations consist of separate emitter and receiver units aimed at one another and separated so that objects will pass between both units. Without the presence of objects, the emitted light

beam is sensed by the receiver. As objects pass between the two units, the light beam is interrupted, and the corresponding sensor output is provided.

Thru-beam is the most reliable sensing mode. Since the receiver is a separate unit, sensing is totally immune to false proxing from shiny objects. Sensing of transparent objects may require gain control adjustment. Thru-beam systems are inherently higher cost and require additional wiring to the second unit.



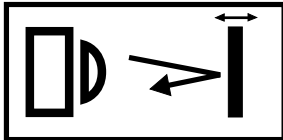
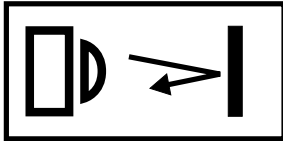
Retro-Reflective Sensing Modes

Diffuse Proximity Sensing Mode

Diffuse proximity sensing should be used when the following conditions exist: (1) the object itself is sufficiently reflective to return incident light to the receiver photodiode; (2) the installation of a reflector on the opposite side of the object is impractical.

The diffuse proximity mode utilizes a single sensor unit as emitter and receiver and relies upon the object sighted to reflect sufficient light to be sensed by the receiver. Absence of objects in the light beam path result in light not returned to the receiver.

Diffuse sensing is the lowest cost approach but depends on the reflectivity (and color) of the target material. This system is suitable for detecting like objects where the gain can be adjusted once for the best performance.



Fiber-Optic Sensing Mode

Introducing a set of fiber-optic cables to photoelectric sensors adds considerable flexibility from an applications perspective. Fiber-optics work well in applications requiring either small part detection or where space in the immediate vicinity of the target object is at a premium. Using fiber-optic cables to reach into environments too harsh for the sensor unit itself is a common application. Fiber-optic cables are immune to electrical and radio frequency interference (EMI and RFI).

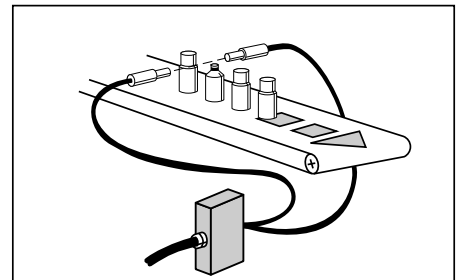
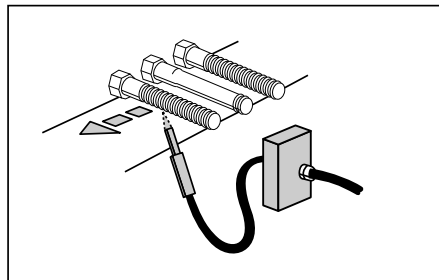
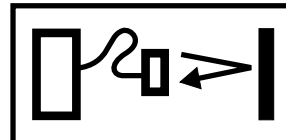
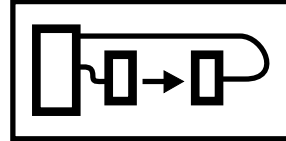
The fiber-optic sensing mode is obtained simply by adding fiber-optic cables to an existing sensor designed to accommodate them. While any sensing mode could utilize fiber-optics, typical cable offerings are designed for thru-beam and diffuse operation. Glass and plastic core materials are common in the industry, each offering their respective advantages and tradeoffs.

Glass cables have better light transmission capabilities, higher operating temperatures and cost, with a sacrifice in physical flexibility. Glass cables cannot be cut to length by the average user.

Plastic cables are lower temperature rated, are less efficient in light transmission, more flexible, lower cost, and can be easily cut to length in the field.

Protective jacketing for fiber-optics include either stainless steel spiral wrap armor or extruded pvc for glass fibers and extruded pvc for plastic fibers.

Both glass and plastic fiber-optic cables offer immunity to electrical interference and permit relocating of the sensor unit in applications where the environment in the sensing area is unusually harsh.



Fiber Optic Sensing Modes

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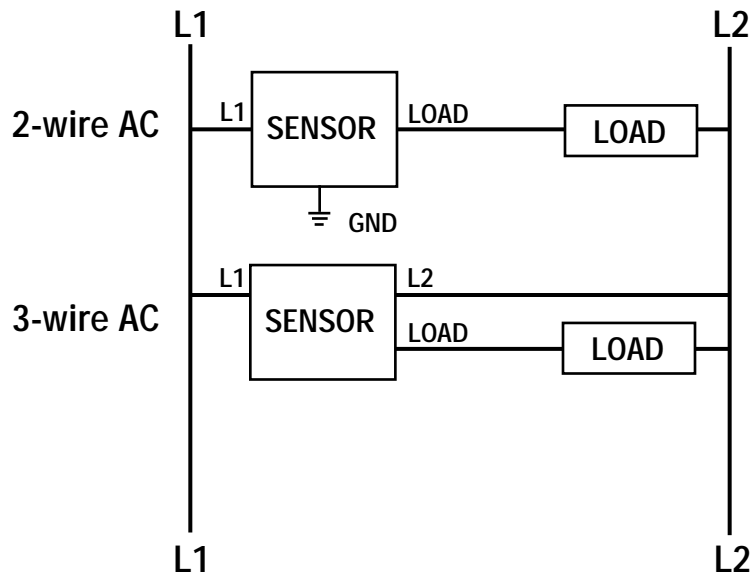
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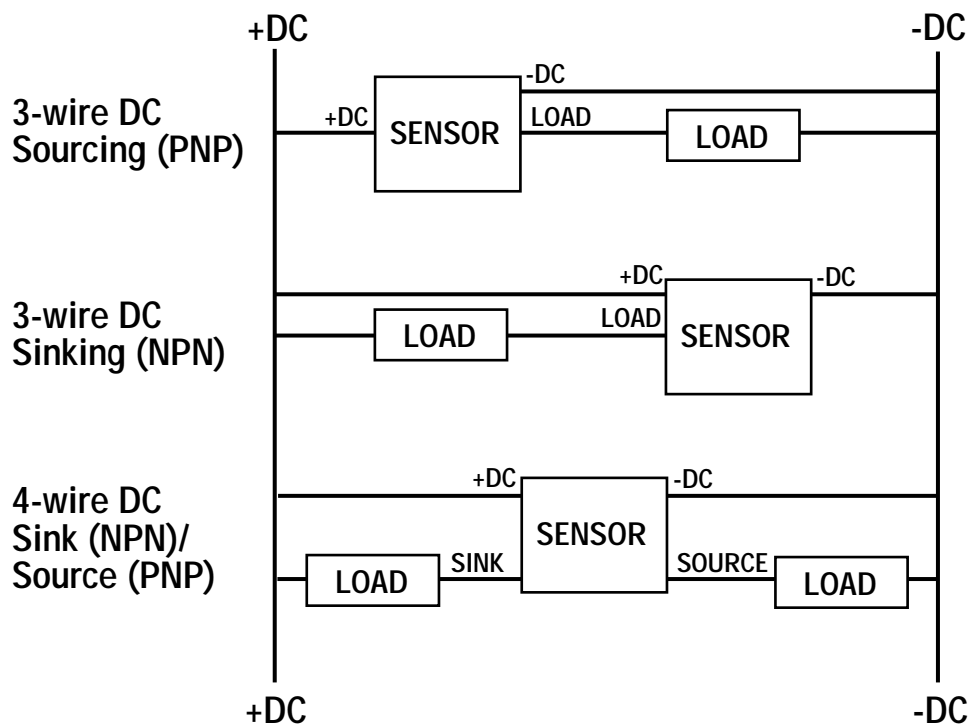
Notes:

1. These diagrams are valid for sensors with cables and connectors.
2. Sensors may or may not have ground connections or grounded housings. Refer to the specific connector or cable diagram for your particular sensor's model number to determine if it is grounded.
3. The markings on these wiring diagrams (L1, Load, etc.) are identical to those on the connector diagrams.
4. All switches are Normally Opened (N.O.) unless specifically marked Normally Closed (N.C.).
5. All switch outputs are Sourcing unless specifically marked Sink.

AC Wiring Diagrams



DC Wiring Diagrams



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Glossary

Photoelectric Sensors

Alignment: Relationship of the light source and the receiver. Proper alignment is necessary to achieve maximum sensitivity to objects being monitored.

Ambient Light: The surrounding light in which the photoelectric sensor operates. Because they use modulated LED switches, Namco sensors are insensitive to ambient light.

Control Module: A remote unit containing the power supply in which amplification, modulation, and conditioning of the photoreceiver signal take place.

Cross-Talk Immunity: A unique capability of Namco sensors that allows several LED controls to be placed close to each other with each receiver responding only to the light beam frequency of its own transmitter.

Current Sinking: The output circuit grounds or sinks the load or current. Current sinking (NPN) or sourcing (PNP) outputs are available on Namco sensors.

Current Sourcing: The output circuit switches the source voltage to the load. Current sinking (NPN) or sourcing (PNP) outputs are available on Namco sensors.

Dark-Operated: Operating mode in which the control is activated by interrupting the beam of light.

Diffuse Proximity: Sometimes called a proximity because of the required nearness of the light source and the photosensor to the reflective object.

Excess Gain: The diffused amount of light falling on the face of a receiver over and above the amount required to operate amplifier of the scanner. It is a guideline measurement for selection of retro-reflective and scanner type units.

Fiber Optic: Cables transmit light from a control unit to an object and then return the reflected light back to the control unit producing an electrical signal.

LED: Light emitting diode. Can be visible or invisible (infrared).

Light-Operated: Operating mode in which the control is activated by an uninterrupted beam of light.

Modulated LED: An LED in which the light is pulsed at a predetermined frequency to reduce interference from ambient light and/or to increase the sensing distance. The receiver is preset to respond only to that predetermined frequency.

Opaque: The quality of a material or object that prohibits light from passing through it.

Operating Mode: Condition of a sensor (dark or light-operated) that will activate it.

Photoreceiver: A unit positioned to detect light, or its absence, in a photoelectric sensor. It consists of a photosensor and a focusing lens in an enclosure.

Proximity: Sensing technique that utilizes a single sensor unit containing both emitter and receiver. Relies upon object to be sensed having high reflectivity.

Range: The distance at which a sensor (excluding thru-beams) will sense white paper on a flat black surface for maximum signal ratio. Retro-reflective units and diffuse proximity units are rated in distance from the unit to a reflector or target.

Repeatability: The ability of a photoelectric unit to sense an object continuously and reliably at a predetermined point within a given tolerance.

Response Time: Time required by a photosensor to respond to an input signal and activate the output.

Retro-Reflective: A sensing technique in which a beam of light is aimed at a specified reflector and reflected back to the photoreceiver.

Reverse Polarity Protection: Usually a diode inserted in one of the power leads of a D.C. switch. This protects the internal circuitry if connections are accidentally reversed.

Self-Contained Control: A photoelectric sensor capable of sensing, signal conditioning, and output in a single unit.

Signal Ratio: The relationship of light to dark when the sensor is illuminated. Proper control alignment is necessary to establish optimum light-to-dark signal ratio.

Specular: Reflective technique in which a light beam is reflected back to a photoreceiver at a predetermined angle from the object being monitored.

Thru-Beam: Sensing technique in which the light source and the sensor are located opposite each other, and the light beam passes from the source to the receiver directly without the use of a reflector.

Translucent: The quality of a material or object that permits light to pass through it but diffuses it. For detection purposes, a retro-reflective technique works best with translucent objects because light must pass through twice, thus producing a larger signal change.

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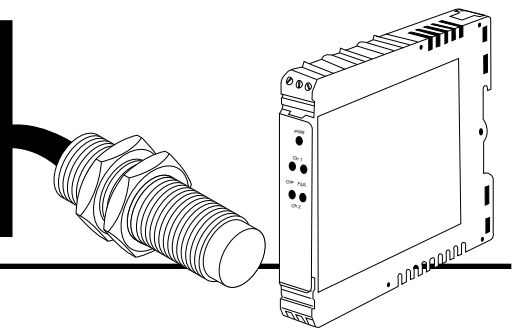
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NAMUR Sensors

Hazardous Location Sensor Systems



NAMUR refers to the standards committee of measurement and control of the chemical industry of Europe. Namco sensors comply with DIN 19234 and therefore are compatible with the NAMUR requirements.

NAMUR sensors are typically used for hazardous location sensing in areas

that require extremely compact sensors. Namur Sensors are not stand-alone sensors unless your control system input is capable of determining current change. Unlike most other sensors, the Namur Sensor uses very low voltage as a source and changes the current passed through as a function of how close the

target is to the sensing coil. Namur sensors are used with either stand-alone amplifiers or Namur specific PLC input cards. When used in a hazardous location, an appropriate barrier is required.

Special Application Solutions

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Sensing Range		Maximum Load Current	Maximum Switching Frequency		Short Circuit Protected
						Shielded	Unshielded		Shielded	Unshielded	
6.5mm Diameter NAMUR 5-25 VDC Smooth											
6.6' Cable	Analog	Metal	30mm	ET112-00310	—	1mm	—	N/A	1KHz	—	N/A
8mm Diameter NAMUR 5-25 VDC											
6.6' Cable	Analog	Metal	30mm	ET112-10310	—	1mm	—	N/A	1KHz	—	N/A
12mm Diameter NAMUR 5-25 VDC											
6.6' Cable	Analog	Metal	30mm	ET112-20310	ET112-21310	2mm	4mm	N/A	800Hz	400Hz	N/A
6.6' Cable	Analog	Plastic	30mm	ET212-20310	ET212-21310	2mm	4mm	N/A	800Hz	400Hz	N/A
18mm Diameter NAMUR 5-25 VDC											
6.6' Cable	Analog	Metal	30mm	ET112-30310	ET112-31310	5mm	8mm	N/A	500Hz	200Hz	N/A
6.6' Cable	Analog	Plastic	30mm	ET212-30310	ET212-31310	5mm	8mm	N/A	500Hz	200Hz	N/A
30mm Diameter NAMUR 5-25 VDC											
6.6' Cable	Analog	Metal	40mm (Sh) 42mm (UnSh)	ET112-40310	ET112-41310	10mm	15mm	N/A	300Hz	250Hz	N/A
6.6' Cable	Analog	Plastic	40mm	ET212-40310	ET212-41310	10mm	15mm	N/A	300Hz	250Hz	N/A
Small Rectangular NAMUR 5-25 VDC											
6.6' Cable	Analog	Plastic	12x26x40mm	ET912-10310	ET912-11310	2mm	4mm	N/A	800Hz	400Hz	N/A

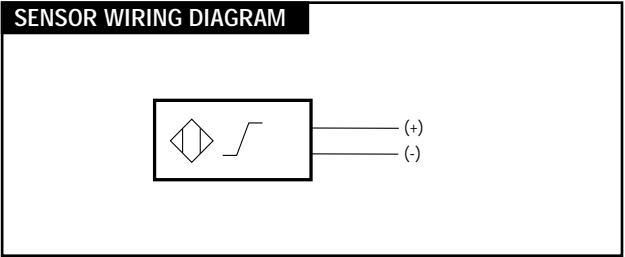
Please consult factory for other versions.



Common Sensor Characteristics

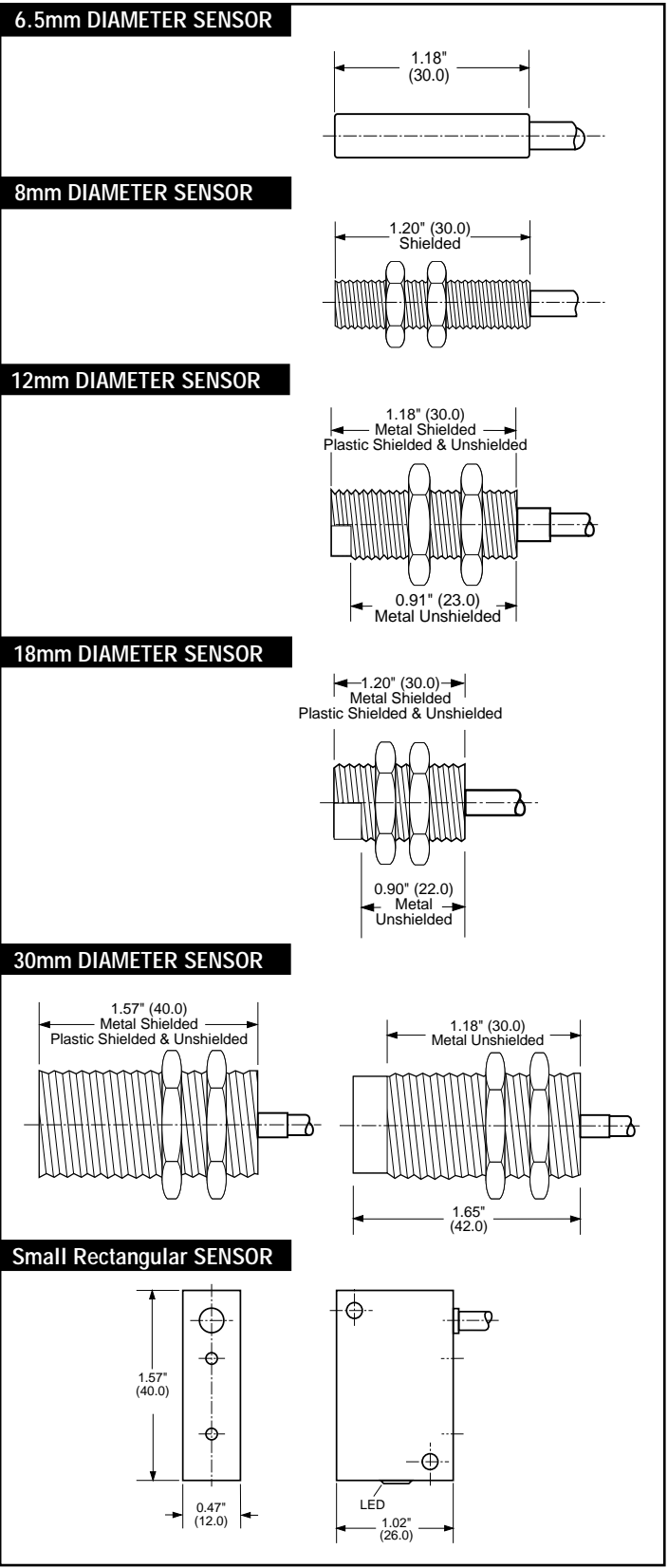
NAMUR DC SENSORS	
Shielded Sensing Range	6.5mm: 1mm 8mm: 1mm 12mm: 2mm 18mm: 5mm 30mm: 10mm Sm. Rec.: 2mm
Unshielded Sensing Range	8mm: 2mm 12mm: 4mm 18mm: 8mm 30mm: 15mm Sm. Rec.: 4mm
Shielded Standard Target (mm) (mild steel)	6.5mm: 8x8x1 8mm: 8x8x1 12mm: 12x12x1 18mm: 18x18x1 30mm: 30x30x1 Sm. Rec.: 12x12x1
Unshielded Standard Target (mm) (mild steel)	8mm: 8x8x1 12mm: 12x12x1 18mm: 24x24x1 30mm: 45x45x1 Sm. Rec.: 16x16x1
Repeatability	2%
Hysteresis	3-8% (typ.); 15% (max.)
Temperature Drift (Max.)	±15%
Ambient Temperature Range	-13°F to +158°F
Current Consumption	N/A
NEMA Rating	1, 3, 4, 6, 13
LED Indicator	N/A
Metal Housings	Chromed Brass
Plastic Housings	Ultradur®
Shipping Weight	6.5mm: 8 oz. 8mm: 8 oz. 12mm: 8 oz. 18mm: 8 oz. 30mm: 10 oz. 34mm: 11 oz. Flat Pack: 5 oz. (Add 5 oz. for Cable model)

Circuit Drawings



Dimensional Drawings

NAMUR

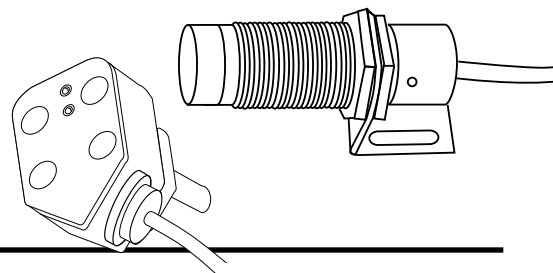


Namco Controls Corporation
Mayfield Village, OH 44143
(440) 460-1360 • FAX (440) 460-3800 • namcocontrols.com

For technical assistance, call 1-800-NAMTECH

**Intrinsically
Safe**

Hazardous Location Sensor Systems



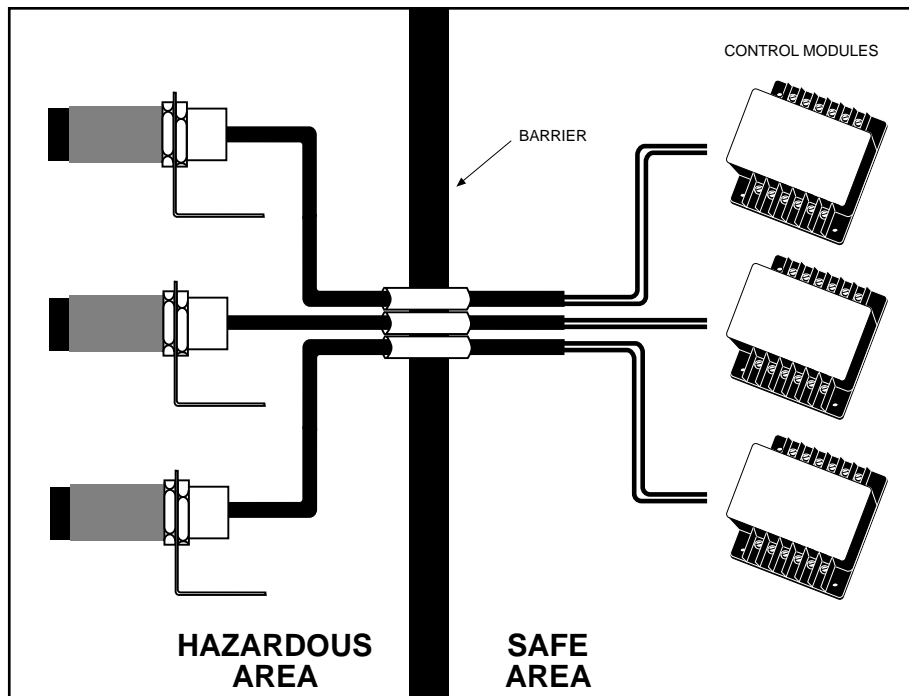
For use in:

**Class I - Groups A, B, C, & D
Class II - Groups E, F, & G**

The EE931 Hazardous Location sensor system is excellent for sensing of position in paint spray booths, belt slip on conveyors, or anywhere that explosion proof switches are normally used. Since the EE931 system is intrinsically safe, no special housings are required to contain any potential flame. Intrinsic Safety is obtained by design of the product such that extremely limited energy is available in the hazardous location. For this reason, these Namco sensors must only be used with the Namco control module. It is possible, however, to use the Namco control module with either the Namco sensors listed in this section or a standard limit switch. (Limit switches must be of the gold contact type due to the low current and voltage supplied by the control module.)

Sensors

Namco offers a variety of intrinsically safe sensors for use in Class I, Groups A, B, C, and D and Class II, Groups E, F, and G hazardous locations. These EE931-series sensors must be used **ONLY** in conjunction with Namco's EE931-series control modules. The hazardous location sensors are completely encapsulated and contain a transistor oscillator circuit. Variations in oscillator amplitude caused



An intrinsically safe proximity sensor system consists of a sensor, which is mounted in the hazardous area, and a control module, which is mounted in the safe area.

by metallic objects passing in front of the sensor face produce activation of the control module output.

Twenty feet of 18AWG oil resistant cable is provided with tubular sensors, although up to 1000 feet can be obtained for applications where the hazardous area is a considerable distance away from the safe area control panel. Sensors providing up to one inch of sensing range are available.

Cylindicator® sensor versions are provided with 50 feet of cable. For longer cable lengths, consult factory.



Cylindicator® Sensors

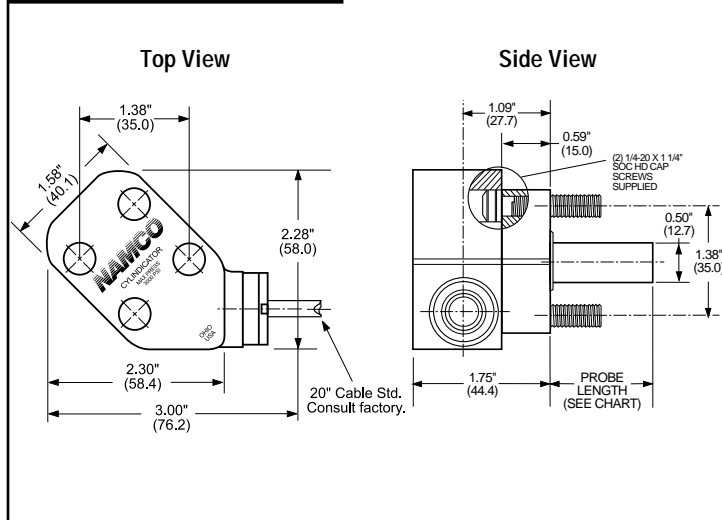
Model No.	Probe Length
EE931-30101	0.950
EE931-30401	1.025
EE931-31301	1.250
EE931-38701	2.062
EE931-37801	2.875
EE931-39001	3.775

Tubular Sensors (See "Sensing Range" opposite page)

Model No.	Sensing Range		"C" Mtg. Clear.	Thread	Cable (20')
	"A" Sensing Field	"B" Side			
EE931-56200	0.20" (5.0)	0.25" (6.3)	0.40" (10.1)	3/4"-20	2 Cond. 18 AWG SVO
EE931-76500	0.37" (9.5)	0.25" (6.3)	0.57" (14.6)	M30 x 1.5	2 Cond. 18 AWG SVO
EE931-75100	1.00" (25.4)	0.50" (12.7)	2.50" (63.5)	M30 x 1.5	2 Cond. 18 AWG SVO

Dimensional Drawings

90° ROTATABLE CYLINDRICATOR® SENSOR



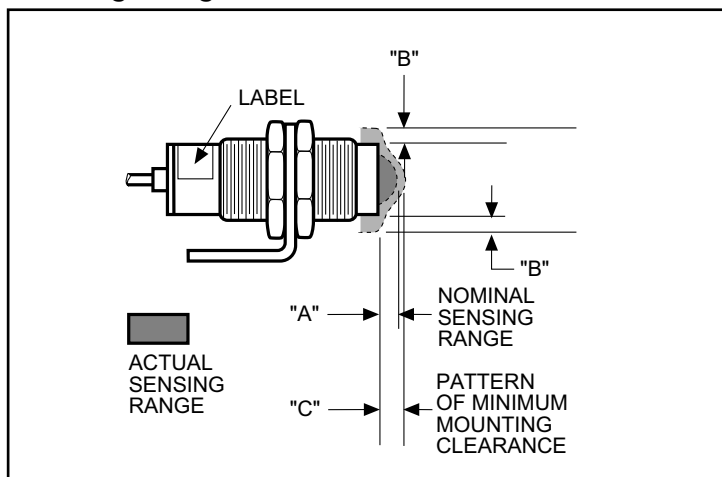
Sensor Mounting

Sensors may be installed with mounting bracket furnished in any position provided the sensor face is kept free of electrically conductive material. See below for maximum sensing range and pattern of minimum mounting distances from other conductive materials for the EE931-series sensors.

See the Cylindricator section in this book for application information on Cylindricator sensors.

Factors influencing sensing range are temperature, target size, target material, and speed. For best all-around performance, use "slide-by" actuation as opposed to "head-on" actuation. Target should present as much surface area to the sensor face as practical. Sensing of non-ferrous metals may reduce sensing range by as much as 50%, depending on the type of material. Since the sensing range of each sensor is fixed, no control module adjustment is required. The target should be placed as close to the sensor face as possible. Namco recommends setting the target at one-half the "maximum" sensing range or closer for best system operation.

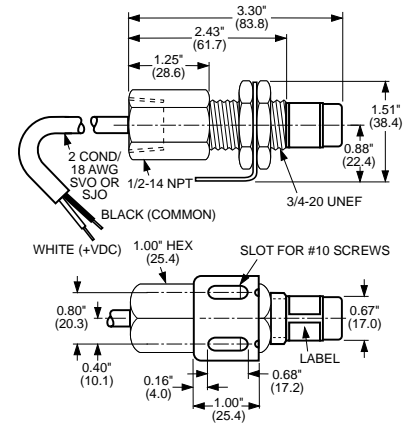
Sensing Range



Dimensional Drawings

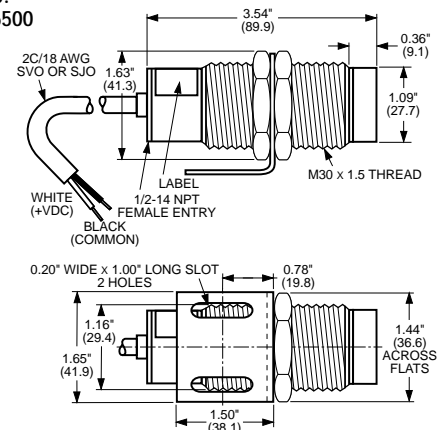
TUBULAR SENSOR – 3/4-20 THREAD 17mm SMOOTH BARREL

Model No.
EE931-56200



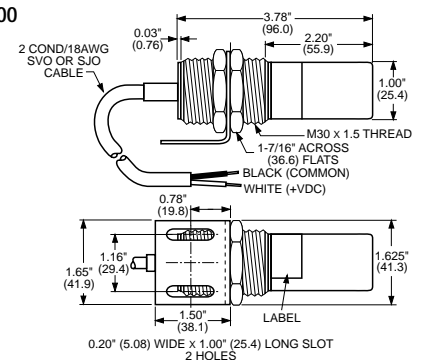
TUBULAR SENSOR – M 30x1.5 FULL THREAD

Model No.
EE931-76500



TUBULAR SENSOR – M 30x 1.5 THREAD 1" SMOOTH BARREL

Model No.
EE931-75100



Continued on
next page. ➡

NAMCO

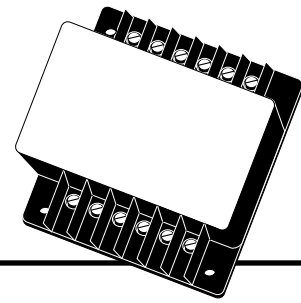
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**Intrinsically
Safe**

Hazardous Location Sensor Systems



Control Modules

The EE931-series control modules are designed to be mounted in the safe area. These modules provide limited energy to Namco's line of hazardous location sensors described on the previous pages. The control modules are housed in high impact Lexan® enclosures and are equipped with eight screw terminals (#8 stud size) for ease of installation. The EE931-02103 module provides an electro-mechanical relay output (One Form C), while the EE931-02303 unit has a photo-darlington (open collector) output for higher speed requirements. The outputs become energized when a metallic target is present in front of the associated sensor.

Control Module Mounting:

The EE931-series control module **should be panel mounted in the safe area** where it will be protected from physical damage, dirt, and vibration. The location should be established within the limits of the sensor cable. The unit can be mounted vertically or horizontally using two No. 8 screws. When mounting with only two screws, **it is imperative to use the two mounting holes provided with brass eyelet inserts**. This method provides an additional ground path for the electronic circuit contained in the module. The ambient temperature range should be from -40°F to +158°F. The physical construction of the control module housing insures a separation of at least two inches between intrinsically safe terminals (5 and 6) and non-intrinsically safe terminals (7 thru 12).

It is important when installing the sensor cable to the control unit terminals (5 and 6) to maintain this minimum spacing of two inches. A separate wiring duct is required to insure that the intrinsically safe sensor cable does not become intermingled with non-intrinsically safe wiring due to vibration. A separate conductor **MUST** be wired from Terminal 9 to earth ground to insure intrinsic safety of the system. Terminal 8 is for the neutral side of AC line. Terminal 7 is hot side of AC line and **MUST** be wired accordingly or intrinsic safety is voided.

Namco advises that the Instrument Society of America Specification RP12.6, which gives the recommended practice for installation of intrinsically safe systems, be followed when using the EE931-series control modules and sensors.

Technical drawings of the Control Module showing front and side views with dimensions.

Front View Dimensions:

- Overall Width: 4.00" (101.6)
- Overall Height: 4.00" (101.6)
- Top Mounting Holes: #8 - 32 x 5/16" SCREWS (8)
- Primary Mounting Holes (with Brass Eyelets): 8 holes, 4 on top and 4 on bottom.
- Output Indicator: Located on the right side of the front panel.
- Label: Located on the right side of the front panel.
- Bottom Mounting Holes: 8 holes, 4 on top and 4 on bottom.
- Bottom Panel Dimensions: 0.37" TYP (9.5) height, 0.38" TYP (9.6) spacing between holes, 3.25" (82.5) width of the bottom panel.
- Label Dimensions: 1.06" (27.0) height, 0.73" (18.5) width.

Side View Dimensions:

- Overall Height: 3.00" (76.2)
- Top Mounting Holes: 1.16" (29.3) height.
- Bottom Mounting Holes: 0.27" (6.8) height.
- Output Indicator: 0.82" (20.9) height.

RELAY OUTPUT

TO HAZARDOUS LOCATION
INTRINSICALLY SAFE

SENSOR #1

OUTPUT STATUS (+)

BLK WHT

NAMCO
CONTROL MODULE
MENTOR, OHIO 44060

EE931-02103

EE931-02103 NON-HAZARDOUS LOCATION CONTROL UNIT FOR EE931-SERIES SENSORS USED IN CLASS I GROUPS, A, B, C AND D; CLASS II, GROUPS E, F, AND G HAZARDOUS LOCATIONS.

RATING	RELAY OUTPUT	
SPOT SWITCH ONLY ONE POLE/ARCTY STD DUTY 50 VAC OR SA RESISTIVE @ 120 VAC		LOAD #1

INPUT: 115VAC 50/60 HZ 2.5 VA

LINE NEUT. GRND.

OUTPUT - RELAY

TO HAZARDOUS LOCATION
INTRINSICALLY SAFE

SENSOR #1

OUTPUT STATUS (+)

BLK WHT

NAMCO
CONTROL MODULE
MENTOR, OHIO 44060

EE931-02303

EE931-02303 NON-HAZARDOUS LOCATION CONTROL UNIT FOR EE931-SERIES SENSORS USED IN CLASS I GROUPS, A, B, C AND D; CLASS II, GROUPS E, F, AND G HAZARDOUS LOCATIONS.

RATING	OUTPUT - PHOTO-DARLINGTON	
RATING 24V _{cso} MAX. 50 mA MAX.		LOAD #1

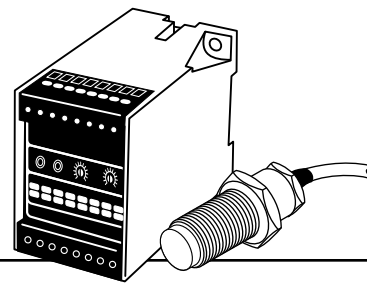
INPUT: 115VAC 50/60 HZ 2.5 VA

LINE NEUT. GRND.

OUTPUT - PHOTO-DARLINGTON

INTRINSICALLY SAFE CONTROL MODULE		
	EE931-02103	EE931-02303
Output	Electro-Mechanical SPDT Relay Rated 5A Resist. One form C	Photo-Darlington 50mA max. @ 24 VAC Open Collector
Speed (Hz)	3	1400
Supply Voltage	120 VAC	
Sensor Input	Namco EE931-Series only	
Ambient Temperature	-40°F to +158°F	
Case Material	Lexan	

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com



- Sensor does not impede media flow
- Totally solid-state—no mechanical parts to wear out
- Monitors both flow and temperature of media
- Rugged, stainless steel sensor

Namco Flow Sensors operate on the calorimetric flow principal providing an economical, reliable way to detect variations in media flow by thermal conduction.

To measure the "heat sinking" capability, or thermal transfer of the media, two temperature sensitive silicon semiconductors and a heater are

mounted directly underneath the sensor face. Flow rates deviating from the user set points are detected by a Wheatstone-Bridge/Amplifier package. This design combines a proven method of measurement with a fully encapsulated, industrial quality, flat-head sensor.

The sensor head is constructed so that no protrusions into the flow media occur. The sensor itself is made entirely of stainless steel. Both flow and temperature are monitored and user adjustable. Switching functions are indicated by LEDs.

The remote electronic packaging enables the system to be operated in applications where monitoring and/or adjusting flow and setpoints is difficult or hazardous such as in a robot cell. The remote electronic module can be

mounted outside of the cell while the sensor is inside enabling easy access even while the robot is in motion.

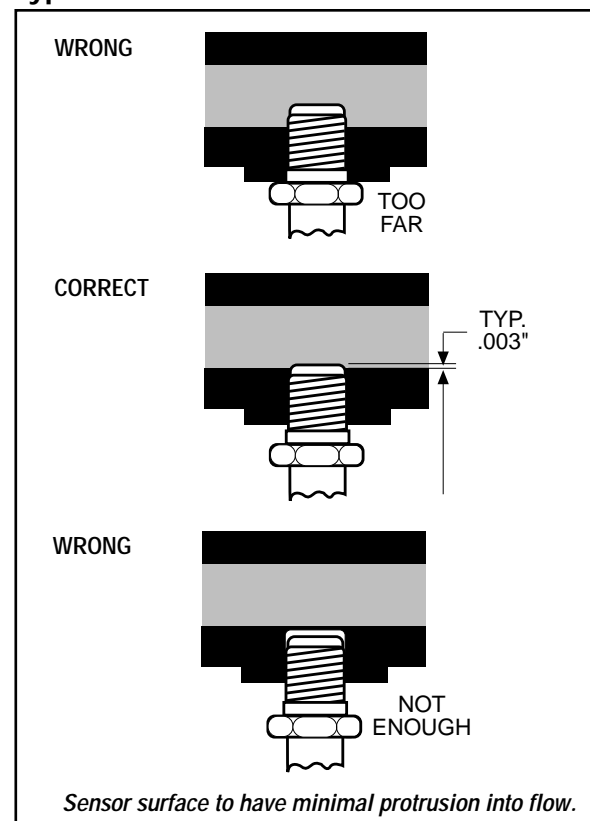
Applications

Coolant, water or lubricant temperature and/or flow indication.

- Dry running protection of pumps
- Flow rate control in boiler systems
- Flow rate monitoring of coolant in welding machines
- Heating systems and exchangers
- Chemical process monitoring
- Pharmaceutical process control
- Lubrication flow rate monitoring
- Process control monitoring of media flow in food and beverage, sewage/wastewater industries, etc.

Model Number	Supply Voltage	Output
Total System (Sensor & Control Module)		
ER320-10000	110VAC	Thyristor NO/NC
ER320-10002	110VAC	DPDT Relay
ER320-10001	24VDC	NPN & PNP Transistor NO/NC
Sensor Only		
ER310-10000	—	—
Control Module Only		
ER300-10000	110VAC	Thyristor NO/NC
ER300-10002	110VAC	DPDT Relay
ER300-10001	24VDC	NPN & PNP Transistor NO/NC

Typical Sensor Installation



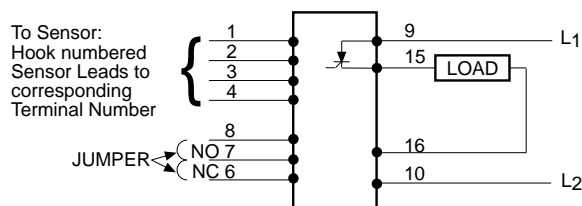
Common Sensor Characteristics

FLOW SENSOR SYSTEMS			
	AC/Thyristor	AC/Relay	DC/Transistor
Pipe O.D. (inches)	Min. Detectable Flow (gal/min)	Max. Detectable Flow (gal/min)	
1/2"	0.020	6.023	
3/4"	0.045	13.551	
1"	0.080	24.090	
1 1/4"	0.125	37.641	
1 1/2"	0.181	54.203	
2"	0.321	96.360	
Supply Voltage	110 VAC 50/60 Hz	110 VAC 50/60 Hz	24VDC
Power Consumption	3VA	4VA	2W
Sensor Pressure Rating	435 psi max.		
Ambient Temperature	+14°F to +158°F		
Media Temperature	+14°F to +176°F		
Temperature Set Point	+23°F to +176°F		
Flow and Temperature Adjustment	Potentiometer and LED		
Output	Thyristor	DPDT Relay	NPN & PNP Transistor
Load Current	30 mA min. 300 mA max.	8A @ 220VAC	500mA
Short Circuit Protection	Yes	No	Yes
Response Time	<5 seconds		

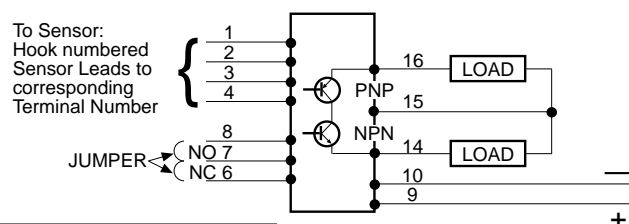
Maximum distance between Control Module and Sensor is 328 ft. using low inductance cable.

Circuit Drawings

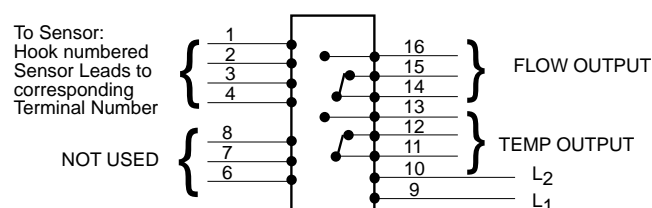
AC THYRISTOR MODELS



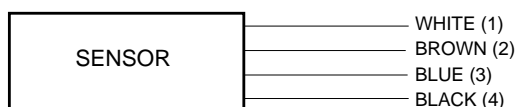
DC TRANSISTOR MODELS



AC/DC RELAY

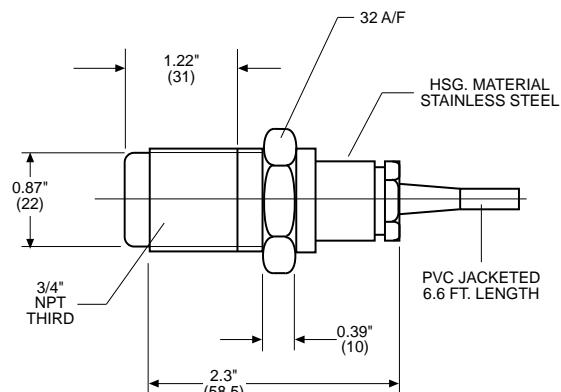


SENSOR WIRING

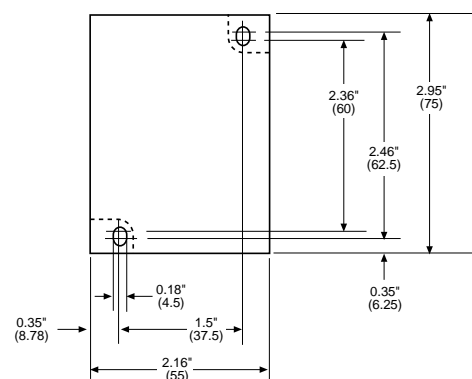
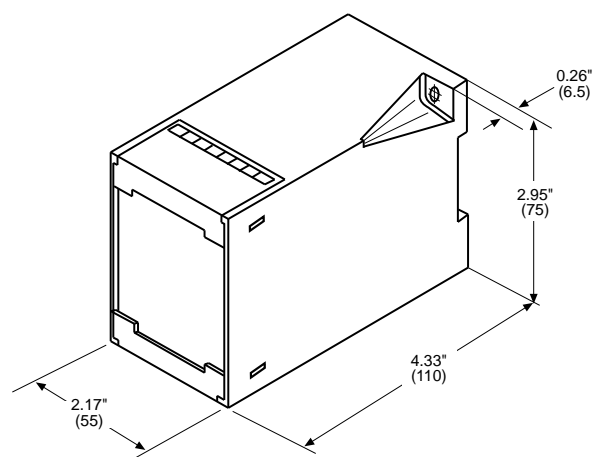


Dimensional Drawings Flow Sensors

SENSOR



CONTROL MODULE



NAMCO

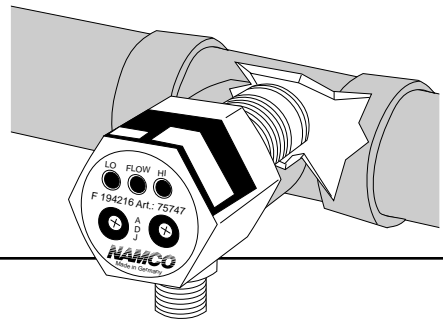
Namco Controls Corporation
Mayfield Village, OH 44143
(440) 460-1360 • FAX (440) 460-3800 • namcocontrols.com

For technical assistance, call 1-800-NAMTECH

Special Application Solutions

**Self-
Contained**

Machinery Protection Flow Sensors



Applications:

Coolant, water or lubricant temperature and/or flow indication.

- Dry running protection of pumps
- Flow rate monitoring of coolant in welding machines
- Heating systems and exchangers
- Chemical process monitoring
- Pharmaceutical process control
- Lubrication flow rate monitoring
- Process control monitoring of media flow in food and beverage, sewage/ wastewater industries, etc.

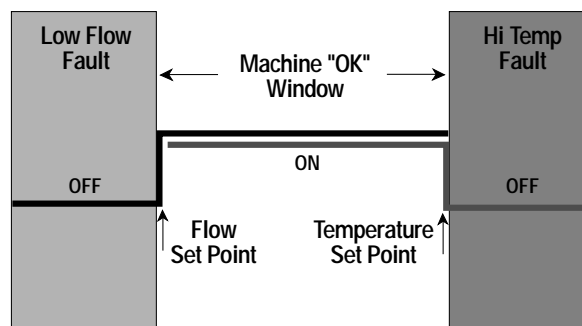
The Namco ER330-10004 (GmbH # 75743) High Temp/Low Flow Sensor acts as a comprehensive machinery coolant or lubrication system monitor. It monitors two key indicators of your machinery's health: the temperature and flow of either coolant or lubricants. The switch alarms when flow is too low or when temperature is too high.

The sensor mounts into fluid supply lines using a 3/4" NPT pipe fitting. Its self-contained design uses a "flat head" sensing surface that does not protrude into the media, so it doesn't obstruct media flow. Solid state circuitry within the sensor detects flow variations based on thermal conduction. Construction is all stainless steel.

The high temp/low flow sensor monitors media temperature and will signal when coolant is too hot (indicating your equipment is overheating) or when coolant flow is too low. These sensors are both 24 VDC only.

Special Application Solutions

High Temp/Low Flow Sensor

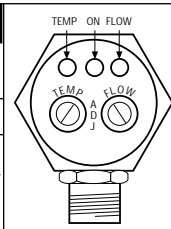


Common Sensor Characteristics

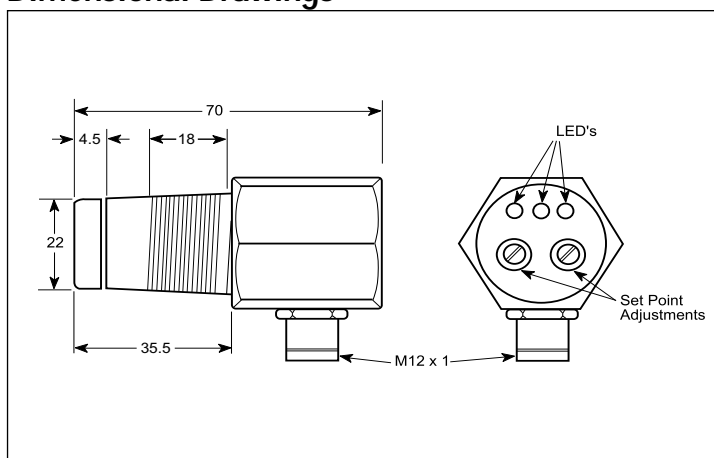
SELF-CONTAINED FLOW SENSORS		
Pipe O.D. (inches)	Min. Detectable Flow (gal/min)	Max. Detectable Flow (gal/min)
1/2"	0.020	6.023
3/4"	0.045	13.551
1"	0.080	24.090
1 1/4"	0.125	37.641
1 1/2"	0.181	54.203
2"	0.321	96.360
Response Time		<5 seconds
Ambient Temperature		-10°C to +70°C
Media Temperature		-10°C to +80°C
Temperature Set Points		Potentiometer and LED
Adjustment		Potentiometer and LED
Supply Voltage		24 VDC
Power Consumption		<2 Watts
Load Current		0.5 to 300mA
Voltage Drop		<3.5 VDC
Leakage Current		<10µA
On/Off Indication		LED
Short Circuit Protection		Yes
Reverse Polarity Protection		Yes
Protection Class		IP 67
Housing Material		Stainless Steel
Pressure Rating		Maximum 435 PSI
Connector		4-pin Euro Style

High Temp/Low Flow - LED Functions

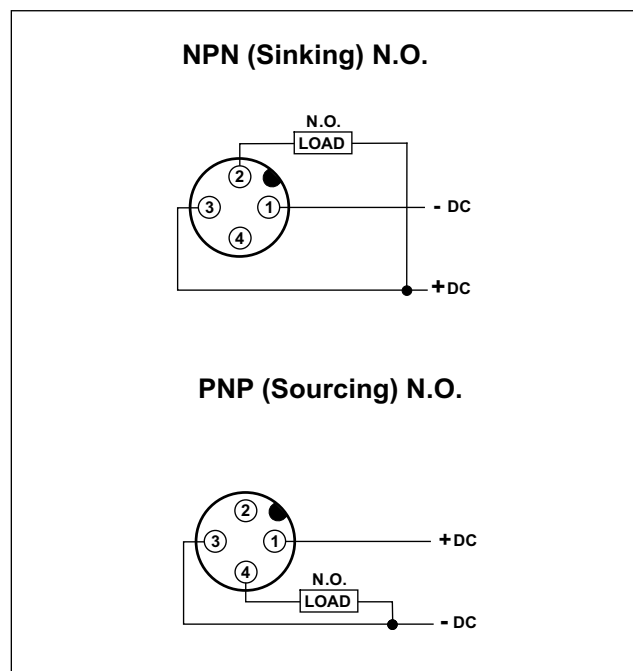
RED	GREEN	RED	CONDITION
Over Temp (TEMP)	Power (ON)	Flow-in-Range (FLOW)	High Temp/Low Flow (ER330-10004)
OFF	ON	OFF	Under-flow Fault
OFF	ON	ON	Temp/Flow Okay
ON	ON	OFF	Over-temperature Fault



Dimensional Drawings



Wiring Diagrams



NAMCO

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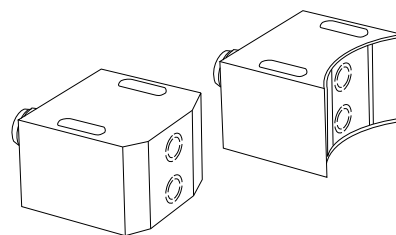
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For technical assistance, call 1-800-NAMTECH

Flat Face
Round Face

Dual Position Valve Sensors

DC
AC



- Senses open and closed valve position in a single-piece compact housing
- Epoxy encapsulated
- Available in AC, DC, and Namur configurations
- 4-pin Euro connector or cable versions available
- Easily mountable
- Compact; approximately one square inch mounting footprint

The new NAMCO Valve Position Proximity Sensor employs a single-piece design to simplify installation. Two inductive proximity sensors are in a single housing. These sensors monitor target disks on the valve actuator, sensing up to four disk combinations which correspond to valve positions. The

sensor is epoxy encapsulated and utilizes surface mount electronics for reliable operation under harsh industrial conditions. Three models are available: one with a standard 10-30 VDC output, one with 80-250 VAC, and the other a Namur-style for hazardous location use.

4mm Range Plastic Housing Valve Sensors

Connector Type	Circuit Description	Housing Style	Model Number	Voltage Drop	Maximum Load Current	Short Circuit Protected
4mm SENSING RANGE NAMUR						
2 m Cable	2 W NAMUR	Round Face	ET912-43310	4.5V@ 200mA	200mA	Yes
2 m Cable	2 W NAMUR	Flat Face	ET912-53310	4.5V@ 200mA	200mA	Yes
4-pin euro	2 W NAMUR	Round Face	ET912-43351	4.5V@ 200mA	200mA	Yes
4-pin euro	2 W NAMUR	Flat Face	ET912-53351	4.5V@ 200mA	200mA	Yes
4 mm SENSING RANGE 10 - 30VDC						
2 m Cable	3-W PNP NO	Round Face	ET911-43110	2.5V@ 200mA	200mA	Yes
2 m Cable	3-W NPN NO	Round Face	ET910-43110	2.5V@ 200mA	200mA	Yes
2 m Cable	3-W PNP NO	Flat Face	ET911-53110	2.5V@ 200mA	200mA	Yes
2 m Cable	3-W NPN NO	Flat Face	ET910-53110	2.5V@ 200mA	200mA	Yes
4-pin euro	3-W PNP NO	Round Face	ET911-43151	2.5V@ 200mA	200mA	Yes
4-pin euro	3-W NPN NO	Round Face	ET910-43151	2.5V@ 200mA	200mA	Yes
4-pin euro	3-W PNP NO	Flat Face	ET911-53151	2.5V@ 200mA	200mA	Yes
4-pin euro	3-W NPN NO	Flat Face	ET910-53151	2.5V@ 200mA	200mA	Yes
4mm SENSING RANGE 80 - 250VAC						
2 m Cable	2 W AC NO	Round Face	ET920-43410	11V@ 200mA	200mA	No
2 m Cable	2 W AC NO	Flat Face	ET920-53410	11V@ 200mA	200mA	No
3 pin micro	2 W AC NO	Round Face	ET920-43420	11V@ 200mA	200mA	No
3 pin micro	2 W AC NO	Flat Face	ET920-53420	11V@ 200mA	200mA	No

► Consult factory for normally closed model availability.



Common Sensor Characteristics

VALVE PROXIMITY SENSORS			
	3-Wire DC	2-Wire AC	NAMUR
Supply Voltage	10-30V DC	80-250V AC	5-25V DC
Voltage Drop	≤ 2.5V @ 200mA	11V @ 200mA	n/a
Max. Load Current @ 25°C	200mA	200mA	2.2mA
Leakage Current	10µA	10µA	n/a
Sensing Range	4mm		
Reverse Polarity Protected	Yes	Yes	n/a
Max. Switching Frequency	180/400Hz	20Hz	400Hz
Ambient Temp. Range	-25°C to 70°C (-13°F to 158°F)		
Short Circuit Protected	Yes	No	n/a

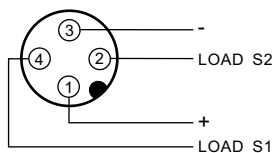
LED Functions

	3-Wire DC	2-Wire AC	NAMUR
	Yellow	Yellow	Yellow
Power Off	Off	Off	Off
Power On - Load De-energized	Off	Off	Off
Power On - Load Energized	On	On	On

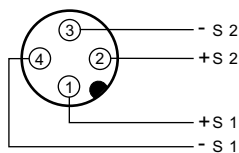
Circuit Drawings

EURO CONNECTOR MODELS

3 Wire DC N.O.

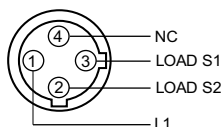


NAMUR



MICRO CONNECTOR MODEL

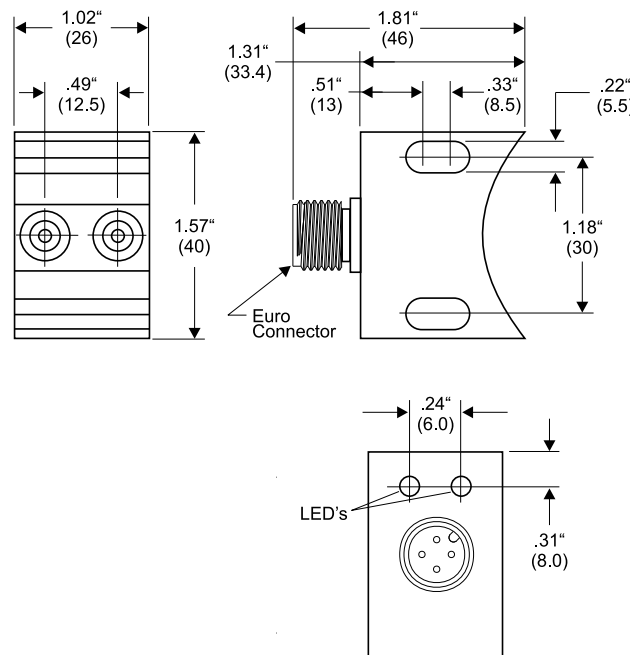
2 Wire AC N.O.



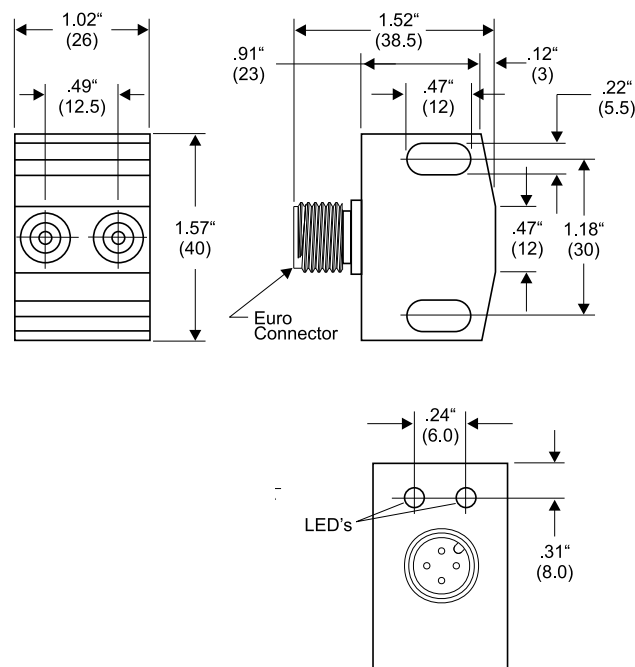
Dimensional Drawings

DC AC

ROUND FACE



FLAT FACE



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Mayfield Village, OH 44143

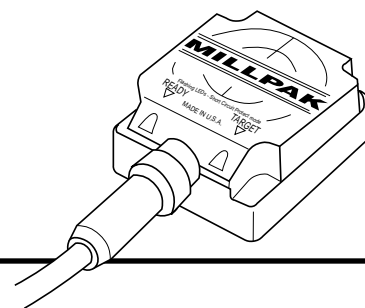
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For technical assistance, call 1-800-NAMTECH

Special Application Solutions

**Mill
Hardened**

Focused Field Long Range Sensors



- Mill Hardened
- Highly Liquid Resistant
- Non-Corrosive cable connection
- Focused Field Will not Lock on Surrounding Metal
- Resistant to electrical noise
- Latching SCP - Simplifies Troubleshooting
- Made in USA

The NAMCO MillPak Hardened Flatpak® Proximity Sensor is the first long range sensor designed to operate reliably in the toughest mill environments.

With liquid and mechanical damage being the largest contributors to switch failure in the harsh mill environment, the MillPak proximity sensor has been designed to effectively combat the effects of both problems, increasing the life expectancy of your sensor.

The MillPak proximity sensor has been sealed to provide a high degree of liquid resistance, allowing the sensor to be used in areas where water cooling and overspray are not a random occurrence, but a daily operation. The mating of the cordset and stainless steel receptacle is also a watertight connection. The stainless steel receptacle resists most corrosive elements and allows the MillPak proximity sensor to remain watertight over many hours of operation.

Competitive sensors have traditionally incorporated two piece housings which are susceptible to liquid leakage and overall water damage.

The MillPak sensor integrates Namco's focused sensing field into it's heavy duty structure. This focused sensing field minimizes sensing of surrounding metal and with a clearance of 0.25" around the sensor, the sensor

will never lock on to surrounding metal. This allows the MillPak sensor to be mounted tightly in brackets or directly in and flush to metal flooring!

Competitive sensors often incorporate a trim pot which allows the user to adjust the sensing range of the sensor as the ambient temperature conditions change. Their sensing field often increases dramatically as the ambient temperature increases, causing the sensor to eventually "lock-on" to surrounding metal. With Namco's patented focused field technology and temperature stability, this sensor never has to be adjusted. The field shape is maintained over the sensor's entire rated temperature range!

With the most noise resistant circuitry in the business, the MillPak sensor is extremely resistant to radio frequency interference and other forms of electrical noise. False detection problems are not an issue with the MillPak sensor.

The MillPak sensor also incorporates Namco's Short Circuit Protection (SCP). If the sensor detects excessive current, it reverts to a limiting state with the LED's alternately flashing. This flashing provides a clear indication of a problem in the circuit thereby simplifying troubleshooting.

Special Application Solutions

Connector Type	Circuit Description	Housing Dimensions	Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
40mm SENSING RANGE DC 10-30V								
4-pin Mini	3W, NO	92x79x40mm	ER511-88430	200mA	10µA	<2.5V @ 200mA	15Hz	yes
40mm SENSING RANGE AC/DC 20-150V								
3-pin Mini	3W, NO	92x79x40mm	ER530-88430	.2A	1.7mA	≤10V	15Hz	yes

Please consult factory for additional versions.

Common Sensor Characteristics

MILLPAK PROXIMITY SENSORS		
Supply Voltage	10-30V DC	20-150V AC/DC
Voltage Drop	$\leq 2.5V$ @ 200mA	$\leq 10V$
	$\leq 2.0V$ @ 100mA	
Max. Load Current @ 25°C	200mA	0.2A
Inrush Current (rms 1Hz)	-	1.5A
Leakage Current	10 μ A	1.7mA
Sensing Range	40mm	
Response Time	30ms	
Power-up Time	70ms	
Max. Switching Frequency	15Hz	
Ambient Temp. Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

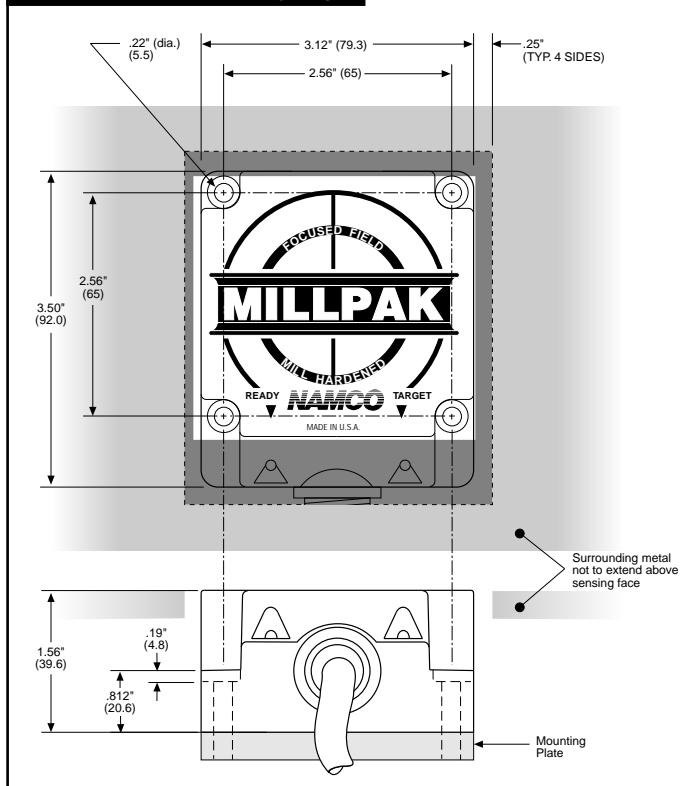
	10-30V DC		20-150V AC/DC	
	Red	Green	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Dimensional Drawings

ER500

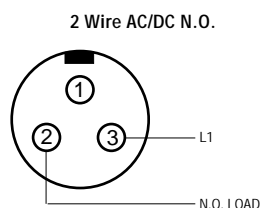
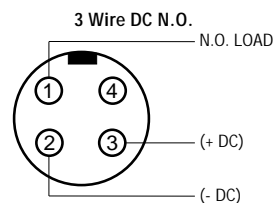
METAL EMBEDDED APPLICATION



Circuit Drawings

MINI CONNECTOR MODELS

Male views shown



NAMCO

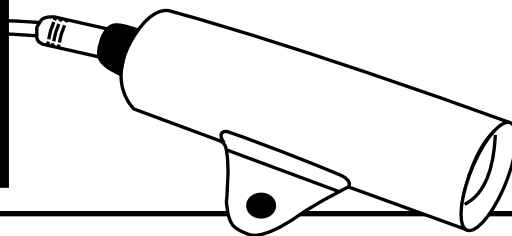
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Special Application Solutions



Reliably sense hot objects in high ambient temperature and dirty conditions.

NAMCO Infra-Red (IR) Hot Metal Detectors not only survive in hot environments, they work because of them. When the IR energy level emitted from a hot object exceeds the HMD's internal set point, the sensor output energizes. Set points of 250°, 450°, 360°, or 800°C and lenses of different viewing angles adapt the HMD to application requirements. The unit's 2-wire AC or 3-wire DC discrete output directly interfaces with programmable controllers or relay coils. The optional pre-check feature allows for remote triggering of the sensor output to verify switching performance.

Available in self-contained and remote lens styles, the tubular stainless steel housing with glass lens is impervious to steam, water, dust, shock, and vibration common to heavy industrial environments.

The self-contained style HMD has a lower installed cost than the remote style HMD and is ambient temperature rated to 85°C. Units with optional cooling jacket increase this rating to 125°C.

The remote lens system is used in applications with high ambient temperatures and/or where system flexibility is invaluable. The sensor electronics are encapsulated in an oil- and water-tight control module. The remote lens is connected to the control module by a stainless steel-jacketed fiber optic cable. The remote lens, void of electronic circuitry, will survive ambient temperatures to 150°C. The fiber optic cable has a 260°C ambient temperature rating and can be used without a remote lens. (Consult factory for details.)

Hot Metal Detectors are ideally suited for continuous caster, hot strip, bar and wire, forge and foundry applications.

Temperature response curve

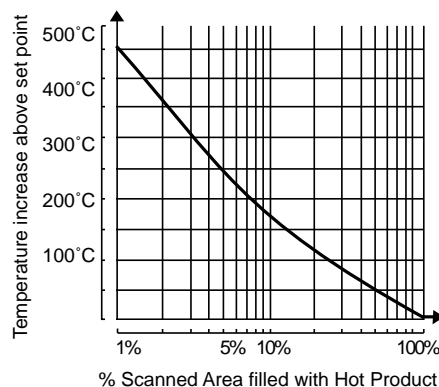
If the surface to be sensed is exactly at the set point temperature of the sensor, then 100% of the scanned area must be covered by the hot surface. As this surface is elevated in temperature, less of the scanned area needs to be covered. The Temperature Response Curve shows the % scanned area to be covered as temperature of sensed surface is elevated above set point.

Example: The IR Sensor ER920-13812 - Response temperature when scanned area is covered 100% by hot product = 450°C

However, if only 5% of scanned area contains hot product, the IR Sensor requires an additional (see chart) set point temperature (250°C).

Set Point Temperature of ER920-13812 = +250°C

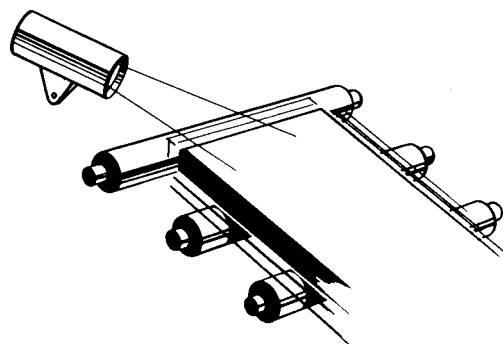
Effective response temperature is therefore = 700°C



Hot Product Sensors Series ER 800 & 900

Call Namco 1-800-NAMTECH for ordering assistance, or consult your local Namco representative or distributor.

Temperature of Object Being Sensed	Remote or Self-Contained Style	Viewing Angle
≥ 800°C	• Remote control module with lens and fiber optic cable	• 25°
≥ 450°C	• Remote control module with only fiber optic cable (no lens)	• 7°
≥ 360°C	• Self contained	• 2°
≥ 250°C	• Self contained with water-cooled jacket	• 1°
		• 1/2°
		• 2° x 25°
		• 1° x 25°
		• 1/2° x 25°



What role does product temperature play?

Namco offers four set point temperatures for its line of HMD's. The set point temperature is the minimum temperature level at which the sensor will detect the product. For example, if the HMD set point temperature is 360°C, it will not detect products with temperatures less than 360°C. The sensor will, however, sense all products hotter than 360°C that cross into its field of view. Available set point temperatures and basic application guidelines are as follows:

800°C - Used for continuous cast monitoring, ladle pour applications, and other operations where temperatures of the metal are between 800°C and molten.

450°C - This is the most frequently used HMD throughout hot strip mills, bar mills, forging presses, etc. It can also accommodate reasonable quantities of steam, water spray, etc. expected in the rolling or forging process.

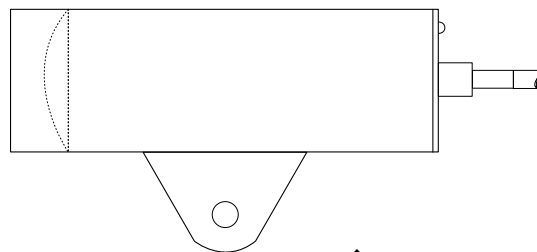
360°C - Used for lower temperature applications where background "noise" temperatures are less than 360°C but the product itself is still hotter than 360°C.

250°C - The lowest set point temperature is good for steel applications where the metal has cooled considerably over time, as in cooling beds and at downcoilers. The 250°C set point temperature is suitable for non-ferrous applications such as aluminum processing in which product temperatures are lower than those in steel operations.

Three Styles of Hot Metal Detectors:

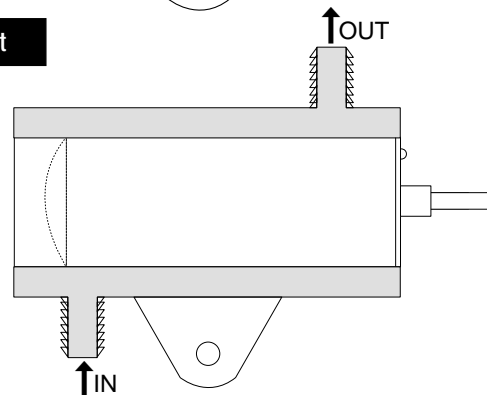
Self-contained (ER900)

This standard unit integrates the lens and electronics in one housing and has an ambient temperature rating of 185°F (85°C).



Self-contained with cooling jacket

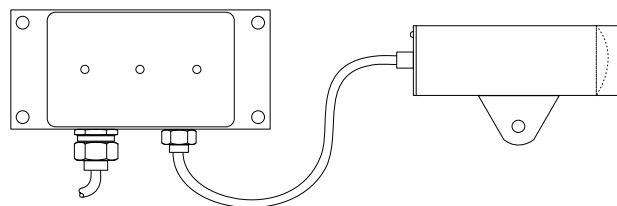
This is also an integrated unit but is surrounded by a sleeve that circulates either water or shop air around the sensor, cooling the sensor and increasing its ambient temperature rating to 257°F (125°C).



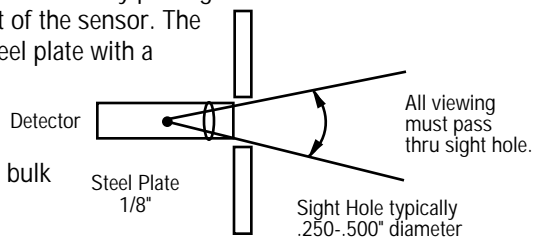
Remote lens system (ER800)

This unit uses a remote lens that is connected to the control module using fiberoptic cable. Since the control module that houses the temperature-sensitive electronics can be placed in a cooler area, this system offers the highest ambient temperature ratings:

Fiberoptic cable 500°F (260°C)
Remote lens 302°F (150°C)
Control module 185°F (85°C)



If temperature levels cannot be maintained, additional protection can be obtained by placing a radiant heat shield in front of the sensor. The heat shield is a 1/8" thick steel plate with a sight hole up to .5" diameter that allows the sensor a full field of view while it is shielded from the bulk of the radiated heat energy.



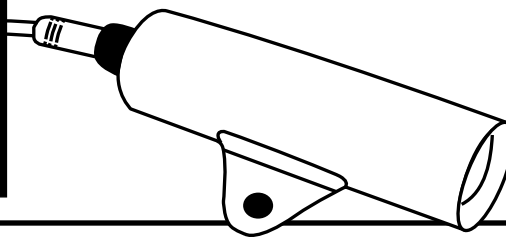
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Q. "How far away from its target can a hot metal detector be placed?"

A. Excessive heat and physical damage account for nearly 100% of all HMD failures. One of the many advantages of the Namco HMD is that up-close mounting is not a requirement, which adds flexibility to installation and application possibilities.

The Namco HMD responds only to IR energy within the viewing field of a given lens type regardless of distance. However, as mounting distance increases, the viewing field increases proportionally and may exceed the overall dimensions of the product and/or see other IR sources (adjacent pass lines, hot scale, background metal temperatures, etc.). In such cases, the HMD lens and minimum response temperature must be selected (see charts) to accommodate these factors.

Applying Namco HMDs is normally a very simple and straightforward process. Well over 50% of all applications can be resolved with a 450°C, non-cooled, 2° lens. Additionally, reliable detection is possible with only 5% of the view field covered at 700°C.

In general, the application process should consider the following:

- Sensing objective (tracking, positioning, cut, etc.)
- Product to be sensed (size, temperature, distance, etc.)
- Sensing conditions (water, steam, scale, ambient temp., etc.)
- HMD selection (response temperature, lens, cooling requirements, etc.)

Q. "How can sensing accuracy vs. distance be maintained?"

A. Viewing angle and distance combine to determine the size of the scanned area (see chart). Therefore, different lenses can be selected to produce viewing angles ranging from 25° (broad) to 1/2° (tight). In general, pickup/dropout accuracy and repeatability will improve with a tighter lens. This will hold true up to the point where product size and viewing field size become equal. Once the viewing field size is within the product size, there are no additional gains in accuracy.

Where accuracy is not a primary factor, and the product size and temperature relationship will assure detection, it is not always necessary to select a tight lens.

Q. "How does the size and shape of the product affect the choice of a hot product sensing system?"

A. Namco's elongated (rectangular) viewing field lenses (1/2 x 25, 1 x 25, and 2 x 25) are designed to solve specialized hot product sensing applications. In general, repeatability and overall accuracy is

improved when the product abruptly enters or exits a vertical (straight line) viewing field boundary as compared to a circular field of the same total area (sharp turn ON/OFF).

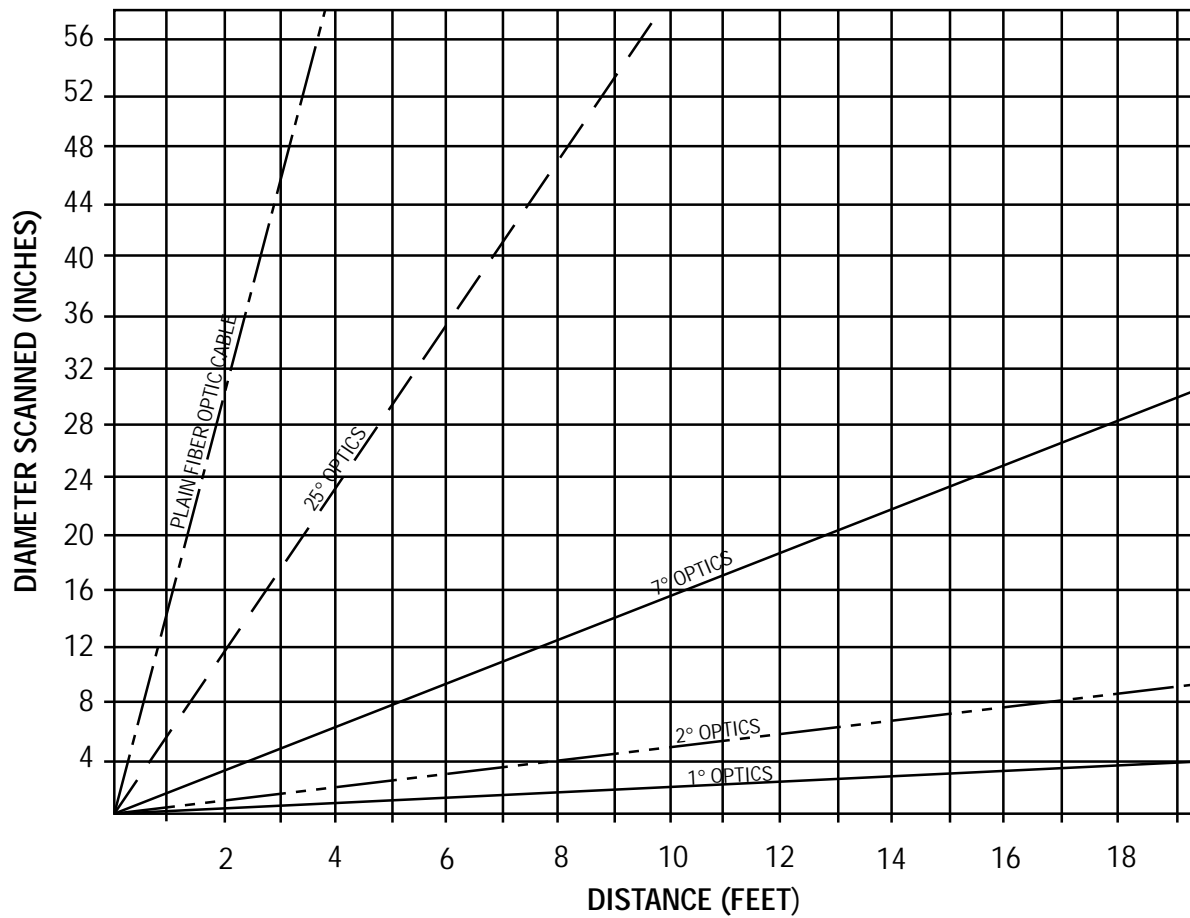
An elongated viewing field lens can be positioned to provide a long, narrow scan area across the length of a runout table, roll face, etc. Products with varying lateral position or irregular shapes will be sensed at the first point of entry/exit along the scan area. Vertical orientation of the field will permit similar detection of varying passline applications.

Mill housings, downcoilers, etc. provide limited vision areas for product sensing. A long narrow field can be applied to sight through these areas with little or no cropping of the viewing field.

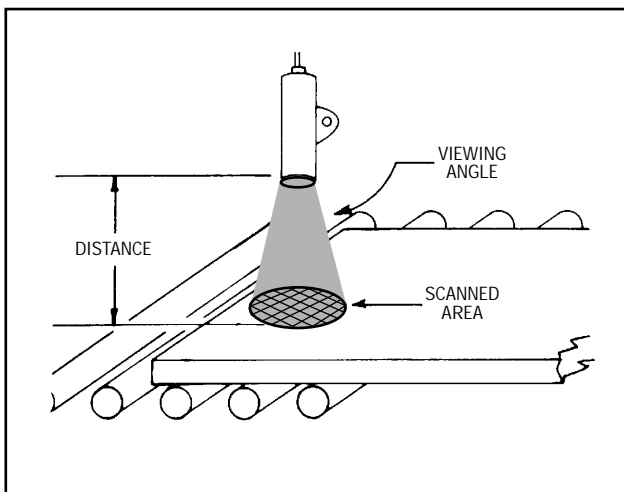
Note: The vertical (25°) viewing field of all Namco elongated field HMDs is in the same plane as the HMD mounting lug.

As previously stated, product temperature and percent of scan area covered within the viewing field combine to determine the "effective" minimum response temperature. Elongated viewing field applications for sensing small diameter rod, etc., should have the "effective" response temperature verified (see charts).

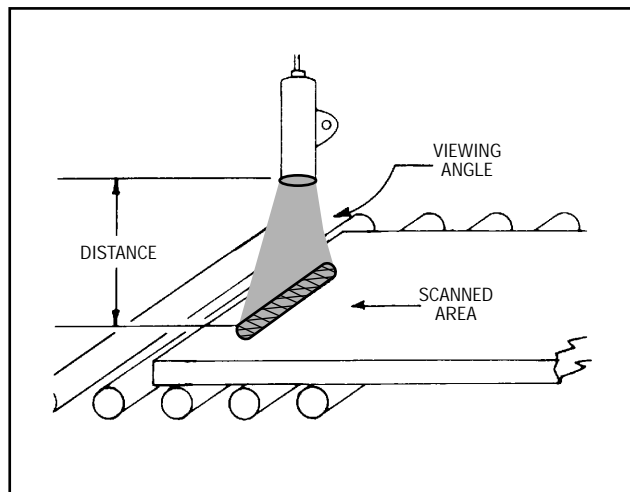
Scanned Area vs. Viewing Angle



Scanned Area for 1/2°, 1°, 2°, 7° and 25° Lenses



Scanned Area for 1/2° x 25°, 1° x 25° and 2° x 25° Lenses



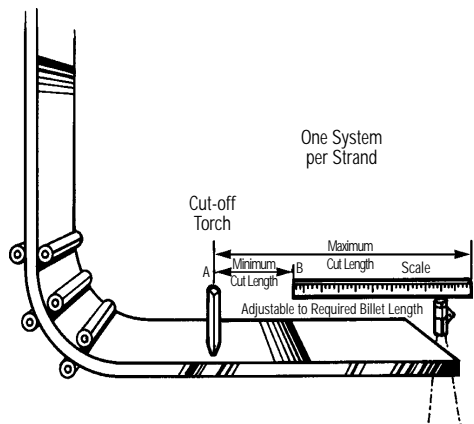
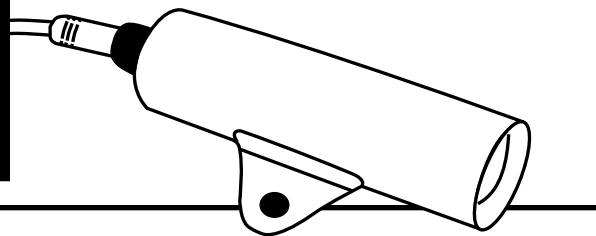
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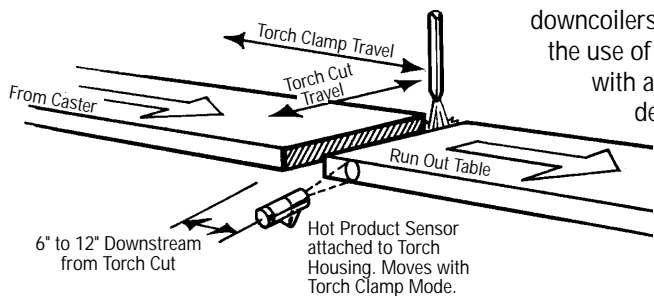
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Regulate slab length in a continuous caster steel mill ▲

The process of cutting a slab into lengths is a hot process, requiring the use of a Namco 800°C set point HMD like the ER900.

Using a 1/2° lens will allow the HMD to be placed six feet away while still producing a refined viewing area of .8". The sensor can be mounted on a sliding scale which is relative to the cutting torch. The sensor detects the leading edge of the slab and initiates the torch clamp and cut sequence, which can occur anywhere between points A and B, depending on predetermined needs. An additional sensor may be mounted to the torch housing to relay information for control of the cutting process.

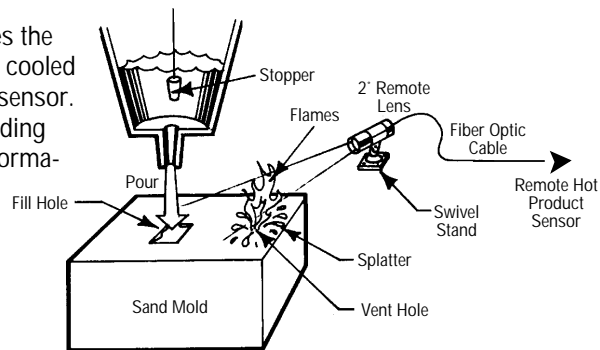


Verify that a slab has been cut ▲

Another 800°C set point temperature HMD can be mounted on the torch housing 6-12" downstream from the torch cut. The cut sequence does not end until the HMD detects the separated slab.

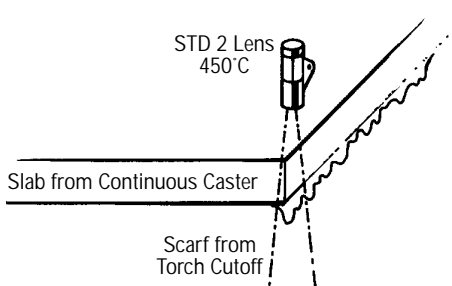
Automate the flash trimmer process ▼

By the time the slab reaches the flash trimmer, it is sufficiently cooled to use a standard 450°C sensor. The HMD detects the leading edge of the slab. The information is relayed to the control board, which initiates positioning of the slab farther down the line. The slab is stopped while the flash trimmer is moved up into position. The rollers bring the slab backward over the trimmer, which removes the scarf from the torch cutting process.



Mold auto fill sequence ▲

For the harsh environment of a foundry's mold fill line, an 800°C remote lens and a sensor system will be required in order for the sensor to accurately view the process. A 2° lens monitors the fill level through the vent hole as the mold is filled by the stationary ladle. When the molten metal in the mold rises to the level of the vent hole, the sensor detects the metal and relays the information to the control board. The stopper is closed and the line is indexed for the next mold to be filled.

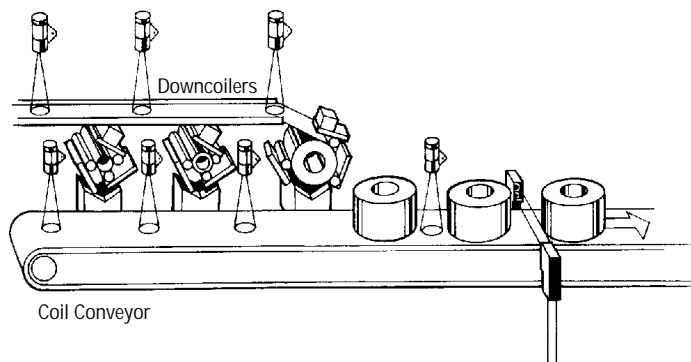


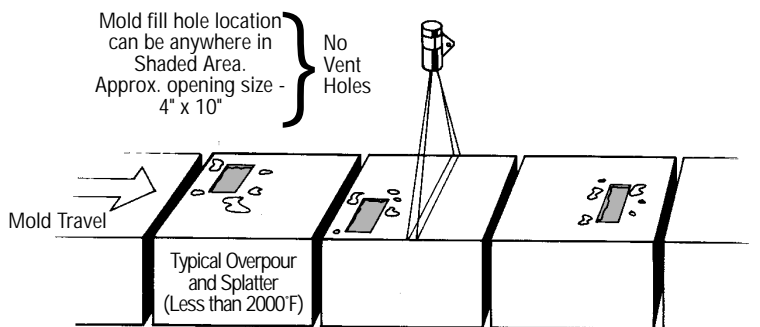
Automate the down-coiling process in a steel mill ▼

Although the steel has cooled considerably by the time it reaches the downcoilers, the automation of the downcoilers is a hot process requiring the use of a Namco ER900 HMD sensor with a 250°C or 360°C set point. By detecting whether there is

already a coil on the conveyor leading to the storage area and relaying

that information, a low set point sensor can help automate the process by eliminating the need for an operator to manually control the operation.



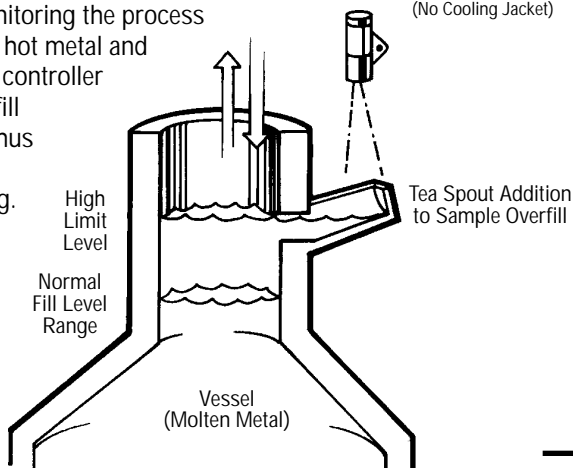


Detect filled molds even if the fill hole isn't always in the same spot ▲

Even if fill holes are located in a different position on each mold, an 800°C set point HMD can still provide accurate detection when it is used with an elongated lens. A lens with a 2° x 25° scan area, for example, will cover the full width of the mold, detecting fill holes as the molds cross the viewing field. This system allows accurate detection of filled molds such as would be needed for a production count.

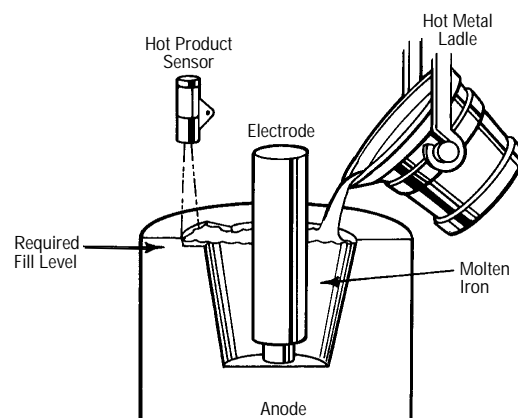
A sensor for high level limit control ▼

If a tea spout overflow area is added at the high level mark of the vessel, a 800°C HMD can be used as the primary level control system. Indexed over the tea spout during the fill cycle, it will sense the molten metal as it reaches the fill level and spills into the tea spout. The sensor monitoring the process detects the hot metal and signals the controller to end the fill cycle and thus prevent overpouring.



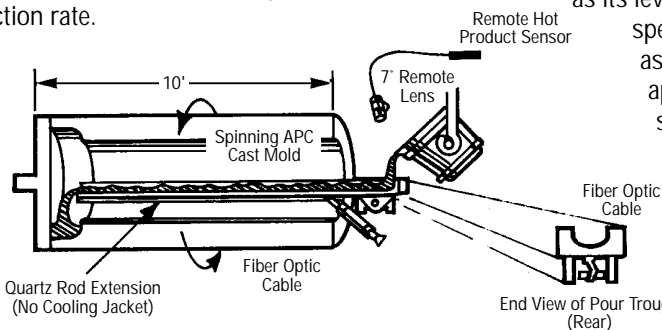
2 x 25° scan area of Hot Product Sensor at about 48" from mold

Occasionally large overpours may occur. Could be nearly equal to temperature of metal at pour hole and larger in area.



Monitor a spin cast process ▼

The same 800°C sensing system used to detect overflow of molten metal can also be used to detect the initial pour sequence of molds for products like pipe. A second sensor placed at the opening of the mold can detect the fill level of the mold, sensing when the mold is full and relaying the message to the controller, which retracts the mold. Presently, the pour and fill sequences are timed from when the ladle first begins to pour, which is inaccurate and leads to a high rejection rate.



Automate an anode assembly process ▲

For anode assembly in aluminum or other nonferrous industries, hot metal is poured around the electrode in order to firmly cast the electrode to the anode. In order to automate this process, the chance for overpour must be eliminated so that an operator does not have to visually monitor the process. This can be accomplished by using a sensor with a narrow viewing angle to sense the metal as its level reaches a

specified point, just as in a vessel fill application. The sensor detects the molten metal when it spills into a notch cut at the required fill level and signals the ladle to cease pouring.

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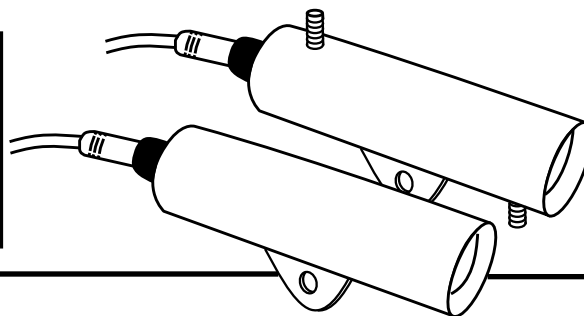
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Self-Contained Systems

Hot Metal Detectors



Namco Hot Metal Detectors (HMD's) were designed to be simple and cost effective in applications requiring dependable detection. Available trigger set points include a 250°, 360°, 450°, or 800°C range. Whether the application is in a steel mill or for flame detection in a burner application, the Namco IR sensor can be counted on for many years of reliable operation.

These devices work on the principle that all heated objects emit infra-red energy. Using a sophisticated optic and internal baffling system, the infra-red energy is collected and precisely focused

on a photo detector inside of the stainless steel housing. When the energy level is sufficient to meet the set point of the HMD, a digital output signal is generated.

The HMD's are totally self-contained in a rugged 4541 stainless steel housing with high quality electronics and glass optic components.

The water jacket models add an additional measure of heat resistance. These water cooled HMD's are specifically designed to be used where temperatures exceed the ambient rating of the standard HMD's.

Both standard and water cooled HMD's are impervious to the effects of steam, water, dust, shock and vibration associated with heavy industrial environments.

Typical Applications:

Continuous casters, hot strip mills, bar mills, shape mills, pipe mills, forges & foundries, coke plants, glass industries, cutoff and measuring of hot product.

360°C* Model No.	450°C Model No.	800°C Model No.	Housing Length	Viewing Angle	Circuit Description	Connector	Minimum Load Current	Leakage Current	Voltage Drop	Maximum Switching Frequency
AC MODELS										
ER920-12817	ER920-13817	ER920-14817	170mm	25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-12813	ER920-13813	ER920-14813	170mm	7°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-12812	ER920-13812	ER920-14812	170mm	2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22811	ER920-23811	ER920-24811	254mm	1°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22819	ER920-23819	ER920-24819	300mm	1/2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-12814	ER920-13814	ER920-14814	170mm	2 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22818	ER920-23818	—	300mm	1 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-22815	ER920-23815	ER920-24815	300mm	1/2 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
AC MODELS WITH WATER COOLED JACKETS										
—	ER920-43813	—	170mm	7°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-43812	ER920-44812	170mm	2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
ER920-52811	ER920-53811	ER920-54811	250mm	1°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-53819	—	300mm	1/2°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-43814	ER920-44814	170mm	2 X 25°	2W, AC, NO	3-pin Mini	20mA	5mA	12 volts	20Hz
AC MODELS WITHOUT WATER COOLED JACKETS WITH PRECHECK										
ER920-16812	ER920-17812	—	170mm	2°	2W, AC, NO	5-pin Mini	20mA	5mA	12 volts	20Hz
—	—	ER920-28811	254mm	1°	2W, AC, NO	5-pin Mini	20mA	5mA	12 volts	20Hz
—	ER920-27819	ER920-28819	300mm	1/2°	2W, AC, NO	5-pin Mini	20mA	5mA	12 volts	20Hz

*Note: 250°C setpoint versions and DC powered versions are also available. All versions are available with optional pre-check. Consult the factory for ordering information.

Common Sensor Characteristics

SELF-CONTAINED INFRA-RED SYSTEMS WITH AND WITHOUT WATER COOLED JACKETS	
Supply Voltage	105-132 VAC, 50/60 Hz
Output	500mA
Switching Delay Activation Release	1 ms 10 ms
Short Circuit Protected	Yes
Precheck Current Consumption (optional)	20 mA
NEMA Rating	3, 4, 12, 13
Connector With optional Pre-check	3-pin mini 5-pin mini
Output	Thyristor, NO
Ambient Temperature (water cooled HMD)	Determined by temperature, specific heat capacity and flow rate of coolant. Precautions must be taken to insure that water does not freeze in cooling jacket and that coolant flow is maintained when working above +55°C.
Ambient Temperature (standard HMD)	360°C: -30°C to +55°C 450°C: -30°C to +75°C 800°C: -30°C to +85°C

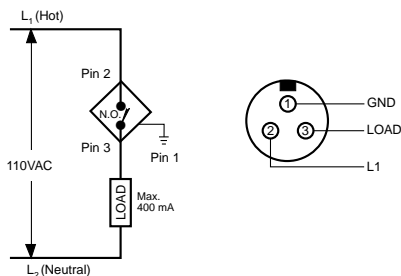
Wiring Diagrams

AC UNITS - with and without Precheck

Mail views shown

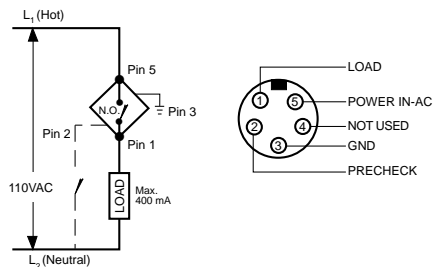
3 Pin Without Precheck

(Use on all 2 wire AC's)



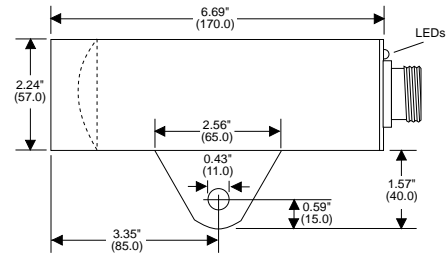
5 Pin With Precheck

(Use on all AC Devices with IR Precheck)

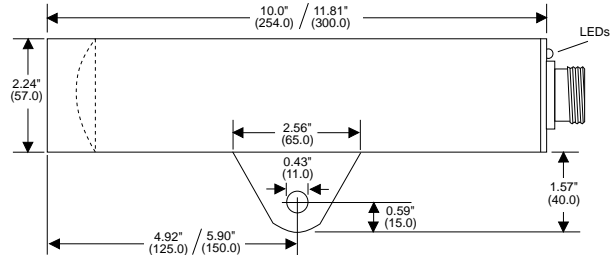


Dimensional Drawings

SHORT HOUSING - 170mm

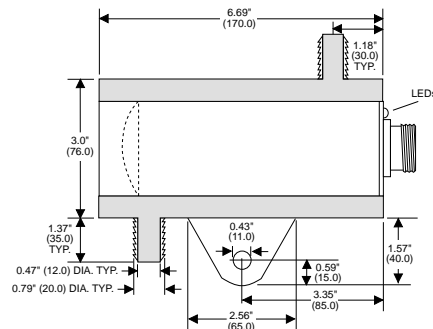


LONG HOUSINGS - 254mm/300mm

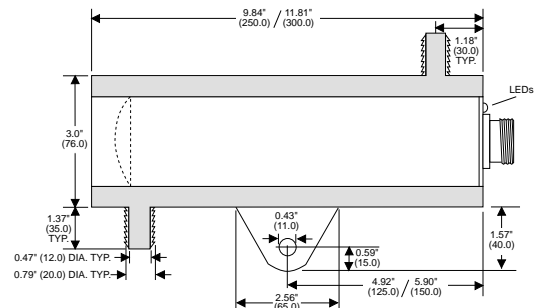


SHORT HOUSING (WATER COOLED) - 170mm

Either air or water may be used for cooling.



LONG HOUSING (WATER COOLED) - 250mm/300mm



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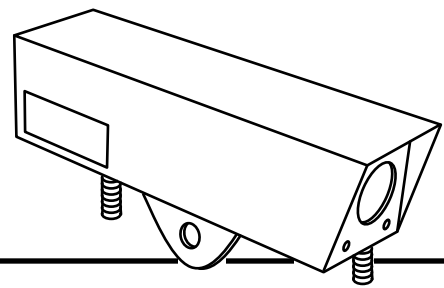
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For technical assistance, call 1-800-NAMTECH

Special Application Solutions

**Multi
Setpoint**

Hot Metal Detectors



- Multi-setpoint versatility
- Reduces stocking requirements
- Integrated air/water cooling jacket with rear hose connection interface
- Low leakage current offers ease of installation to PLC inputs
- Industry standard mounting for easy upgrade
- Factory serviceable
- Surface Mount Technology
- Made in USA

Namco Hot Metal Detectors (HMD's) were designed to be simple and cost effective in applications requiring dependable detection. A single Hot Metal Detector (HMD) can be used nearly anywhere in your hot mill process. The Namco Multi-Setpoint HMD is the first to offer local or remote programmable setpoints to the industry standard of 350°C-450°C-800°C response temperatures. Automatic re-calibration with no physical switch virtually eliminates tampering or mill environment problems. Now when your sensing conditions change, so can you. No longer do you have to order or inventory multiple HMD types specific to your application. Now you can use the same unit from the caster and re-heat furnaces through the coiler or cooling beds. Plus, because the setpoint is selectable, the new HMD is forgiving in applications where rolling or background temperatures are not as originally

envisioned. If the current selected setpoint is not appropriate, the HMD can quickly be changed.

Namco's HotSpot HMD uses the industry standard for mounting. So, direct replacement of an existing HMD is easy to upgrade.

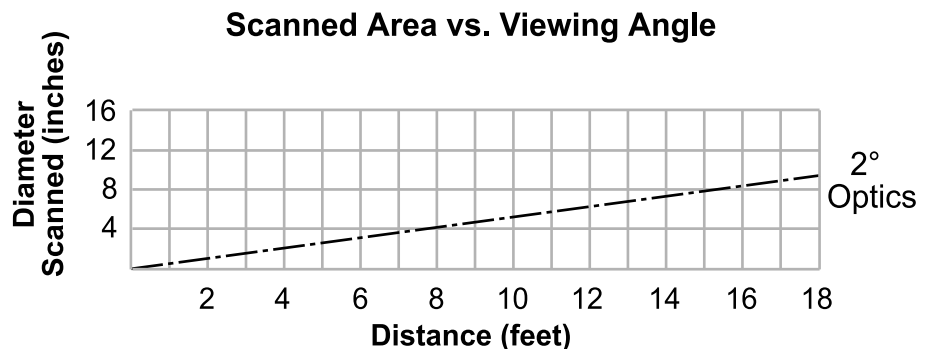
Typical Applications:

For tracking, positioning, length control on hot strip, rod, bar, shapes, seamless pipe mills and casters.

Special Application Solutions

Model No.	Viewing Angle	Circuit Description	Connector	Minimum Load Current	Leakage Current	Voltage Drop	Maximum Switching Frequency
AC/DC MODEL							
ER720-10702	2°	2W, AC/DC, NO	5-pin Micro	5mA	1.7mA	< 10 volts	1.5Hz

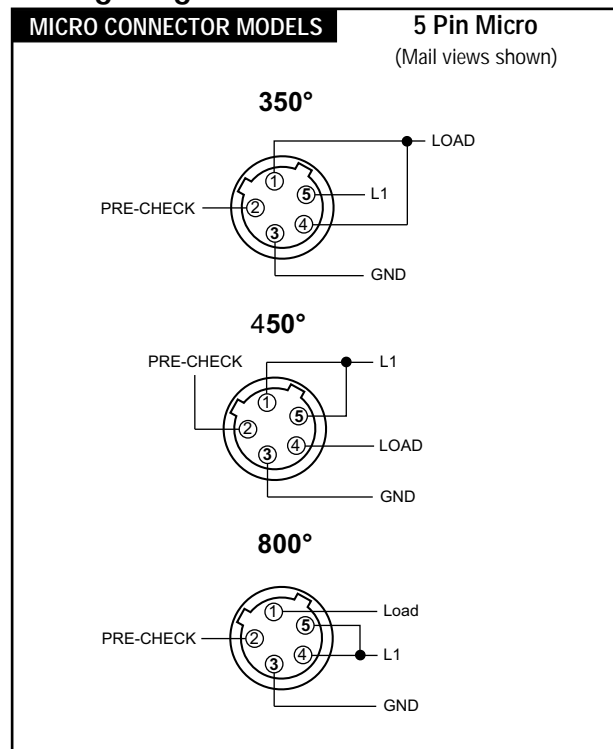
Please consult factory on availability of lens viewing angles: 1°, 2°, 1°x25°, 2° x25°.



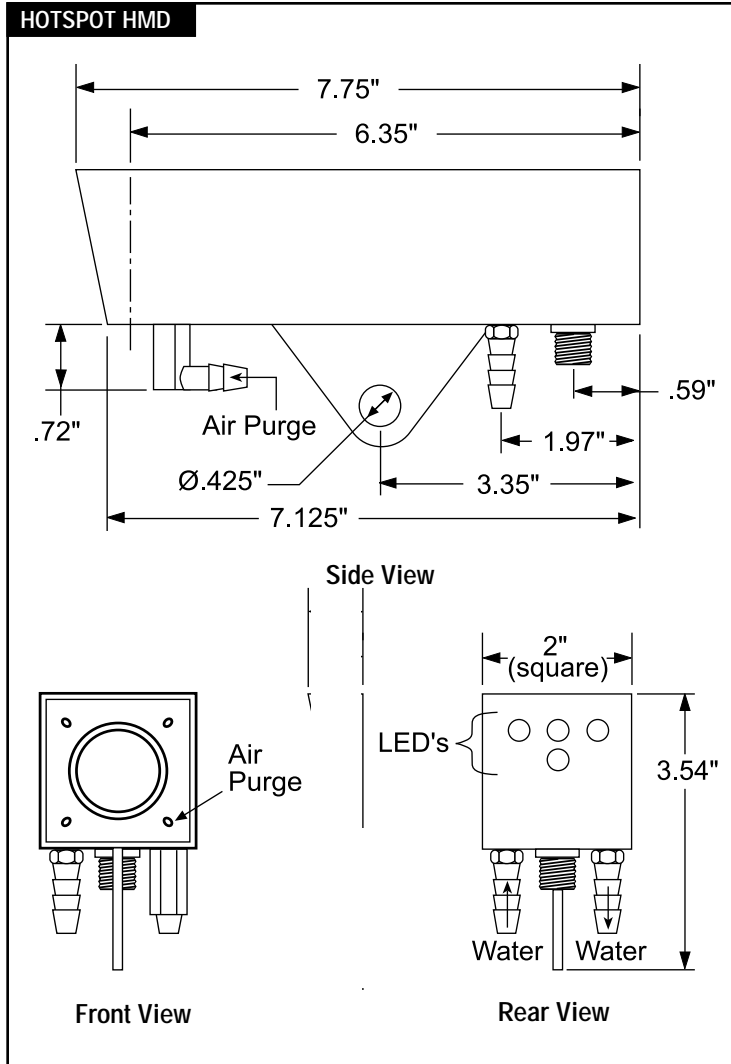
Common Sensor Characteristics

HOTSPOT INFRA-RED SYSTEMS	
Supply Voltage	80-230 VAC/DC 50/60 Hz
Voltage Drop	< 10 V
Output	200mA
Minimum Load Current	5 mA
Leakage Current	1.7 mA
Switching Delay Activation Release	300 ms 50 ms
Short Circuit Protected	Yes
Max. Switching Freq.	1.5 Hz
Precheck Current Consumption	25 mA
Enclosure Designed to meet NEMA Type	3, 4, 12, 13
Connector With optional Pre-check	5-pin micro
Output	Thyristor, NO
Ambient Temperature	Determined by temperature, specific heat capacity and flow rate of coolant. Precautions must be taken to insure that water does not freeze in cooling jacket and that coolant flow is maintained when working above +55°C.

Wiring Diagrams



Dimensional Drawings



Note: The water cooling jacket uses the 1/4" hose fittings.
The air lens purge uses the 5/16" hose fittings.

LED Indicators

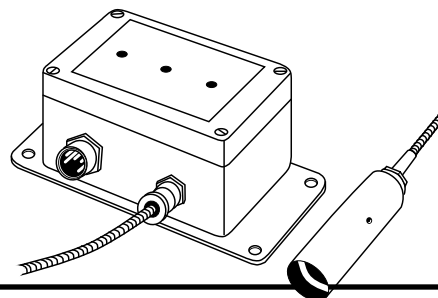
	RED 350°C	RED 450°C	RED 800°C	GREEN
Power Off	Off	Off	Off	Off
Power On @ 350°C Setpoint	On	Off	Off	Off
Power On @ 450°C Setpoint	Off	On	Off	Off
Power On @ 800° Setpoint	Off	Off	On	Off
Target	Off	Off	Off	On
Pre-check On	Off	Off	Off	On

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Namco IR detectors are digital switches which respond intelligently to infra-red energy given off by heated surfaces at 4 different pre-set temperatures and above. They are temperature compensated which allows them to be used in high ambient (up to 200°F) locations. Temperature settings are pre-set and never require adjustment. An IR precheck feature on all remote units is standard. This allows the user easy access to verification of system performance.

The Namco remote HMD system is designed with the user in mind. A number of different remote type lenses are available which give the system versatility and added value during the selection of such a system. These lenses,

having different viewing angles, will sense a known scanned area and, when a heated object enters this area, its emitted IR energy is detected and transmitted via the fiberoptic cable to the remote electronics package where a digital response signal takes place.

Namco utilizes fiberoptic cables that have a flexible stainless steel jacket designed to withstand severe environmental abuse. All fiberoptic cables are constructed with the highest quality glass bundles thereby assuring optimum IR transmission to the detector. All remote lenses are made from premium quality glass optics and sealed in stainless steel housings to ensure reliable operation in the most adverse applications.

Typical Applications:

Continuous casters, hot strip mills, bar mills, shape mills, pipe mills, forges & foundries, coke plants, glass industries, cutoff and measuring of hot products.

Remote Lens

Viewing Angle	Scanned Area at 2 Meters	Model No.
150°C max. amb.		
1/2°	0.8" Dia.	ER800-00009
1°	1.6" Dia.	ER800-00001
2°	3.2" Dia.	ER800-00002
7°	11" Dia.	ER800-00003
25°	40" Dia.	ER800-00007
1/2 x 25°	3/4" x 40"	ER800-00005
1 x 25°	1.6" x 40"	ER800-00008
2 x 25°	3" x 40"	ER800-00004

Control Module

Style	Set Point Temperature ²	Ambient Temperature	Output	Model No.	
				Connector	Cable
Flat Pak	360°C	-30° to +55°C	120V AC N.O. Thyristor	ER920-36816	ER920-36826
Flat Pak	450°C	-30° to +75°C		ER920-37816	ER920-37826
Flat Pak	800°C	-30° to +85C		ER920-38816	ER920-38826

Consult factory for DC units.

Fiber Optic Cable¹

Cable Length	Note	Model No.
250°C max. amb.		
2 Meters	—	ER800-00600
Specify	—	ER800-00700
3 Meters	2	ER800-00100
4 Meters	3	ER800-00200

Notes:

¹ All cables may be used with or without lens.

Viewing Angle = 67°

² Signal loss = 50°C

³ Signal loss = 100°C

Common Sensor Characteristics

REMOTE DETECTION SYSTEMS	
	AC
Supply Voltage	105-132 VAC
Output	500 mA
Minimum Load	20 mA
Leakage Current	7 mA
Voltage Drop	12 VAC
Switching Frequency	20 Hz
Switching Delay Activation Release	1 ms 10 ms
Short Circuit Protected	Yes
Precheck Current Consumption	20 mA
NEMA Rating	3, 4, 12, 13
Metal Housing	Aluminum-Epoxy Paint
Connector	5-pin Mini

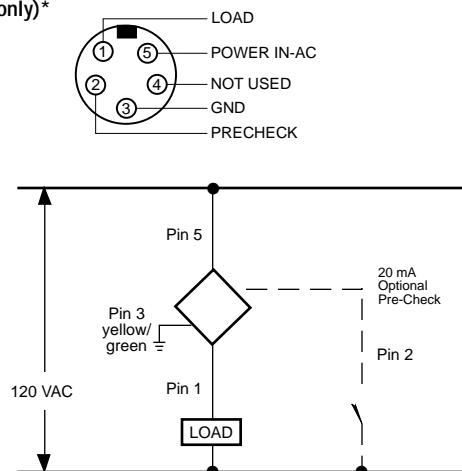
Accessories

Model No.	Description
ER800-10000	Purge mount for 7° remote lens
ER800-01000	Swivel stand mount

Circuit Drawings

5-PIN MINI CONNECTOR

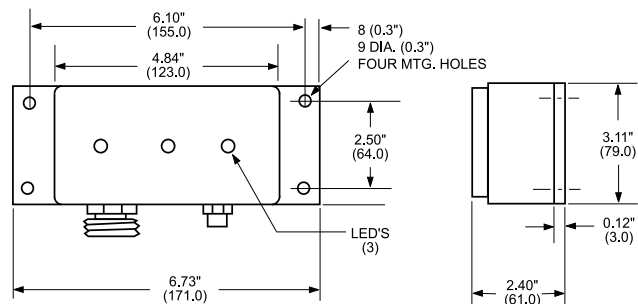
AC Wiring Diagram
(Ref. only)*



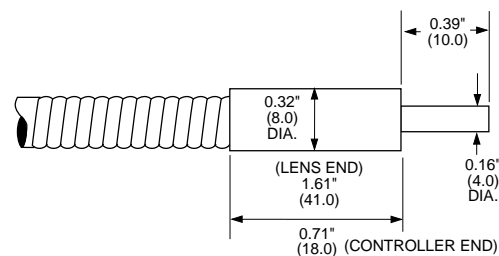
*Always connect as shown on label.

Dimensional Drawings

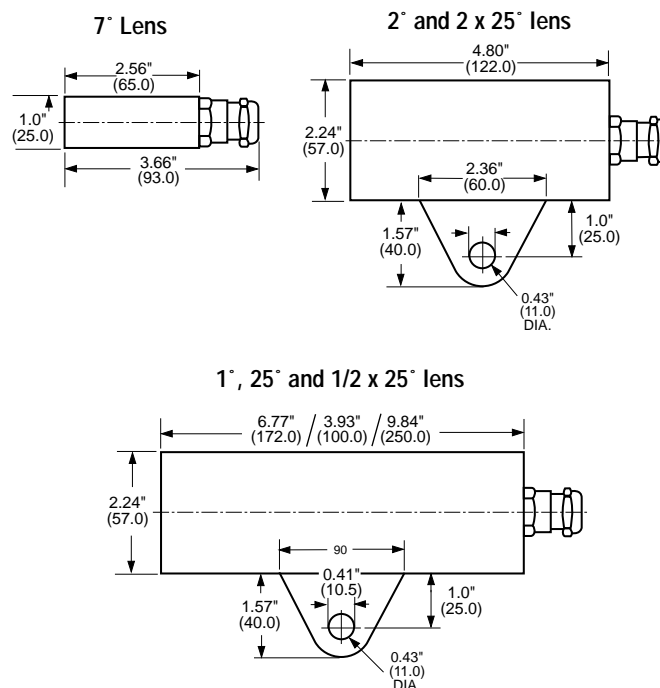
CONTROL MODULE



FIBER OPTIC CABLE



REMOTE LENS



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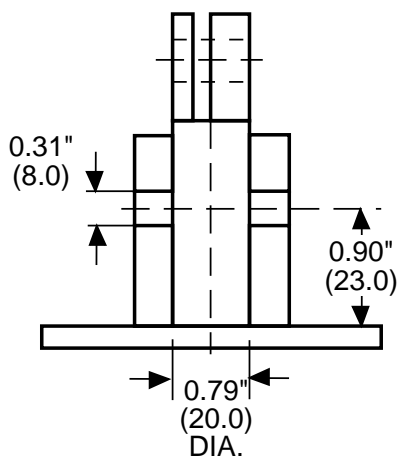
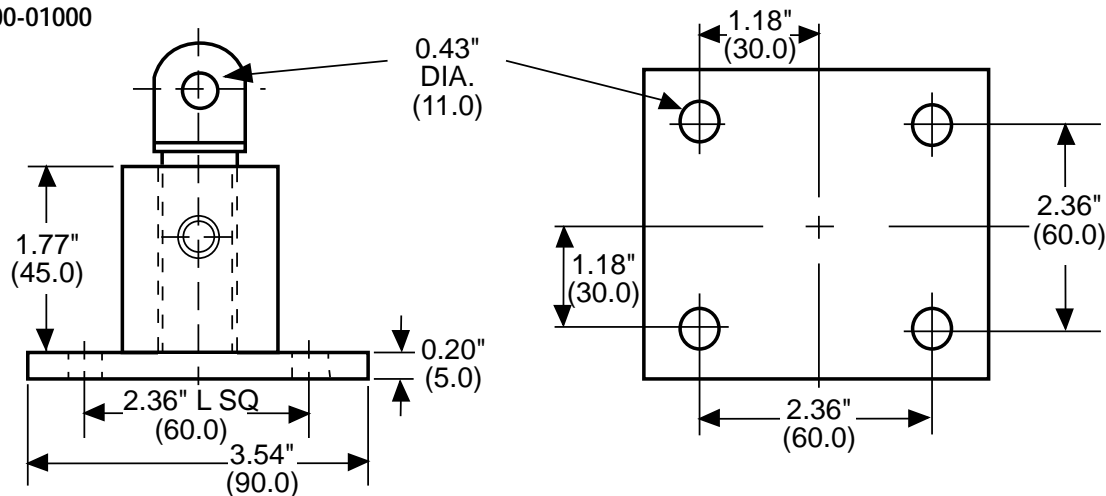
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Special Application Solutions

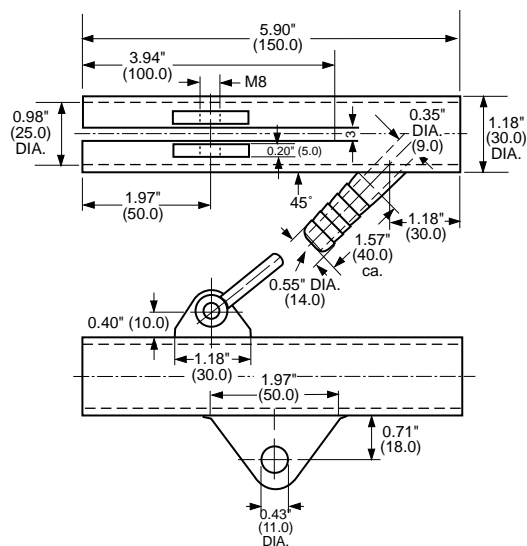
Swivel Stand

Part No. ER800-01000

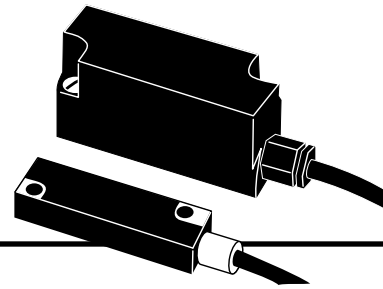


PURGE MOUNT FOR REMOTE 7° LENS

Part No. ER800-10000



Ferrous/Magnet Actuated Switches



- 14° to 122°F
- High-shock resistant
- Water, oil, and dust tight
- Fully submersible to 200 psi

Namco's Maglock proximity switches are small, tough, and versatile. They are ideal for use in signal circuits and similar applications up to 5A, 250 volts. They are operated by an actuator which is either a permanent magnet (in the case of magnetically actuated types) or a piece of ferrous material such as ordinary mild steel (in the case of ferro-actuated models).

The switching elements comprise fast-acting, hermetically sealed, dry reed switches, permanently mounted in brass, glass-filled nylon, or stainless steel housings.

Operating Principles

The actuation procedure depends on the particular function to be performed.

The successful selection of switch and actuator requires an understanding of the techniques employed.

Magnetically Actuated Switches

The switch and its actuator must be brought within a specific proximity to each other (operating distance). The actual distance in any particular case will depend on their relative attitudes, sensitivity, and direction of closing.

When the actuator (magnet) is brought close enough, the switch will operate. When it is withdrawn, it will reset itself. The gap between the switch and the actuator when the switch operates is always less than the gap at which the switch resets. The difference between the two is referred to as the "operating differential".

Ferro-Actuated Switches

The fundamental difference between a Maglock magnetically actuated switch

and a ferro-actuated type is that the latter has a built-in system of permanent magnets. Unlike magnetically actuated switches that require the approach of an external permanent-magnet actuator before they will operate, ferro-actuated switches operate upon the approach of a simple piece of ferrous material, i.e., mild steel.

The effect of the ferro-magnetic material is to modify or shunt a part of the internal magnetic field surrounding the switch contacts allowing the switch to operate.

Typical Applications

Proximity switches, limit switches, door interlock switches, machine tool control, liquid level control, weight and measurement control, material handling programming, machine guard interlocks, systems interlocks, alarm systems, batching and timing mechanisms, instrument counters, valve position indicators, and all types of automatic control devices.

Voltage	Current	Power (Max.)	Contact Arrangement	Switch Model No.	Actuator Model No.	Operating Range	On-Off Diff.	Minimum Target Size
Ferrous Actuated, Rectangular								
250V, AC/DC	0.25A DC, 1A AC	15W DC 15VA AC	SPST, NO	EE960-10000	—	.25"	.50"	2" x .50" x .125"
250V, AC/DC	2A DC, 2A AC	40W DC 40VA AC	SPST, NO	EE960-20000	—	.12" .37" .71"	.75"	1/2" dia. x 3/16" 5/8" dia. x 1/4" 3-1/4" dia. x 1-1/4" x 1/16"
Magnet Actuated, Tubular								
300V, DC	1A DC	20W DC	SPST, NO	EE960-00100	EE961-03800 EE961-03900 EE961-04000	.25" .39" .98"	.24" .27" .47"	—
250V, AC	1.5A AC	24VA AC	SPST, NO	EE960-00100	EE961-03800 EE961-03900 EE961-04000	.25" .39" .98"	.24" .27" .47"	—
250V, AC/DC	1.25A AC/DC	20W DC 20VA AC	SPDT NO/NC	EE960-00200	EE961-03900 EE961-04000	.08" .69"	.27" .27"	—
Magnet Actuated, Rectangular								
250, AC/DC	1.25A DC, 1.35A AC	20W DC 20VA AC	SPDT NO/NC	EE960-02000	EE961-02000 EE961-03000	.37" .87"	.44" .69"	—
200V, AC 250V, DC	.5A, AC/DC	12VA AC 10W DC	SPST, NO	EE960-03000	EE961-02000 EE961-03000	.62" 1.00"	.38" .69"	—
110V, AC 250V, AC	3A AC, 2A AC	—	SPST, NO	EE960-16000*	EE961-01600 EE961-02500	.20"	.45"	—

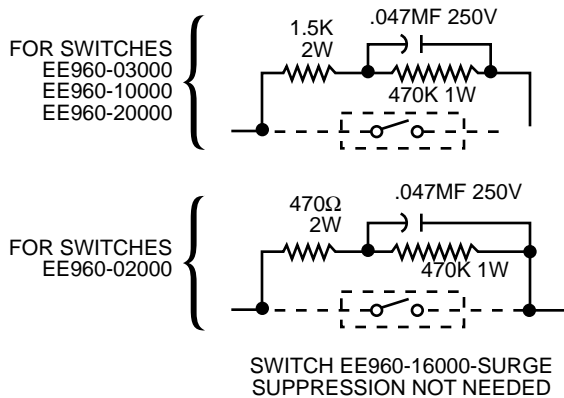
* The EE960-16000 Magnet Actuated Proximity Switch is designed for power applications, such as motor starters. This SPST NO switch has double contacts: one for breaking circuit current, the other for ensuring continuity at low currents. Typical life of this series is 100 million operations (at or below rated load).

Circuit Drawings

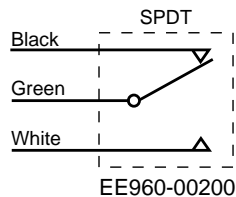
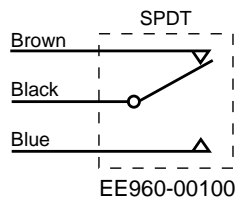
CONTACT PROTECTION

Voltage and current values given are maximum values of each but must not be construed to be a Volt-Amp rating. Switch capacity is listed as wattage or V-A except in the case of the EE960-16000 where switch capacity is the product of the applied voltage and the break-current.

All switch capacities are resistive (except for the EE960-16000) ratings, and surge protection should be used when switching inductive loads.

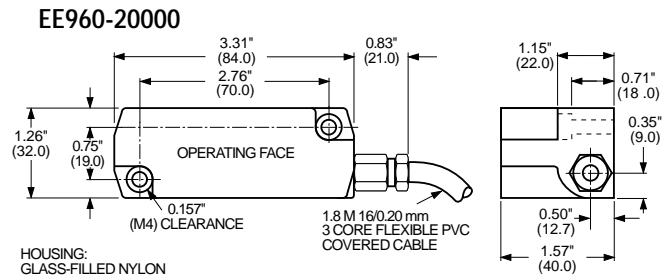


Wiring Diagrams

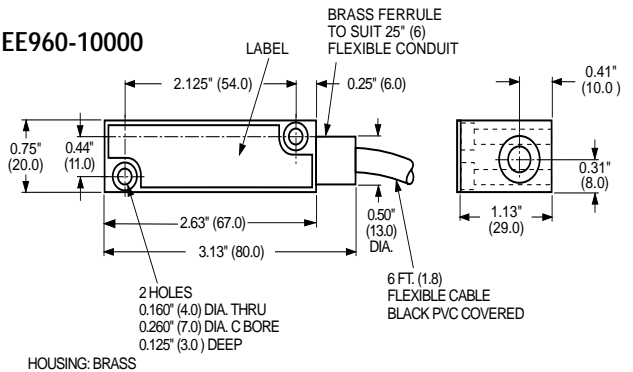


Dimensional Drawings

FERROUS ACTUATED SWITCHES, RECTANGULAR

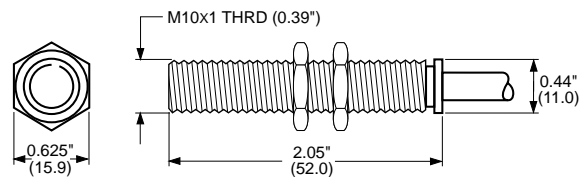


EE960-10000

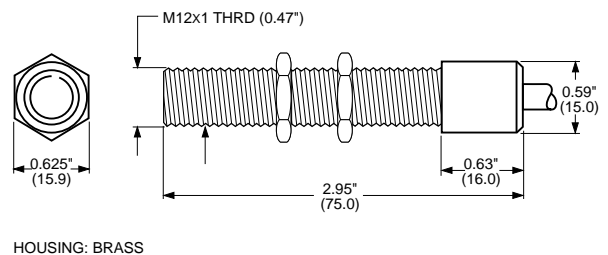


MAGNET ACTUATED SWITCHES, TUBULAR

EE960-00100



EE960-00200



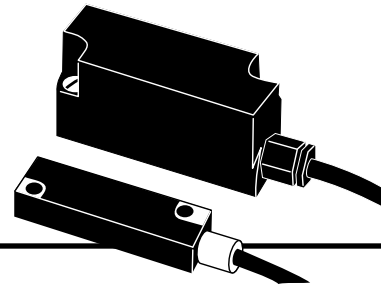
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next page. →

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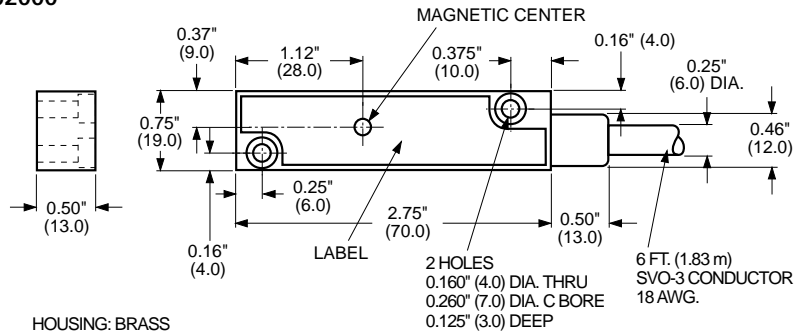
Ferrous/Magnet Actuated Switches



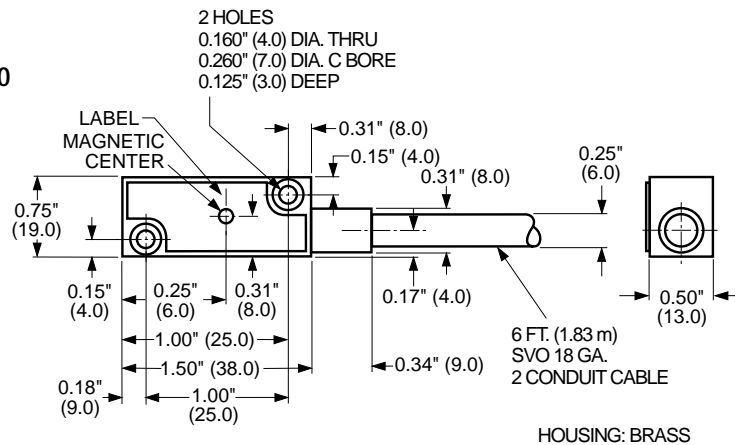
Dimensional Drawings

MAGNET ACTUATED SWITCHES, RECTANGULAR

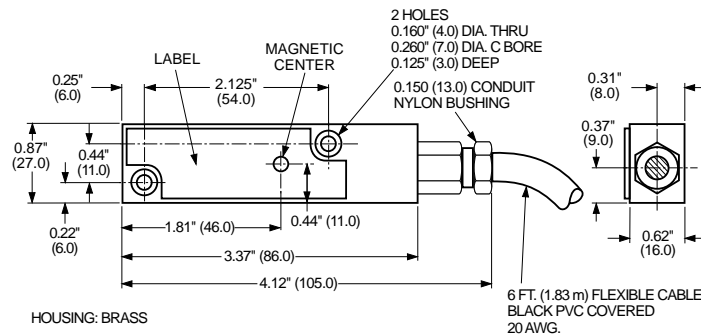
EE960-02000



EE960-03000



EE960-16000

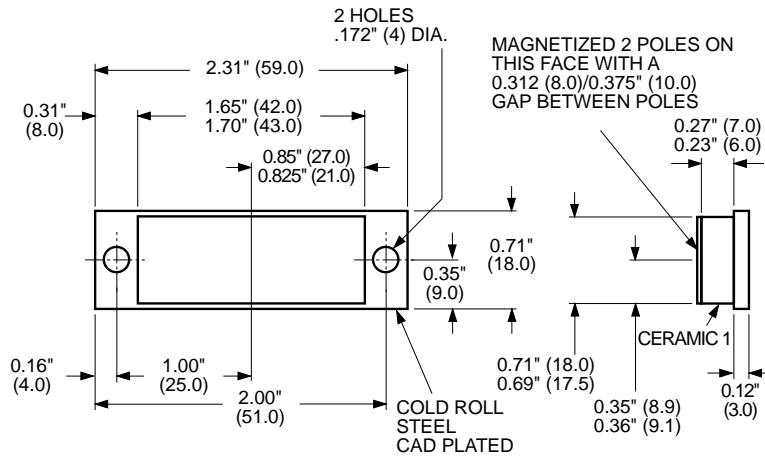


Dimensional Drawings

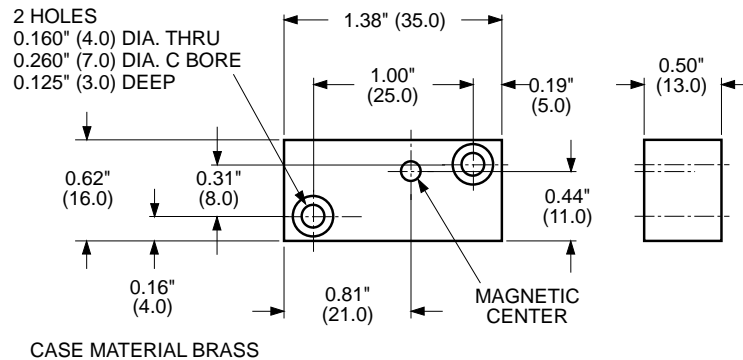
Ferrous/Magnet Actuated

MAGNET ACTUATED SWITCHES, RECTANGULAR

EE961-02500



EE961-02000



Continued on
next page. ➡

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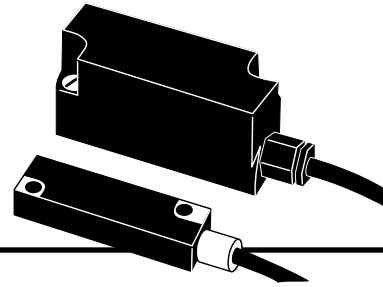
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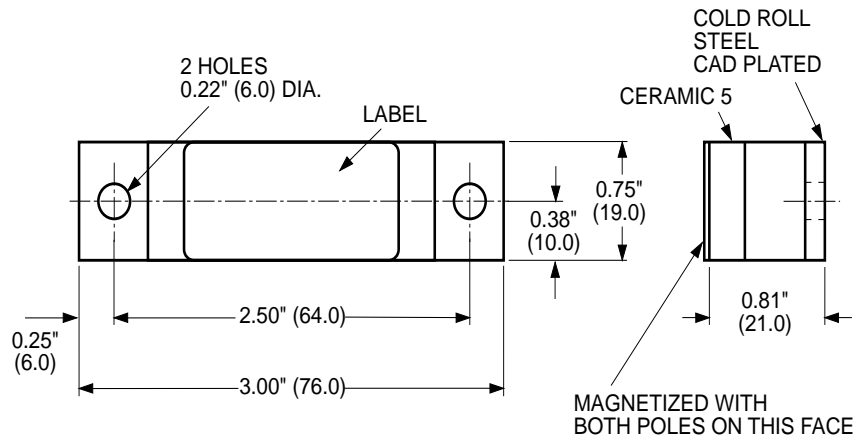
Ferrous/Magnet Actuated Switches



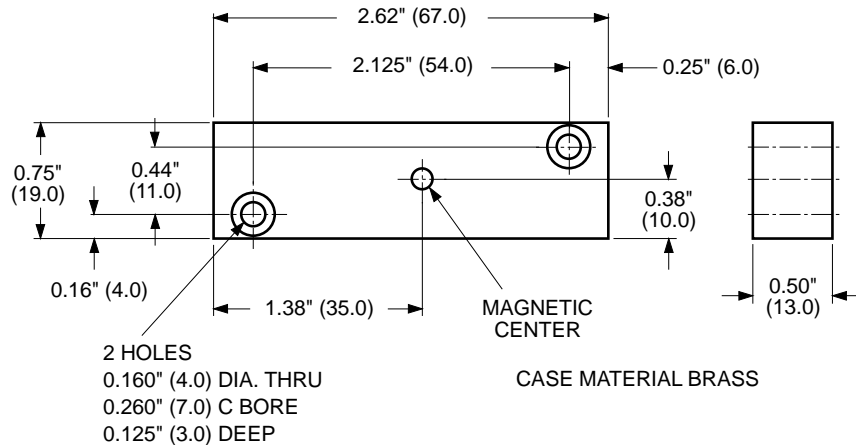
Dimensional Drawings

MAGNETIC ACTUATORS, RECTANGULAR

EE961-01600



EE961-03000

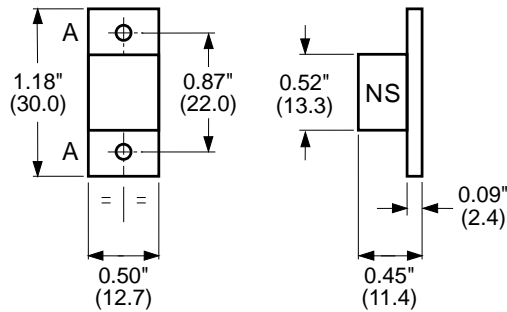


Dimensional Drawings

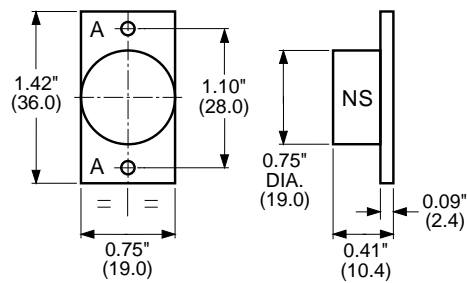
Ferrous/Magnet Actuated

MAGNETIC ACTUATORS, TUBULAR

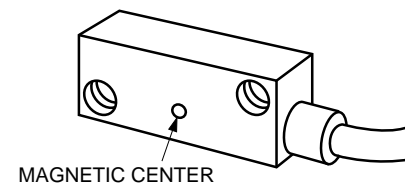
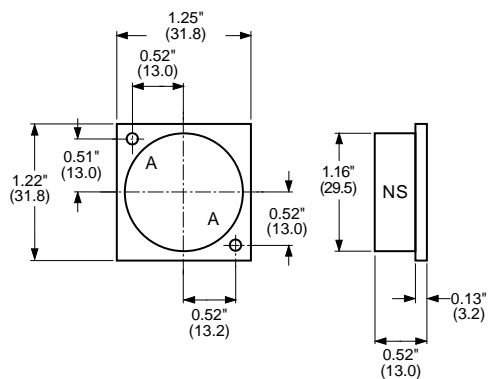
EE961-03800



EE961-03900



EE961-04000



The magnetic center of a MAGLOCK SWITCH or an ACTUATOR is denoted by the mark "O" on its housing.

Special Application Solutions

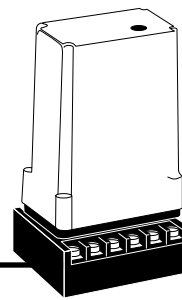
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For technical assistance, call 1-800-NAMTECH



- Underspeed/Overspeed
- Underspeed Only
- Zero Speed

Motion Switch

Namco Controls EE891 Series Motion Switch is a digital system. It compares the time between input pulses with an adjustable reference time base.

The Motion Switch can be used in any of four modes. It may be used for overspeed or underspeed monitoring of rotating equipment with either manual reset or automatic reset. These functions are easily programmed into the unit via external jumper connections.

This series includes models for underspeed detection only as well as zero-speed unit. A choice of outputs is also available.

Series EE891 Motion Switches will accept a wide range of input signals including a simple contact closure. Used in conjunction with our EE510/ET series self-contained DC proximity switches, they offer a high reliability system.

The switch point (or trip frequency) is adjustable through the top of the enclosure. A screwdriver is required to set the trip point. A 15-turn potentiometer with a slip clutch at both ends prevents accidental damage due to excessive rotation.

The unit comes in a tough Lexan* enclosure to protect it from accidental damage. The unit also features plug-in convenience for easy installation or replacement.

**Lexan is a General Electric Product*

Zero Speed Switch

The EE891-32103 Zero Speed Switch is designed to accept either a sinking or sourcing input. The output function can be reversed, relay normally

de-energized or normally energized, with the selector switch located on top of the module. An internal regulated power supply is provided to supply power to self-contained Proximity Switches.

Operating Principles: Standard Motion Switches

Input Signal

- Ground based positive
- Pulse rate to 1KHz with 300 microsecond minimum pulse width. Contains input bounce filter (up to 375 microseconds) for contact closure inputs.
- Internal switch for selecting NPN (sinking) or PNP (sourcing) inputs is accessible through a hole in the top of the module.

Underspeed

Underspeed operation is programmed in the unit by connecting a jumper between pin 3 and pin 4 of the terminal socket. The unit will now drop out if the input pulse rate should fall below the internal reference rate (variable through top of unit by screwdriver adjustment of 15-turn potentiometer).

Overspeed

Overspeed operation is programmed in the unit by connecting a jumper between pin 2 and pin 4 of the terminal socket. The unit will now drop out if the input rate rises above the internal reference rate (variable through top of unit by screwdriver adjustment of 15-turn potentiometer).

Automatic Reset

The output (once de-energized) will remain off until a reset button is closed momentarily. However, if your application requires an automatic reset function, this may be accomplished by connecting a jumper between the manual reset pins instead of a normally open switch.

Input

The Motion Switch is only as reliable as the input information. Therefore, it is extremely important that a good, reliable signal be made available. This can either be from a proximity switch or a contact closure. For reliable operation, the frequency of the target signal should be determined through use of an oscilloscope or tachometer. This frequency can then be applied to the input terminal of the motion switch. We recommend that a signal generator be used for this purpose. (Note: the signal generator should produce a positive only square wave. Any other wave form may damage the unit.)

The adjust potentiometer is then set to the proper "pick-up" point. We recommend that the values chosen for this frequency be approximately 5% above or below the normal "run" speed to allow for normal variations in the target speed. This is a minimum value. Please follow the set-up procedure provided with the particular type of switch used in your application.

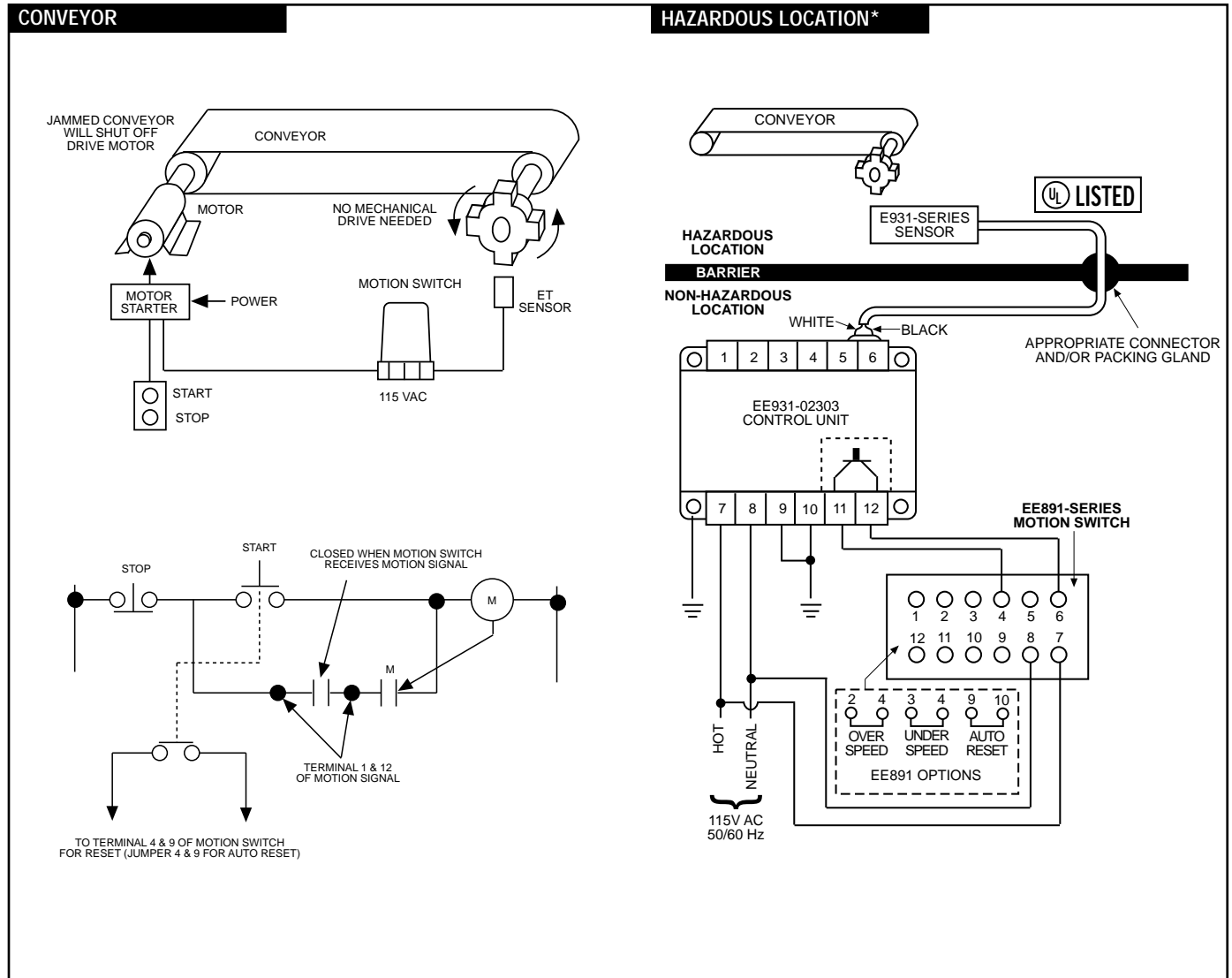
NOTE: The EE891-32103 zero speed control module provides for an adjustable OFF delay when either the ON or OFF mode is selected. The OFF delay is retriggerable; therefore, the timing function starts at the beginning of each input pulse. (See Time Delay Chart.)

Operating Principles: Zero Speed Switches

Like the Motion Switch, the Zero Speed Switch accepts either a contact closure, proximity, or photoelectric sensor input. This control module is based on time from the last input to the next as the equipment being monitored slows down.

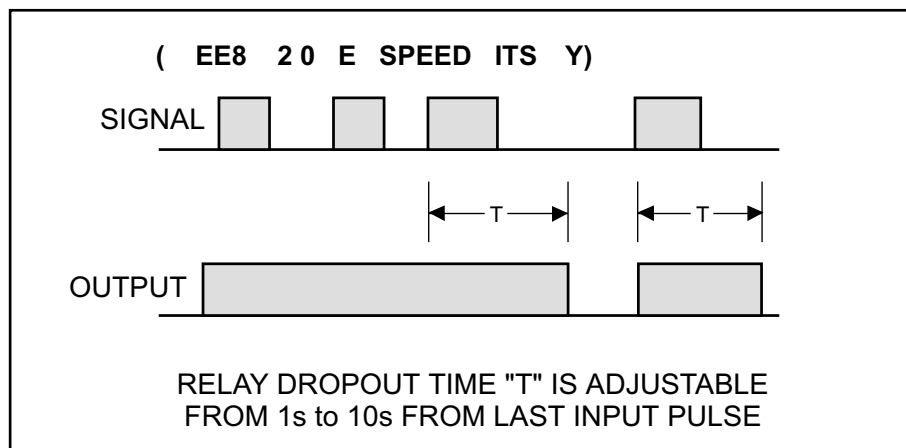
When the pulse rate disappears for a time exceeding the set point, the output of the zero speed module will change. (The zero speed unit will not be "confused" if the input remains activated due to the target remaining in front of the sensor.)

Typical Applications



* See Hazardous Location section for more information on Series EE931 products.

Time Delay Chart



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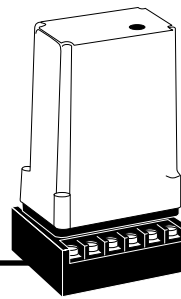
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For technical assistance, call 1-800-NAMTECH

Special Application Solutions

Motion Detection Systems



Motion Detection Systems consist of these motion detection modules coupled with a DC proximity sensor. Either the EE510 series or any DC ET-series sensor is compatible. EE931 sensors may also be employed for hazardous location requirements.

Motion Detection Modules

Output	Speed Adjustment Range				UL Listed
	3 to 60 Pulses Per Minute Model No.	24 to 480 Pulses Per Minute Model No.	384 to 7680 Pulses Per Minute Model No.	See Time Delay Chart Model No.	
Motion Switch					
Electromechanical Relay 1 Set Form C 5A-115 VAC Resistive	EE891-02103*	EE891-12103*	EE891-22103*	—	✓
Open Collector 20 ma. sink V ext. max. 40 volts	EE891-02303*	EE891-12303*	EE891-22303*	—	✓
Reed Relay 1 NO, 1 NC, 12VA or 10 watts	EE891-02403*	EE891-12403*	EE891-22403*	—	✓
Underspeed Only Switch					
Electromechanical Relay 1 Set Form C 5A-115 VAC Resistive	EE891-02113	EE891-12113	EE891-22113	—	
Zero Speed Switch					
Electromechanical Relay 2 Form C 5A-115 VAC Resistive	—	—	—	EE891-32103	

*UL Listed.

Order numbers shown are for 120 VAC units.

For intrinsically safe applications, use any EE981 sensor.

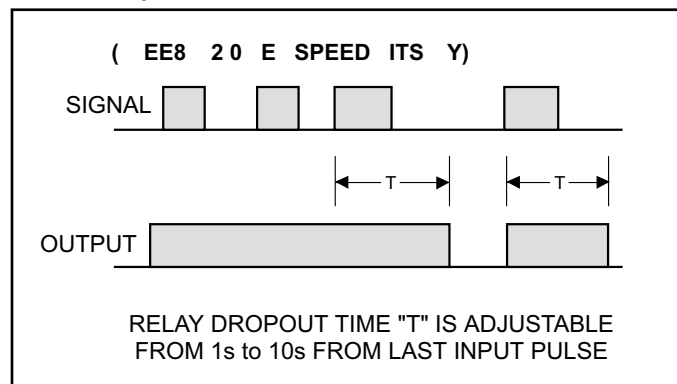
Specifications

MOTION DETECTION SYSTEMS		
	MOTION SWITCH	ZERO SPEED
Input	120VAC, 50/60Hz or 230 VAC	120 VAC, 50/60Hz
Electromechanical Relay	1 Set Form C 5A Resistive @ 120 VAC	DPDT 5A Resistive @ 120 VAC
Reed Relay	1 NO - 1 NC 10 W or 12 VA	N/A
Transistor	Vext. 40 VDC max. Sinking, 10 mA	N/A
Solid State Relay	.050 Amps min. to 1.5 Amps max. 240 VAC max.	
DC Power Supply	24VDC, 50 mA max. for sinking (NPN) or sourcing (PNP) Input***	
Drop-Out Time	N/A	1-10 Sec. Adjustable
Hysteresis	5%	N/A
Latch	Yes	N/A
Mode of Operation	Overspeed or Underspeed programmed	N/A
Trip Point Adjust	Yes	N/A
Response Time	<10ms: electromechanical <2ms: reed relay	N/A

**The use of an external suppressor network on relay output models is recommended to prolong contact life.

*** Early models may have 12 VDC supply.

Time Delay Chart



Compatible Sensors (DC versions only)

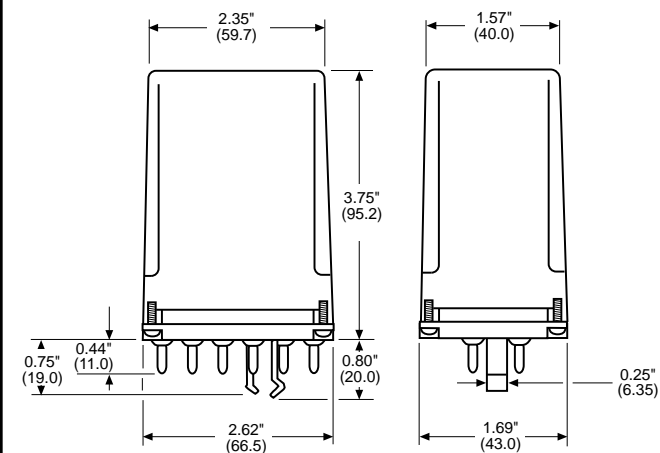
EE510 Series

ET Series

EE931 Series (for Hazardous Locations)

Dimensional Drawings Motion Detection

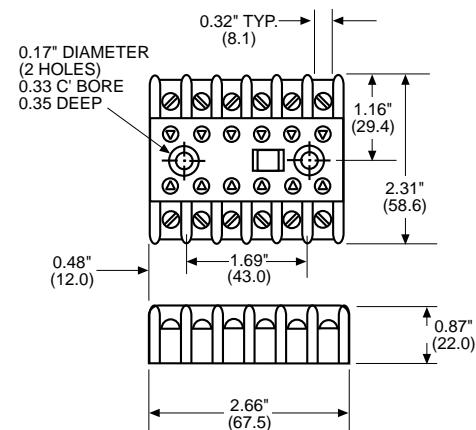
CONTROL MODULE



BASE PIN SOCKET

EE012-50004

(Order as
separate item)



Special Application Solutions

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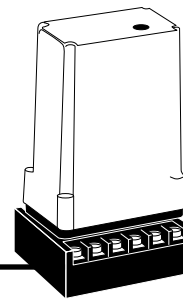
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Motion Detection Systems

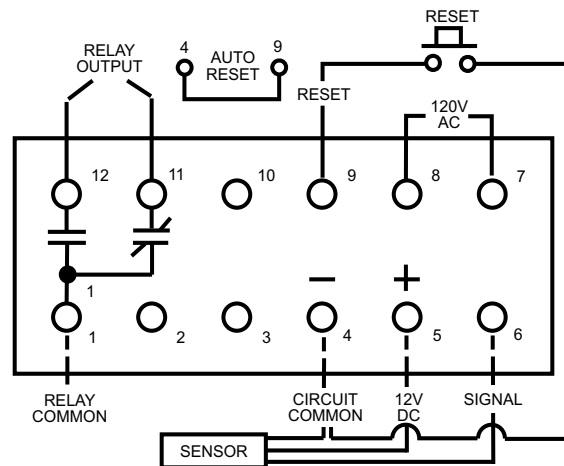


Circuit Drawings

UNDERSPEED ONLY SWITCH, ELECTROMECHANICAL RELAY

Model Nos.
EE891-02113
EE891-12113
EE891-22113

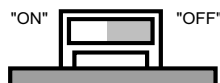
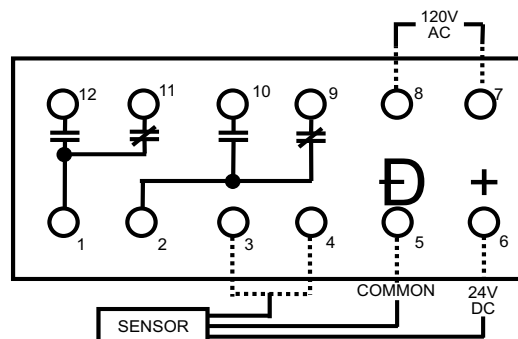
RELAY OUTPUT 1 FORM "C"
5 AMPS RESISTIVE @ 120V AC



ZERO SPEED SWITCH, ELECTROMECHANICAL RELAY SOLID STATE RELAY

Model Nos.
EE891-32103

RELAY OUTPUT: 2 FORM "C" 5 AMP RESISTIVE
@ 120V AC

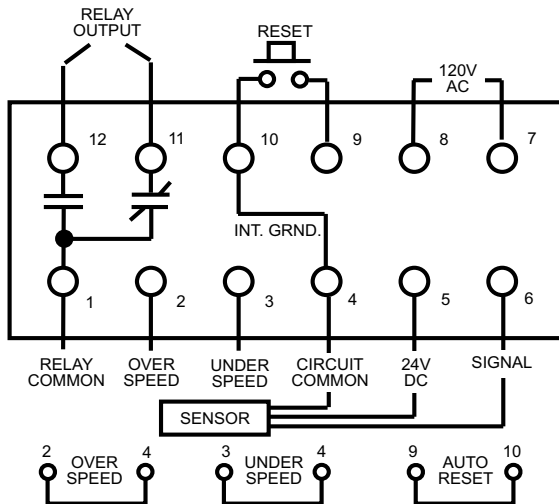


INTERNAL SWITCH
FOR NORMALLY "ON" OR NORMALLY "OFF"
RELAY OPERATION

MOTION SWITCH, ELECTROMECHANICAL RELAY

Model Nos.
EE891-02103
EE891-12103
EE891-22103

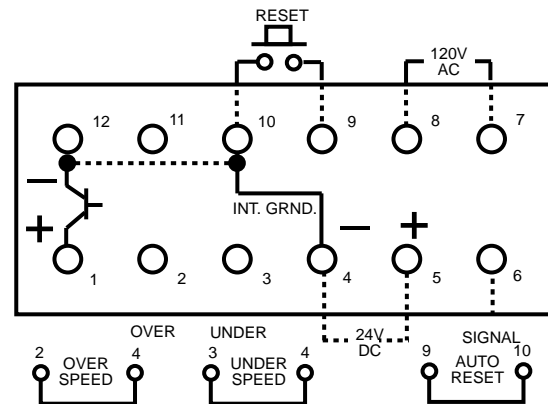
RELAY OUTPUT 1 FORM "C"
5 AMP MAX. RESISTIVE @ 120V AC



MOTION SWITCH, OPEN COLLECTOR

Model Nos.
EE891-02303
EE891-12303
EE891-22303

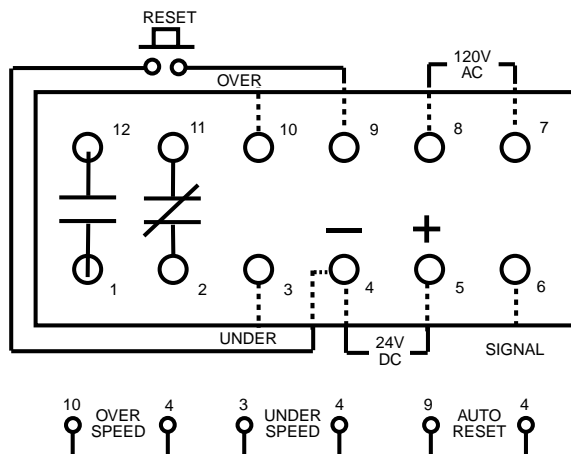
V EXT = 40V DC 20 ma MAX.



MOTION SWITCH, REED RELAY

Model Nos.
EE891-02403
EE891-12403
EE891-22403

RELAY OUTPUT
FORM "A" FORM "B"
12 va 120V OR
10 WATT MAX., 500 ma MAX., 120V MAX



NOTE: Early models may have 12VDC supply.

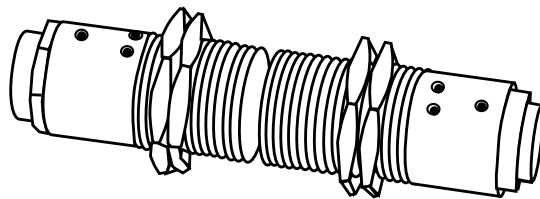
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Non-Contact Coupling System



- Provides connector-free installation and operation between stationary and moving assemblies
- Any Namco 2-wire AC/DC low leakage sensor can be used for part sensing on the moving equipment side of the system
- Up to 0.10" gap between Master and Remote Coupler

The Namco ProxCoupler™ System is designed primarily for use on equipment that has both stationary and movable elements. The ProxCoupler replaces cumbersome connector contact or slip-ring assemblies with a non-contact, solid-state system consisting of two parts. The Master Coupler is used on the stationary side of the equipment and provides power to the Remote Coupler. The Remote Coupler supplies power to the Remote Sensor and target status information to the Master Coupler. The Remote Sensor can be either a Namco 2-Wire AC/DC device or a mechanical contact device. Interconnection of the Remote Coupler and Remote Sensor is via standard double-ended Mini-style cordsets.

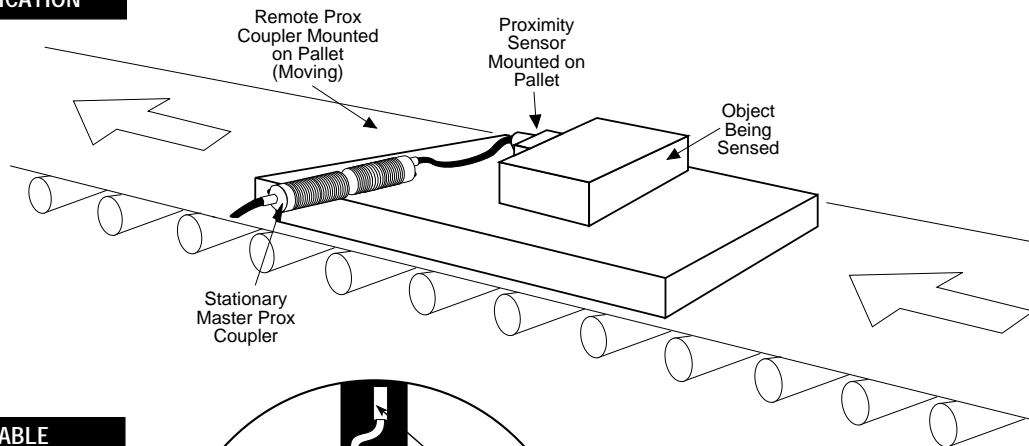
Applications:

- Material Handling Systems
- Monitoring Robot Arm Applications
- Rotary Transfer Machines
- Transfer Presses

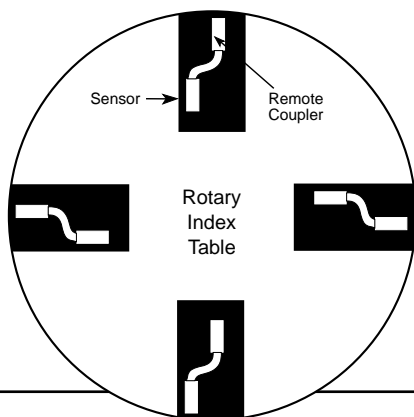
Model No.	Description
EE100-00125	Master Coupler (2-wire DC)
EE970-77600	Master Coupler (3-wire DC, PNP)
EE970-77000	Remote Coupler

Potential Uses of the Prox Coupler System

CONVEYOR APPLICATION



ROTARY INDEX TABLE APPLICATION



Permits additional sensors without addition of conventional slip rings

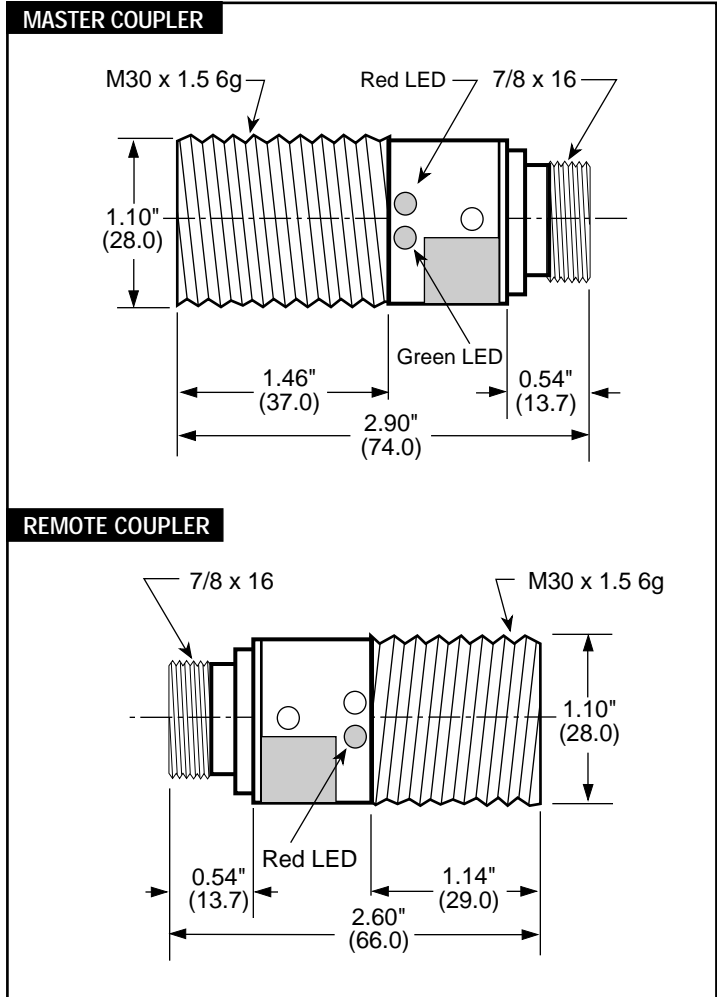


Specifications

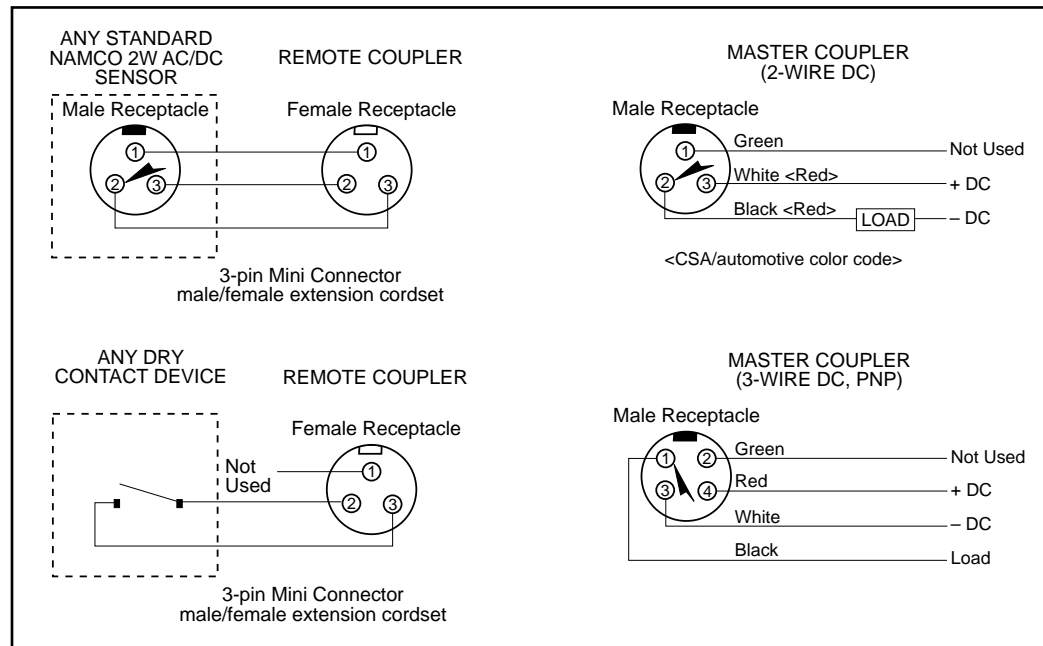
NON-CONTACT COUPLING SYSTEM		
MASTER COUPLER	3-Wire DC, PNP	2-Wire DC
Supply Voltage	20-30 VDC	
On-State Voltage Drop	+2.5 V	+10 V
Maximum Load	0.2 A	
Minimum Load	N/A	60 mA
Leakage Current	10 μ A	15 mA
WFI/SCP	yes	
Air Gap (minimum)	0.01 inch	
Air Gap (maximum)	0.10 inch	
Lateral Misalignment	0.01 inch (max.)	
Operating Temperature	-20°C to +70°C	
LED Indicators	Red On: Power on/non-conducting Green On: Target sensed/conducting Both Flashing: Short circuit condition	
REMOTE COUPLER		
LED Indicator	Red On: Energized by Master Coupler	
Remote Coupler Connection	3-pin male/female Mini style cordset	

Dimensional Drawings

Prox Coupler



Circuit Drawings



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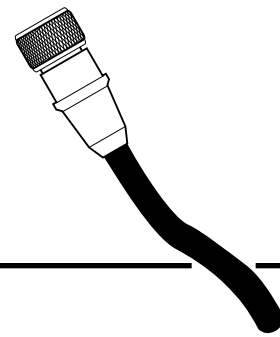
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Single Ended Female

Cable Cordsets



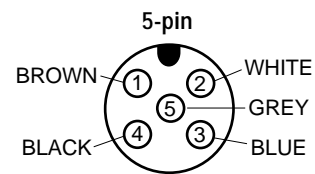
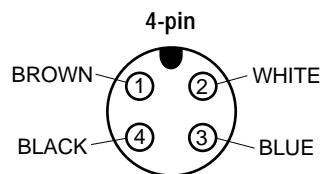
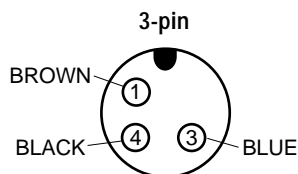
Cable Length	Pin Configuration	Euro Connector		Mini Connector		Micro Connector	
		Model No.	Wire Size	Model No.	Wire Size	Model No.	Wire Size
STRAIGHT CONNECTOR							
6 ft.	3-pin	EE978-52301	22 AWG	EE978-50301	16 AWG	EE978-51301	18 AWG
6 ft.	4-pin	EE978-52401	22 AWG	EE978-50401	16 AWG	EE978-51401	18 AWG
6 ft.	5-pin	EE978-52501	22 AWG	EE978-50501	16 AWG	EE978-51501	18 AWG
12 ft.	3 pin	EE978-52302	22 AWG	EE978-50302	16 AWG	EE978-51302	18 AWG
12 ft.	4-pin	EE978-52402	22 AWG	EE978-50402	16 AWG	EE978-51402	18 AWG
12 ft.	5-pin	EE978-52502	22 AWG	EE978-50502	16 AWG	EE978-51502	18 AWG
90° CONNECTOR							
6 ft.	3-pin	EE978-52311	22 AWG	EE978-50311	16 AWG	EE978-51311	18 AWG
6 ft.	4-pin	EE978-52411	22 AWG	EE978-50411	16 AWG	EE978-51411	18 AWG
6 ft.	5-pin	EE978-52511	22 AWG	EE978-50511	16 AWG	EE978-51511	18 AWG
12 ft.	3-pin	EE978-52312	22 AWG	EE978-50312	16 AWG	EE978-51312	18 AWG
12 ft.	4-pin	EE978-52412	22 AWG	EE978-50412	16 AWG	EE978-51412	18 AWG
12 ft.	5-pin	EE978-52512	22 AWG	EE978-50512	16 AWG	EE978-51512	18 AWG

All cables are PVC Jacketed, STO/STOW

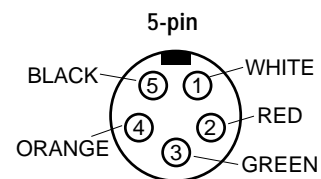
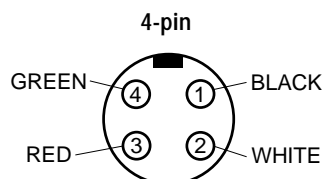
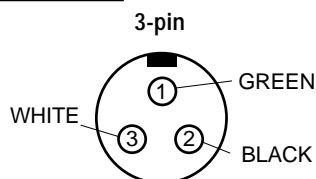
*Optional cable material and wire gauges available.
Consult factory for additional information.

Connector Drawings (Female views shown)

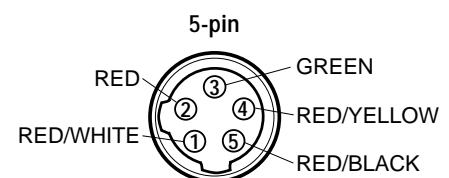
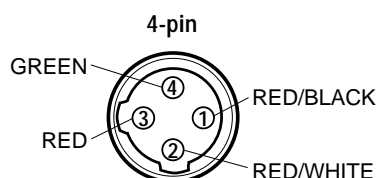
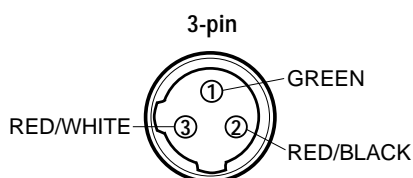
EURO CONNECTOR



MINI CONNECTOR

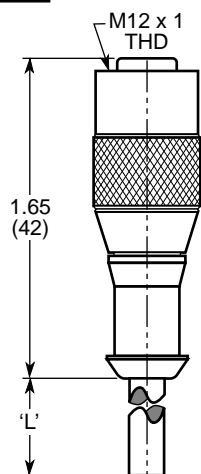


MICRO CONNECTOR

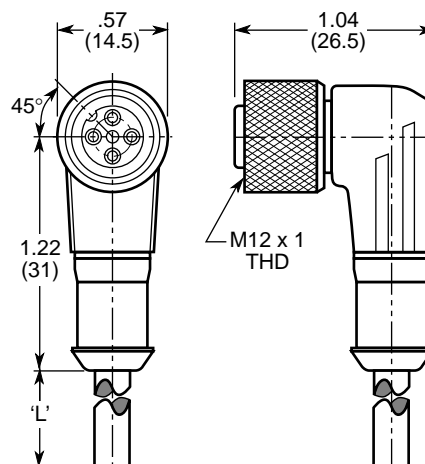


Euro Connectors - Dimensional Drawings

STRAIGHT FEMALE

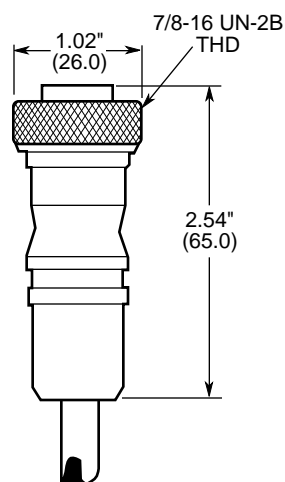


90° FEMALE

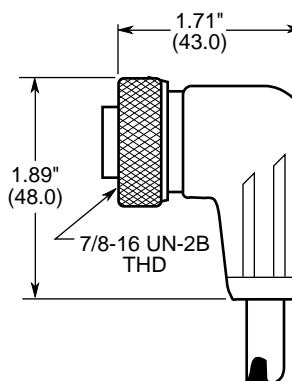


Mini Connectors - Dimensional Drawings

STRAIGHT FEMALE

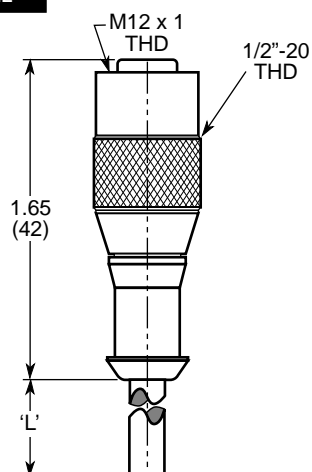


90° FEMALE

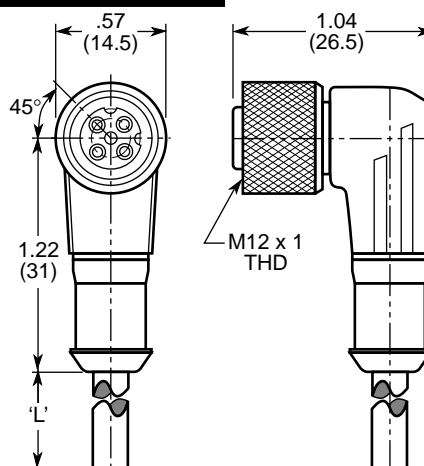


Micro Connectors - Dimensional Drawings

STRAIGHT FEMALE



90° FEMALE



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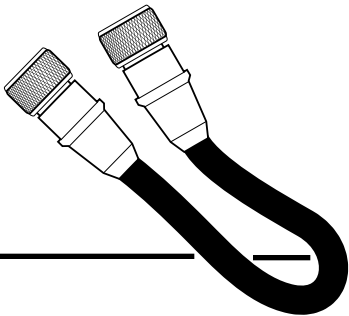
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Double
Ended

Cable Cordsets

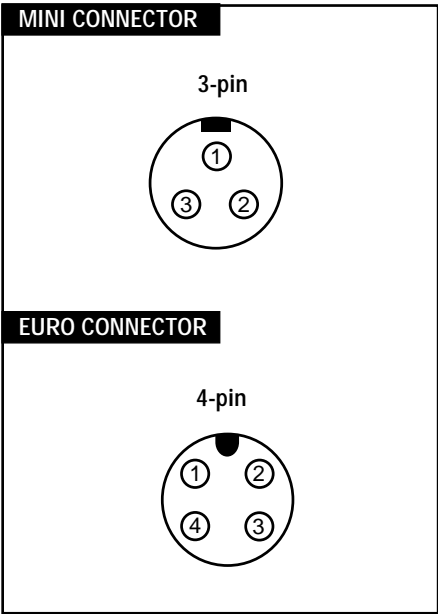


Cordsets

Cable Length	Model Number	Wire Size
DOUBLE-ENDED STRAIGHT EURO / 4-PIN MALE/FEMALE		
1'	PB978-30001	22AWG
3'	PB978-30003	22AWG
6'	PB978-30006	22AWG
9'	PB978-30009	22AWG
12'	PB978-30012	22AWG
DOUBLE-ENDED 90° EURO / 4-PIN STRAIGHT MALE		
1'	PB978-30101	22AWG
3'	PB978-30103	22AWG
6'	PB978-30106	22AWG
9'	PB978-30109	22AWG
12'	PB978-30112	22AWG
20'	PB978-30120	22AWG
DOUBLE-ENDED (2) 90° EURO / 4-PIN MALE/FEMALE		
1'	PB978-30201	22AWG
3'	PB978-30203	22AWG
6'	PB978-30206	22AWG
9'	PB978-30209	22AWG
12'	PB978-30212	22AWG
20'	PB978-30220	22AWG
DOUBLE-ENDED STRAIGHT MINI / 3-PIN MALE/FEMALE		
1'	PB978-30301	18AWG
3'	PB978-30303	18AWG
6'	PB978-30306	18AWG
9'	PB978-30309	18AWG
12'	PB978-30312	18AWG
20'	PB978-30320	18AWG

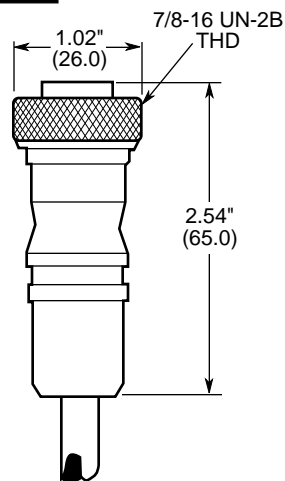
**Optional cable material, wire gauges and custom lengths available. Consult factory for additional information.*

Connector Drawings (Female views shown)

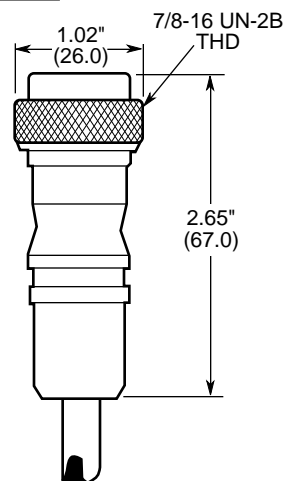


Mini Connectors - Dimensional Drawings

STRAIGHT FEMALE

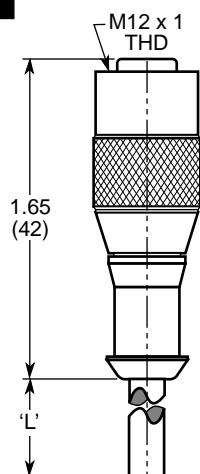


STRAIGHT MALE

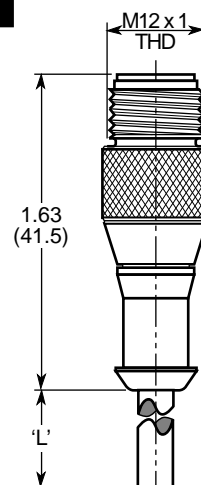


Euro Connectors - Dimensional Drawings

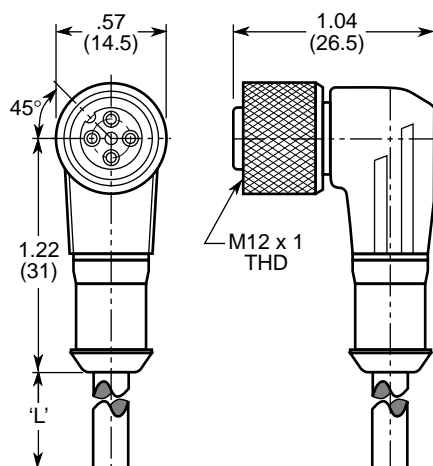
STRAIGHT FEMALE



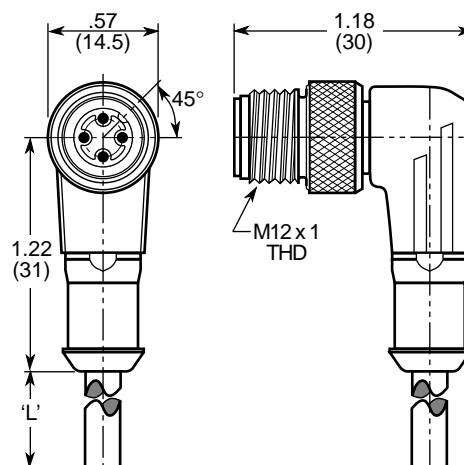
STRAIGHT MALE



90° FEMALE



90° MALE



Cables and cordsets are purchased to Namco specifications from multiple sources. As such, styles may vary slightly.

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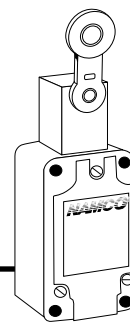
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Compact Body
Standard Environment
Butt Contacts

Limit Switches



Limit Switches

- Small Size
- Rotatable Head
- Light Operating Force
- Compact Durable Housing
- SPDT; Positive Opening in event of Minor Contact Welding

The new Namco Snap-Lock® EA530 Series limit switches are intended for reliable sensing performance in rugged industrial environments. They have a compact 30mm x 60mm mounting footprint and trip force of 40 in • oz., making them ideal for lighter force applications. These compact limit switches have a die cast zinc housing with epoxy paint and positive-acting contacts. They are NEMA A300 AC and Q300 DC rated and UL and CSA listed.

A variety of actuator styles are available, including top roller plunger and rotary roller lever. The switch heads are rotatable by 90° increments to allow for four positions of operation. Action can be changed from momentary clockwise and counterclockwise to momentary clockwise only or momentary counterclockwise only by setting the head internally.

EA530 Single Pole 1 N.O. - 1 N.C. / Butt Contacts

Model Number	Type	A Trip Travel	B Reset Travel	C Recommended Travel	D Total Travel	Operating Force
STANDARD TRAVEL/COMPACT						
EA530-14700	Plunger	.130"	.053"	.169"	.197"	33 oz.
EA530-15701	Roller Plunger	.102"	.053"	.141"	.197"	33 oz.
EA530-17702	Lever	35°	17°	48.5°	75°	40 in oz.

EA530 DPDT 2 N.O. - 2 N.C. / Butt Contacts

Model Number	Type	A Trip Travel	B Reset Travel	C Recommended Travel	D Total Travel	Operating Force
STANDARD TRAVEL/COMPACT						
EA530-47702	Lever	25°	10°	48.5°	75°	40 in oz.

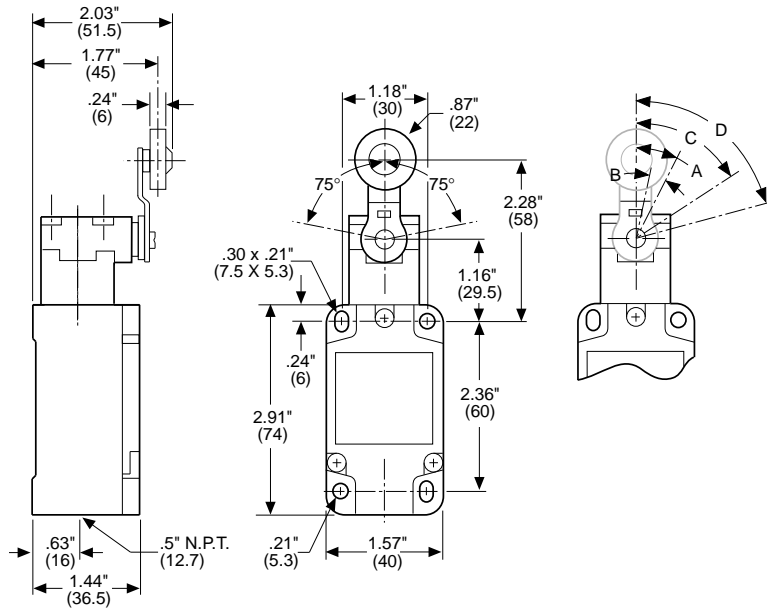
Common Switch Characteristics

SINGLE POLE, STANDARD ENVIRONMENT, COMPACT BODY, BUTT CONTACTS	
NEMA Enclosure Type	Designed to meet 1, 2, 4, 12 & 13 (IP66)
Ambient Temperature Range	-25°C to +80°C
Rotatable Head	yes
Light Operating Force	yes
UL/CSA	yes

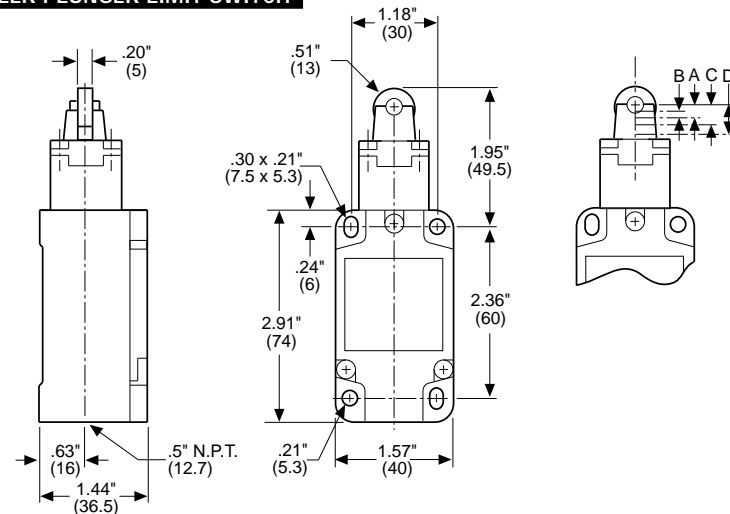
Dimensions and Mounting

EA530

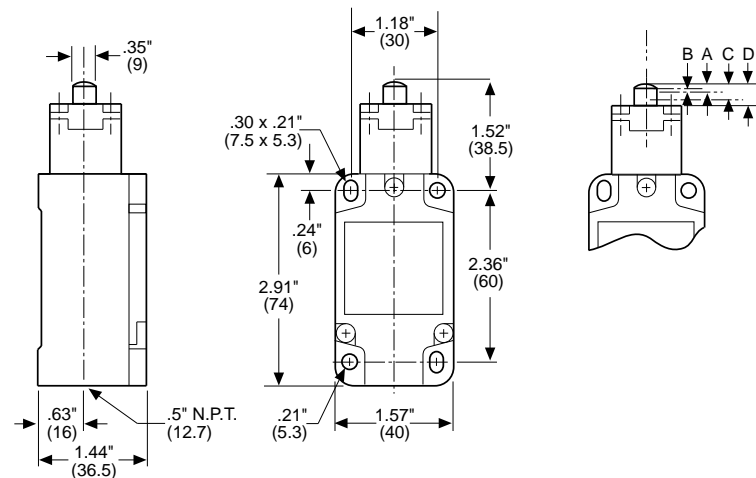
LEVER LIMIT SWITCH



ROLLER PLUNGER LIMIT SWITCH



PLUNGER LIMIT SWITCH



Dimensions: inches/(mm)

Continuous Current Rating - Amperes

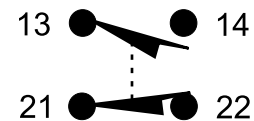
AC 50/60 Hz NEMA A300				
AC	Make	Break	Continuous	Voltamperes
120V	60A	6A	10A	7200 (make) 720 (break)
240V	30A	3A		
480V	15A	1.5A		
480V	15A	1.5A		
600V	12A	1.2A		

DC NEMA Q300			
DC	Make or Break	Continuous	Voltamperes
125V	.55A	N/A	69
250V	.27A	N/A	69
300V to 600V	12A	1.2A	N/A

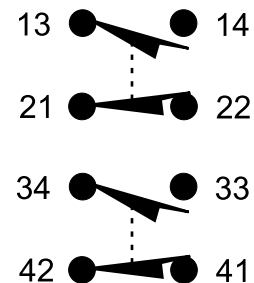
Limit Switches

Contact Configurations

SPST



DPDT



NAMCO

Namco Controls Corporation

Mayfield Village, OH 44143

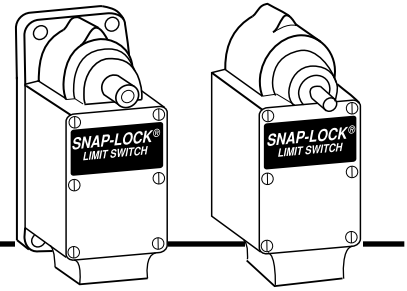
(440) 460-1360 • FAX (440) 460-3800 • namcocontrols.com

For technical assistance, call 1-800-NAMTECH

Single Pole Standard Environment

Limit Switches

Butt Contacts



Limit Switches

EA080

Single pole, double throw, heavy duty limit switch having mechanical travel of 10° to trip and with one normally open and one normally closed circuit. Can be furnished with wide and long mountings.

EA060

With mechanical travel of 6-1/2° required to trip, this heavy duty limit switch operates

with one normally open and one normally closed circuit. Can be furnished with wide and long mountings.

EA040

Designed for applications where a neutral position is essential in operation. This series provides the same snap locking action of the other series of Snap-Lock switches.

EA700

The versatility of the Snap-Lock mechanism is gained through the use of a series of uniquely designed cams. The cam and cam mechanism allow features such as bi-directional operation and generous overtravel. These features make the EA700 Series one of the most popular. Can be furnished with standard, wide or long mounting.

EA060 & EA080 Single Pole 1 N.O. - 1 N.C. / EA040 2 N.O. / Butt Contacts / Standard Travel / Rocker Type

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
NEUTRAL POSITION												
-	EA040-21100	EA040-11100	CW/CCW	7°	6°	7°30'	33°	-	-	22	C	1
SHORT TRAVEL												
-	EA060-21100	EA060-11100	CW	6°30'	4°	7°	35°	-	-	24	A	1
-	EA060-22100	EA060-12100	CCW	6°30'	4°	7°	35°	-	-	24	B	1
-	EA060-23100	EA060-13100	Maintained	6°30'	4°	7°	35°	-	-	12	-	1
STANDARD TRAVEL												
-	EA080-21100	EA080-11100	CW	10°	8°	13°	38°	-	-	14	A	1
-	EA080-22100	EA080-12100	CCW	10°	8°	13°	38°	-	-	14	B	1
-	EA080-23100	EA080-13100	Maintained	10°	8°	13°	38°	-	-	5	-	1

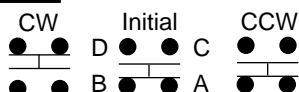
EA700 Single Pole 1 N.O. - 1 N.C. / Butt Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA700-10000	EA700-40000	EA700-70000	CW	18°	14°	30°	90°	-	-	15	A	1
EA700-10001	EA700-40001	EA700-70001	CCW	18°	14°	30°	90°	-	-	15	D	1
EA700-10100	EA700-40100	EA700-70100	CW/CCW	18°	14°	30°	90°	-	-	15	E	1
MAINTAIN CONTACT AND LEVER POSITION												
EA700-16000	EA700-46000	EA700-76000	CW	55°	22°	60°	116°	55°	64°	6	J	2
			CCW	25°	25°	60°	124°	54°	56°	9		
MAINTAIN CONTACTS AND SPRING RETURN LEVER POSITION												
EA700-16700	EA700-46700	EA700-76700	CW	30°	26°	45°	90°	30°	-	12	J	3
			CCW	16°	30°	45°	90°	26°	-	13.5		
NEUTRAL POSITION - ALL CONTACTS OPEN												
EA700-15000	EA700-45000	EA700-75000	CW	11°	9°	45°	90°	-	-	18	F	1
			CCW	35°	13°	45°	90°	-	-	13.5		
NEUTRAL POSITION - ALL CONTACTS CLOSED												
EA700-15100	EA700-45100	EA700-75100	CW	11°	9°	45°	90°	-	-	18	G	1
			CCW	35°	13°	45°	90°	-	-	13.5		
NEUTRAL POSITION - ALL CONTACTS OPEN												
EA700-15700	EA700-45700	EA700-75700	CW	31°	22°	45°	90°	-	-	15	H	1
			CCW	31°	12°	45°	90°	-	-	19.5		
NEUTRAL POSITION - ALL CONTACTS CLOSED												
EA700-15800	EA700-45800	EA700-75800	CW	31°	22°	45°	90°	-	-	15	I	1
			CCW	31°	12°	45°	90°	-	-	19.5		

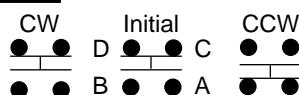
See Operating Levers Section

Contact Configurations

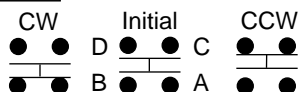
CIRCUIT A



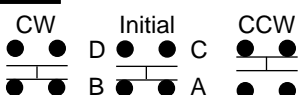
CIRCUIT B



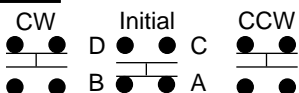
CIRCUIT C



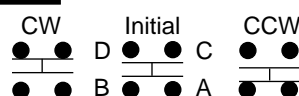
CIRCUIT D



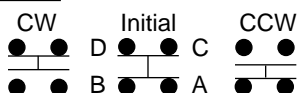
CIRCUIT E



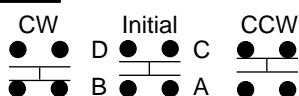
CIRCUIT F



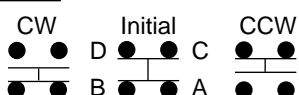
CIRCUIT G



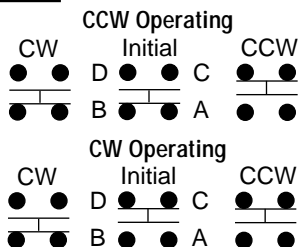
CIRCUIT H



CIRCUIT I



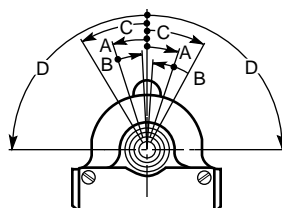
CIRCUIT J



EA040/EA060/EA080/EA700

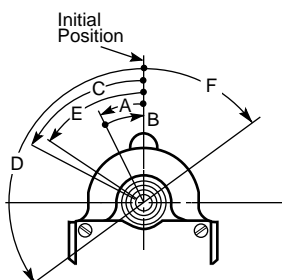
Operational Data Drawings

DRAWING #1

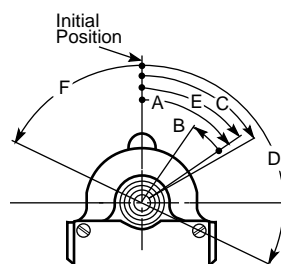


DRAWING #2

CCW Operating



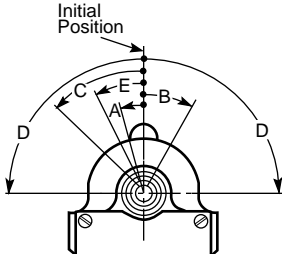
CW Operating



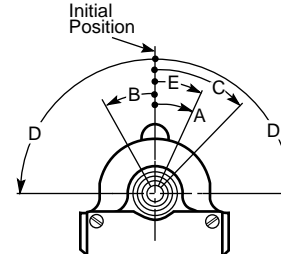
To change switch operation from CW operating to CCW operating, operate switch through angle E. Remove lever and reset at initial position.

DRAWING #3

CCW Operating



CW Operating



To change switch operation from CW operating to CCW operating, operate switch through angle E.

Limit Switches

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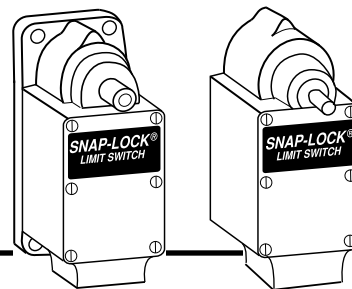
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For technical assistance, call 1-800-NAMTECH

Single Pole
Standard Environment

Limit Switches

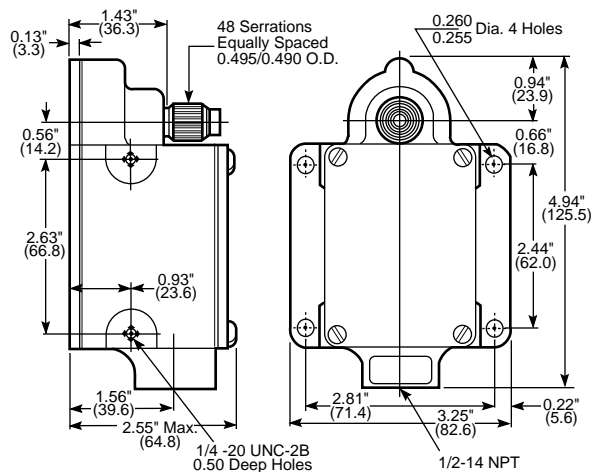
Butt
Contacts



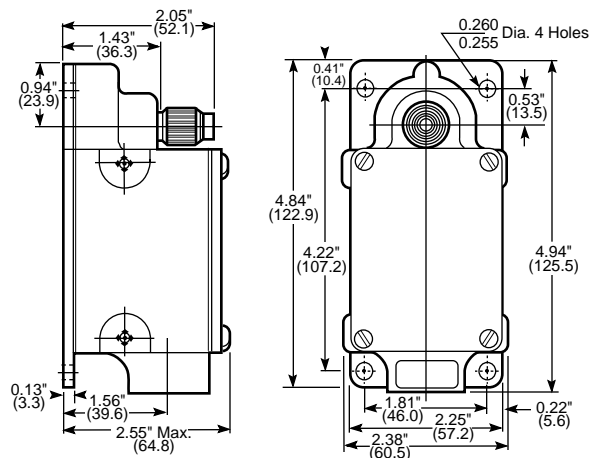
Limit Switches

EA040/060/080 Series Drawings

WIDE MOUNTING PLATE

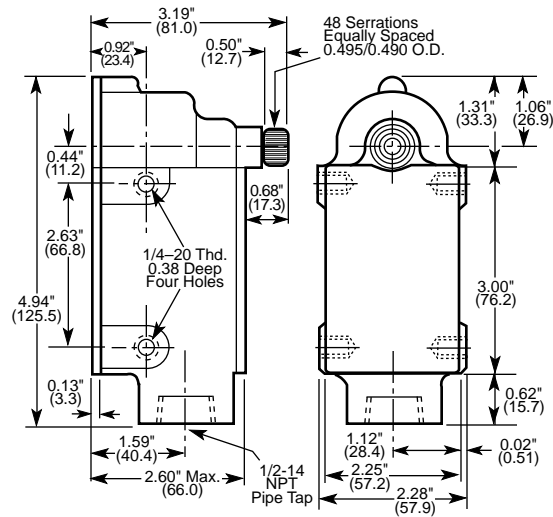


LONG MOUNTING PLATE

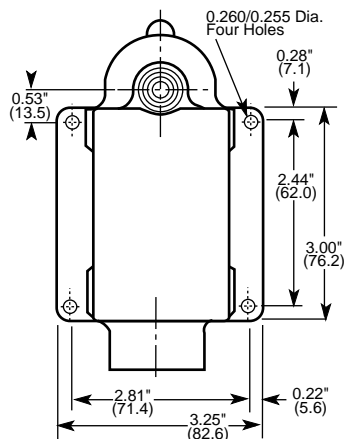


Dimensions: inches/(mm)

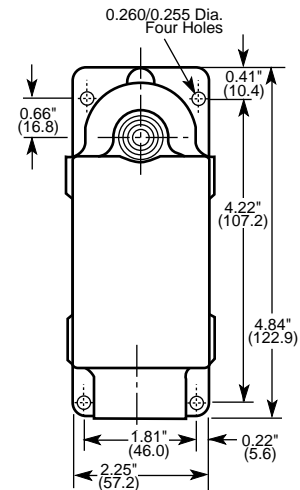
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE



Dimensions: inches/(mm)

Common Switch Characteristics

SINGLE POLE, STANDARD ENVIRONMENT, BUTT CONTACTS		
	EA040, 060, 080	EA700
NEMA Enclosure Type	1, 4, 13	
Housing Material	Zinc	
Ambient Temperature Range*	-20°C to +90°C	
Shipping Weight	2.3 lbs. approx.	3 lbs. approx.
Lever Adjustment	7°30' Increments thru 167°	7°30' Increments thru 360°
Contacts	Butt, Silver Alloy, Form Z	

*Some high temperature (+20°C to 180°C) and low temperature (-40°C to +90°C) versions available. Contact factory.

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

75-100% Power Factor

NAMCO

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Mayfield Village, OH 44143

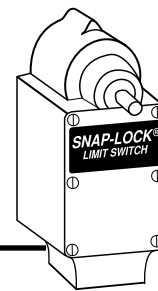
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For technical assistance, call 1-800-NAMTECH

Single Pole
Standard Environment

Limit Switches

Sliding
Contacts



Limit Switches

The versatility of the Snap-Lock mechanism is gained through the use of a series of uniquely designed cams. The cam and cam mechanism allow features such as bi-directional operation and generous overtravel. These features make the EA710 Series one of the most popular. Can be furnished with Standard, Wide or Long mounting.

EA710 Single Pole 1 N.O. - 1 N.C. / Sliding Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA710-10000	EA710-40000	EA710-70000	CW	18°	14°	30°	90°	-	-	15	A	1
EA710-10001	EA710-40001	EA710-70001	CCW	18°	14°	30°	90°	-	-	15	B	1
EA710-10100	EA710-40100	EA710-70100	CW/CCW	18°	14°	30°	90°	-	-	15	C	1
MAINTAINED CONTACTS AND LEVER POSITION												
EA710-16000	EA710-46000	EA710-76000	CW	55°	22°	60°	116°	55°	64°	6	D	2
			CCW	25°	25°	60°	124°	54°	56°	9		

Common Switch Characteristics

SINGLE POLE, STANDARD ENVIRONMENT, SLIDING CONTACTS	
NEMA Enclosure Type	1, 4, 13
Housing Material	Zinc
Ambient Temperature Range*	-20°C to +90°C
Shipping Weight	3 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Sliding, Silver Alloy, Form Z

Continuous Current Rating - Amperes

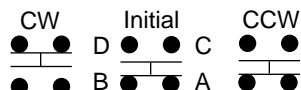
VOLTAGE	AC	DC
125	10.0	2.5
250	7.5	.75
480	5.0	-
600	2.5	-

75-100% Power Factor

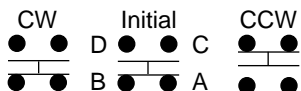
See Operating Levers Section

Contact Configurations

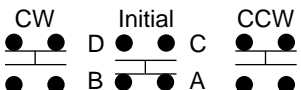
CIRCUIT A



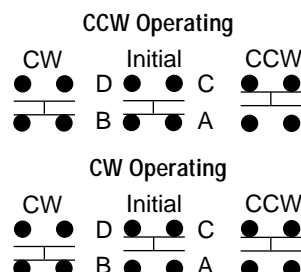
CIRCUIT B



CIRCUIT C

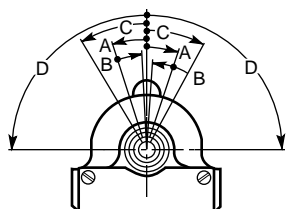


CIRCUIT D

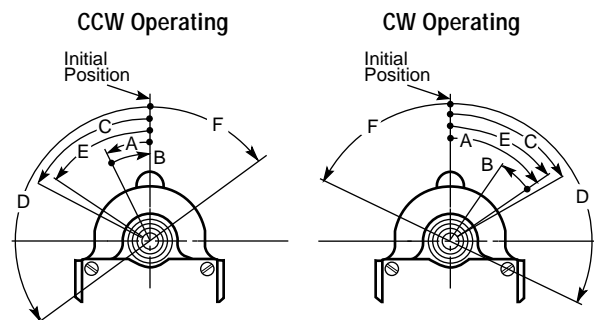


Operational Data Drawings

DRAWING #1



DRAWING #2

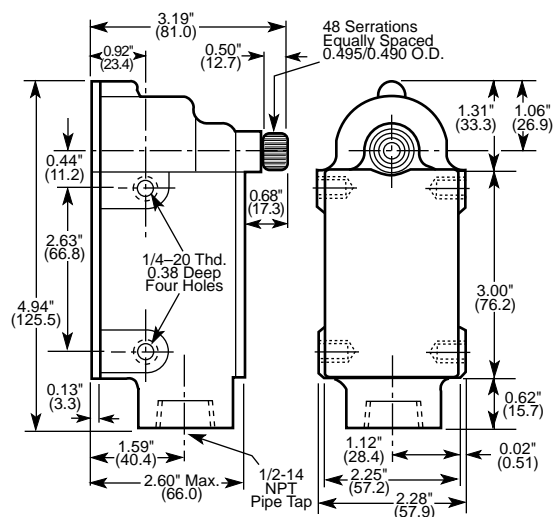


To change switch operation from CW operating to CCW operating, operate switch through angle E. Remove lever and reset at initial position.

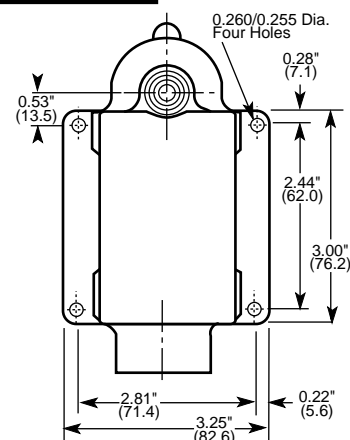
Dimensions and Mounting

EA710

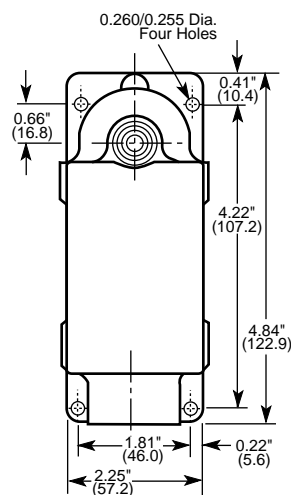
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE



Dimensions: inches/(mm)

Limit Switches

NAMCO

Namco Controls Corporation

Mayfield Village, OH 44143

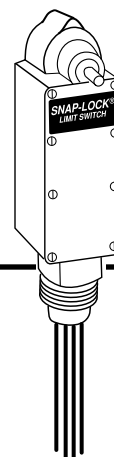
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For technical assistance, call 1-800-NAMTECH

Single Pole
Standard Environment
(Super Sealed)

Limit Switches

Butt
Contacts



Limit Switches

- Multiple Contacts — SPDT
- Epoxy Sealed
- Generous Overtravel
- Heavy Duty Cam Operated
- Flexibility of Motion CW, CCW and CW/CCW

Wide range of operation...modular construction...practical flexibility.

The Series EA770 Super Sealed Water & Oil Tight Snap-Lock Limit Switches are the “ultimate” of the industry. By incorporating the moisture seal with these switches, trouble caused by water, soluble oils or condensation has been eliminated. The scope of models is tailored to meet today's rugged requirements...there is a model of size and type to meet virtually all demands.

Besides covering all functional requirements, this line is designed to meet practically every condition of installation. These Snap-Lock Switches provide reliable “machine-life” service and have the stamina to operate under unusual conditions...at the same time giving millions of consistently fast, accurate contacts.

Here are a few of the outstanding features built into the switch for maximum performance. Generous overtravel and by-pass, flexibility of motion, fast contact action, and Form Z contact arrangement.

Options Available

- Low temperature (-40°C to +90°C) components and lubricants.
- A variety of levers can be ordered from Namco Controls Series EL. NOTE: Levers must be ordered as separate item. See pages 294-301.
- Basic design permits mounting from either side or back. Style L or W mounting plates, for back mounting.

EA770 Single Pole 1 N.O. - 1 N.C. / Butt Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL											
EA770-10000	EA770-40000	EA770-70000	CW	18°	14°	30°	90°	-	-	15	A
EA770-10001	EA770-40001	EA770-70001	CCW	18°	14°	30°	90°	-	-	15	B
EA770-10100	EA770-40100	EA770-70100	CW/CCW	18°	14°	30°	90°	-	-	15	C

See Operating Levers Section

Common Switch Characteristics

SINGLE POLE, STANDARD (SUPER-SEALED) ENVIRONMENT, BUTT CONTACTS	
NEMA Enclosure Type	1, 4, 6, 13
Housing Material	Zinc
Ambient Temperature Range*	-20°C to +90°C
Shipping Weight	3 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Butt, Silver Alloy, Form Z
Lead Wires**	4 lead wires, part no. shown is for 15 ft.

*Some low temperature (-40°C to +90°C) versions available. Contact factory.

**Available in increments of 5 ft. Contact factory.

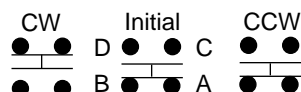
Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

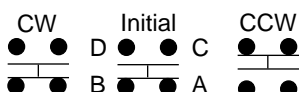
75-100% Power Factor

Contact Configurations

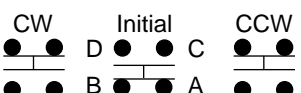
CIRCUIT A



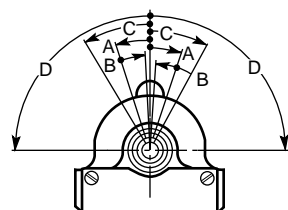
CIRCUIT B



CIRCUIT C



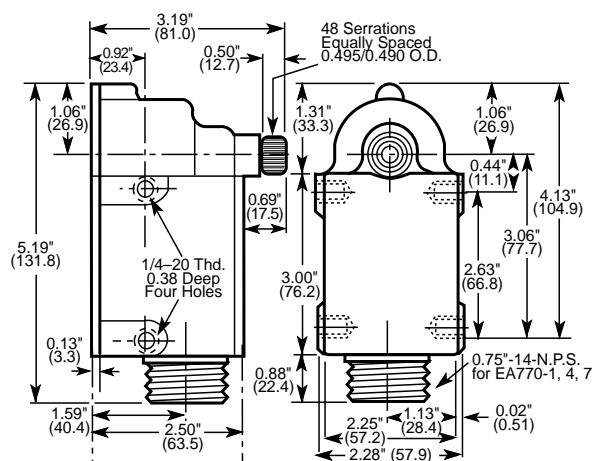
Operational Data Drawings



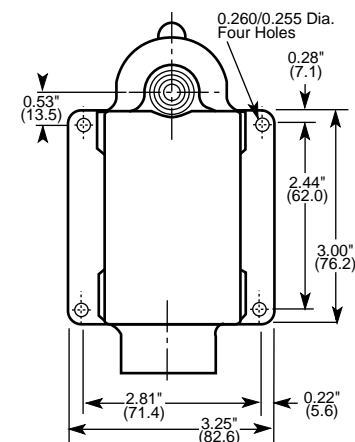
Dimensions and Mounting

EA770

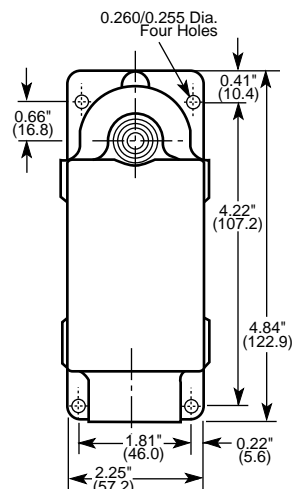
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE



NAMCO

Namco Controls Corporation

Mayfield Village, OH 44143

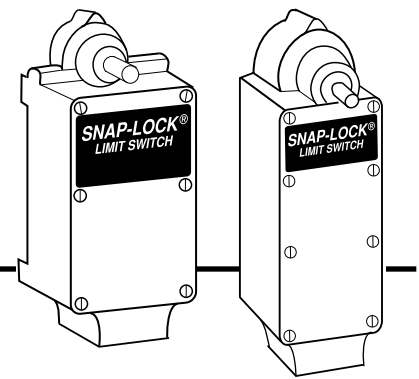
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For technical assistance, call 1-800-NAMTECH

Double Pole
Standard Environment

Limit Switches

Butt
Contacts



Limit Switches

Standard (EA170)

Double pole, double break, double throw, heavy duty limit switch having mechanical travel of 10° to trip and with two normally open and two normally closed circuits. Can be furnished with standard, wide or long mounting.

Short Travel (EA170)

With mechanical travel of 6-1/2° required to trip, this heavy duty limit switch operates with two normally open

and two normally closed circuits. Can be furnished with standard, wide or long mounting.

Reverse Shaft (EA170)

Designed for applications where a reverse shaft is essential in operation. This series provides the same snap locking action of the other series of EA170 Snap-Lock Switches. Can be furnished with standard, wide or long mounting.

EA700 (Standard)

The versatility of the Snap-Lock mechanism is gained through the use of a series of uniquely designed cams. The cam and cam mechanism allow features such as bi-directional operation and generous overtravel. These features make the EA700 Series one of the most popular. Can be furnished with Standard, Wide or Long mounting.

EA170 Double Pole 2 N.O. - 2 N.C. / Butt Contacts / Rocker Type

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA170-11100	EA170-21100	EA170-31100	CW	10°	8°	13°	37°	-	-	23	A	1
EA170-12100	EA170-22100	EA170-32100	CCW	10°	8°	13°	37°	-	-	23	B	1
EA170-13100	EA170-23100	EA170-33100	Maintain	10°	8°	13°	37°	-	-	10	-	1
SHORT TRAVEL												
EA170-14100	EA170-24100	EA170-34100	CW	6° 30'	4°	7°	36°	-	-	32	A	1
EA170-15100	EA170-25100	EA170-35100	CCW	6° 30'	4°	7°	36°	-	-	32	B	1
EA170-16100	EA170-26100	EA170-36100	Maintain	6° 30'	4°	7°	36°	-	-	10.5	-	1
STANDARD TRAVEL - REVERSE SHAFT												
EA170-41100	EA170-51100	EA170-61100	CW	10°	8°	13°	37°	-	-	30	A	1
EA170-42100	EA170-52100	EA170-62100	CCW	10°	8°	13°	37°	-	-	30	B	1
EA170-43100	EA170-53100	EA170-63100	Maintain	10°	8°	13°	37°	-	-	23	-	1

EA700 Double Pole Standard 2 N.O. - 2 N.C. / Neutral Position 4 N.O. or 4 N.C. / Butt Contacts

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL / CAM ACTION												
EA700-20000	EA700-50000	EA700-80000	CW	18°	14°	30°	90°	-	-	27	C	1
EA700-20001	EA700-50001	EA700-80001	CCW	18°	14°	30°	90°	-	-	27	D	1
EA700-20100	EA700-50100	EA700-80100	CW/CCW	18°	14°	30°	90°	-	-	27	E	1
NEUTRAL POSITION / CAM ACTION - ALL CONTACTS OPEN												
EA700-25000	EA700-55000	EA700-85000	CW	11°	9°	45°	90°	-	-	19.5	F	1
			CCW	35°	13°	45°	90°	-	-	15		

See Operating Levers Section

EA700 Double Pole Standard

2 N.O. - 2 N.C. / Neutral Position 4 N.O. or 4 N.C. / Butt Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
NEUTRAL POSITION - ALL CONTACTS OPEN												
EA700-25102	EA700-55102	EA700-85102	CW	31°	22°	45°	90°	-	-	16.5	G	1
			CCW	31°	12°	45°	90°	-	-	20.5		
NEUTRAL POSITION - ALL CONTACTS CLOSED												
EA700-25108	EA700-55108	EA700-85108	CW	31°	22°	45°	90°	-	-	16.5	H	1
			CCW	31°	12°	45°	90°	-	-	20.5		
MAINTAINED CONTACT - MAINTAINED CONTACTS & LEVER POSITION												
EA700-26000	EA700-56000	EA700-86000	CW	55°	22°	60°	116°	55°	64°	6	I	2
			CCW	25°	25°	60°	124°	54°	56°	12		
MAINTAINED CONTACT - MAINTAINED CONTACTS - LEVER RETURNED												
EA700-26700	EA700-56700	EA700-86700	CW	30°	26°	45°	90°	30°	-	15	I	3
			CCW	16°	30°	45°	90°	26°	-	16.5		

Contact Configurations

CIRCUIT A			CIRCUIT B		
CW	Initial	CCW	CW	Initial	CCW
● ● H ● ● G	● ● F ● ● E	● ● D ● ● C	● ● H ● ● G	● ● F ● ● E	● ● D ● ● C
● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A
CIRCUIT C			CIRCUIT D		
CW	Initial	CCW	CW	Initial	CCW
● ● H ● ● G	● ● F ● ● E	● ● D ● ● C	● ● H ● ● G	● ● F ● ● E	● ● D ● ● C
● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A
CIRCUIT E			CIRCUIT F		
CW	Initial	CCW	CW	Initial	CCW
● ● H ● ● G	● ● F ● ● E	● ● D ● ● C	● ● H ● ● G	● ● F ● ● E	● ● D ● ● C
● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A
CIRCUIT G			CIRCUIT H		
CW	Initial	CCW	CW	Initial	CCW
● ● H ● ● G	● ● F ● ● E	● ● D ● ● C	● ● H ● ● G	● ● F ● ● E	● ● D ● ● C
● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A
CIRCUIT I			CIRCUIT I		
CCW Operating			CW Operating		
CW	Initial	CCW	CW	Initial	CCW
● ● H ● ● G	● ● F ● ● E	● ● D ● ● C	● ● H ● ● G	● ● F ● ● E	● ● D ● ● C
● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A	● ● B ● ● A

Operational Data Drawings

DRAWING #1

DRAWING #2

CCW Operating CW Operating

To change switch operation from CW operating to CCW operating, operate switch through angle E. Remove lever and reset at initial position.

DRAWING #3

CCW Operating CW Operating

To change switch operation from CW operating to CCW operating, operate switch through angle E.

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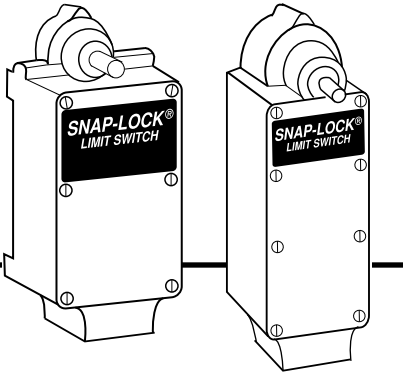
(440) 460-1360 • FAX (440) 460-3800 • namcocontrols.com

For technical assistance, call 1-800-NAMTECH

Double Pole
Standard Environment

Limit Switches

Butt
Contacts



Limit Switches

Common Switch Characteristics

DOUBLE POLE, STANDARD ENVIRONMENT, BUTT CONTACTS		
	EA170	EA700
NEMA Enclosure Type	1, 4, 13	
Housing Material	Zinc/Al.	Zinc
Ambient Temperature Range*	-20°C to +90°C	
Shipping Weight	3.5 lbs. approx.	4 lbs. approx.
Lever Adjustment	EA170 Std. Shaft: 7°30' Increments thru 167° EA170 Rev. Shaft: 7°30' Increments thru 360°	7°30' Increments thru 360°
Contacts	Butt, Silver Alloy, Form Z	

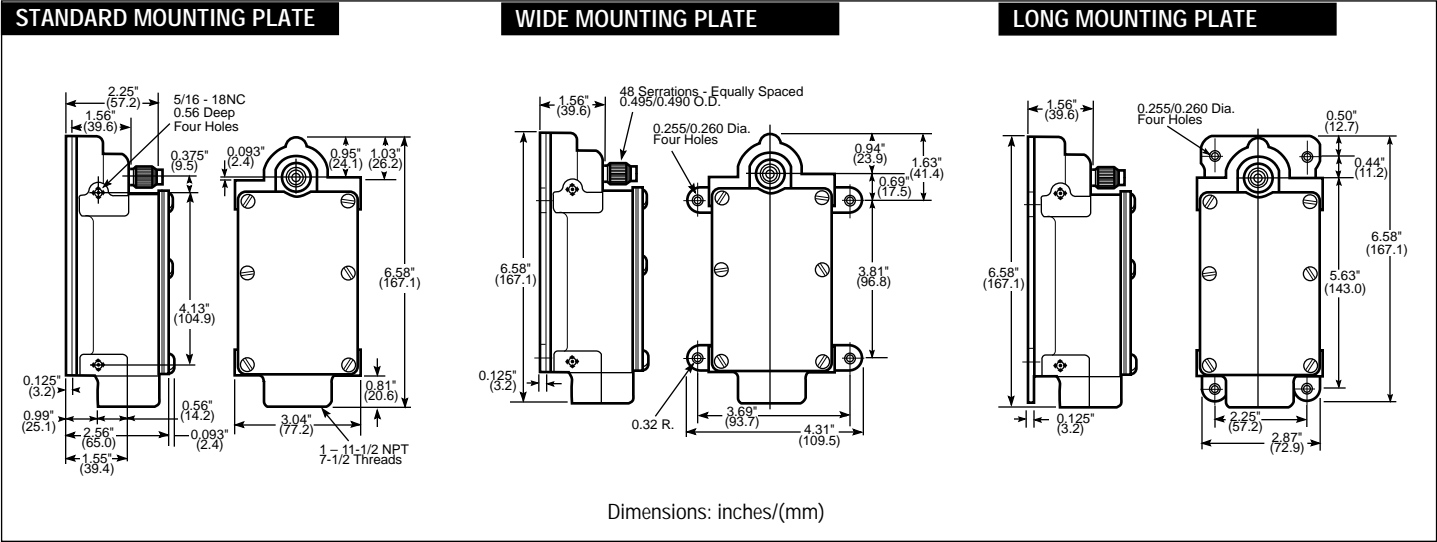
*Some high temperature (+20°C to 180°C) and low temperature (-40°C to +90°C) versions available. Contact factory.

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

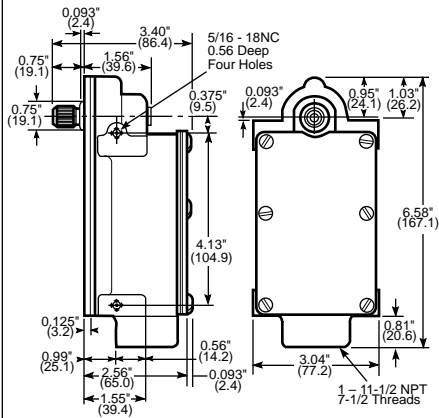
75-100% Power Factor

EA170 (Standard) Series Drawings

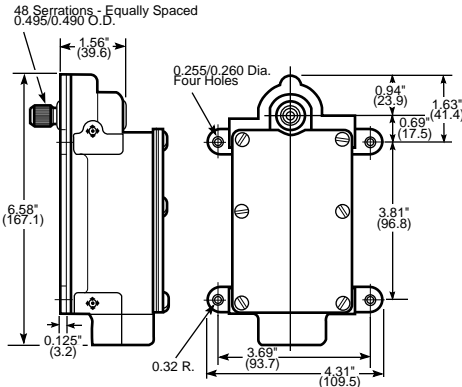


EA170 (Reverse Shaft) Series Drawings

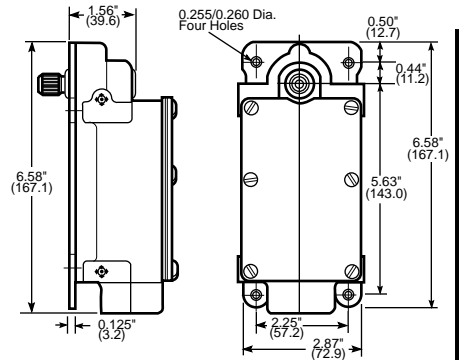
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE

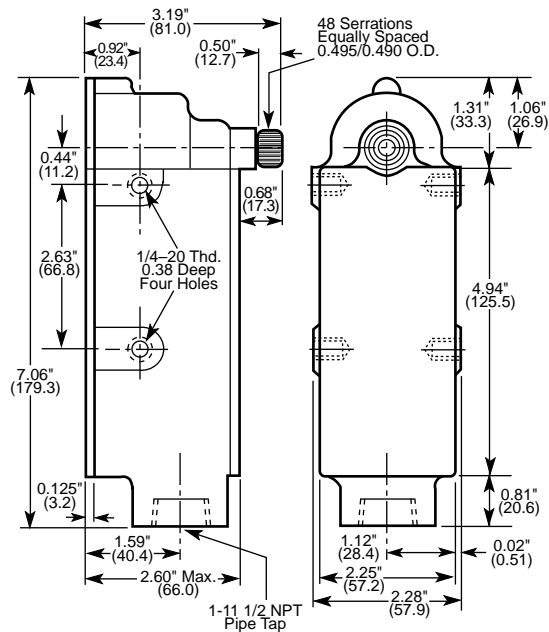


Dimensions: inches/(mm)

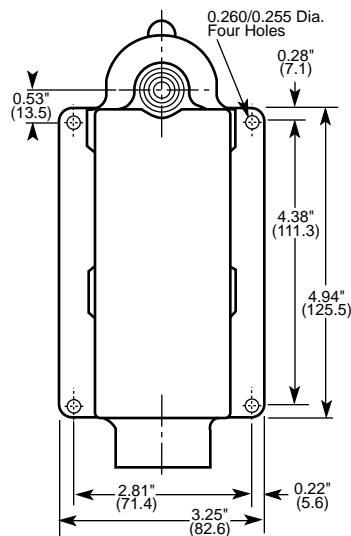
Limit Switches

EA700 Series Drawings

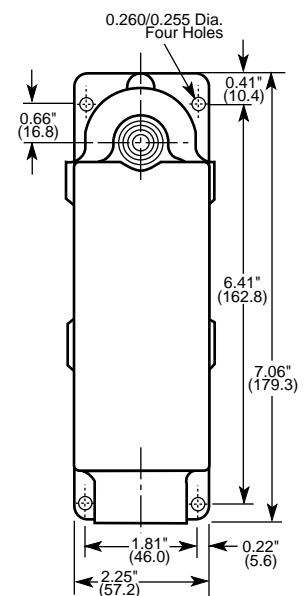
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE



Dimensions: inches/(mm)

NAMCO

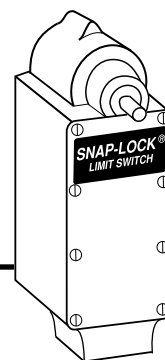
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Mayfield Village, OH 44143
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For technical assistance, call 1-800-NAMTECH

Double Pole
Standard Environment

Limit Switches

Sliding
Contacts



Limit Switches

The versatility of the Snap-Lock mechanism is gained through the use of a series of uniquely designed cams. The cam and cam mechanism allow features such as bi-directional operation and generous overtravel. These features make the EA710 Series one of the most popular. Can be furnished with Standard, Wide or Long mounting.

EA710 Double Pole 2 N.O. - 2 N.C. / Sliding Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA710-20000	EA710-50000	EA710-80000	CW	18°	14°	30°	90°	-	-	20	A	1
EA710-20001	EA710-50001	EA710-80001	CCW	18°	14°	30°	90°	-	-	20	B	1
EA710-20100	EA710-50100	EA710-80100	CW/CCW	18°	14°	30°	90°	-	-	20	C	1
MAINTAINED CONTACT AND LEVER POSITION												
EA710-26000	EA710-56000	EA710-86000	CW	55°	22°	60°	116°	55°	64°	6	D	2
			CCW	25°	25°	60°	124°	54°	56°	9		

Common Switch Characteristics

DOUBLE POLE, STANDARD ENVIRONMENT, SLIDING CONTACTS	
NEMA Enclosure Type	1, 4, 13
Housing Material	Zinc
Ambient Temperature Range*	-20°C to +90°C
Shipping Weight	4 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Sliding, Silver Alloy, Form Z

*Some high temperature (0 to 150°C) versions available. Contact factory.

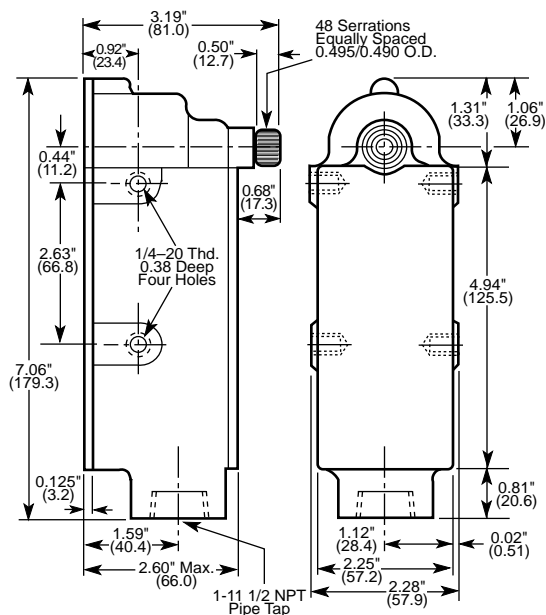
Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	10.0	2.5
250	7.5	.75
480	5.0	-
600	2.5	-

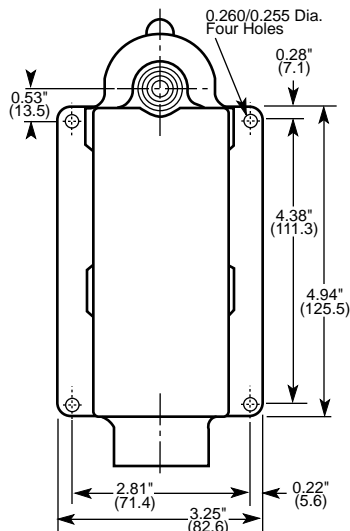
75-100% Power Factor

See Operating Levers Section

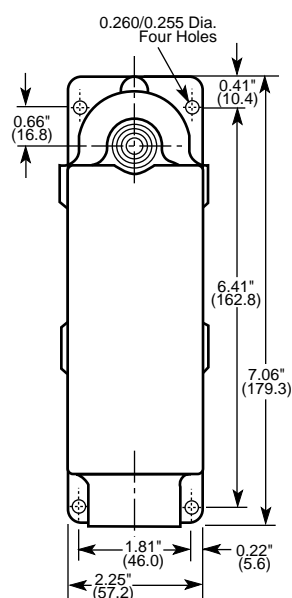
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE

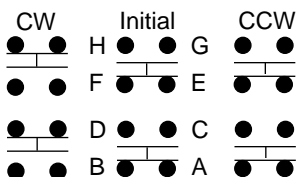


Dimensions: inches/(mm)

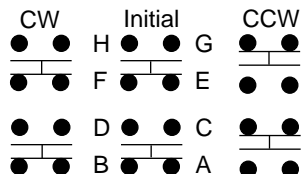
Limit Switches

Contact Configurations

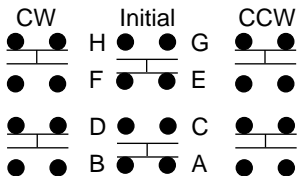
CIRCUIT A



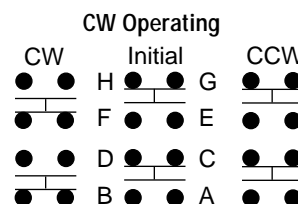
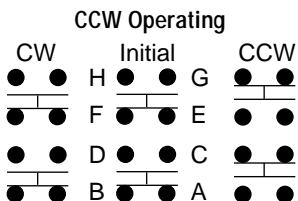
CIRCUIT B



CIRCUIT C

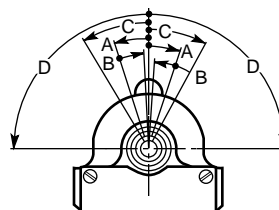


CIRCUIT D

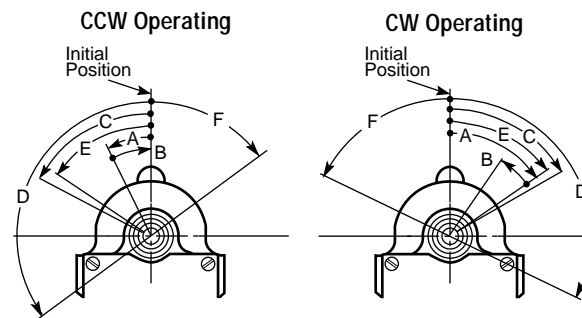


Operational Data Drawings

DRAWING #1



DRAWING #2



To change switch operation from CW operating to CCW operating, operate switch through angle E. Remove lever and reset at initial position.

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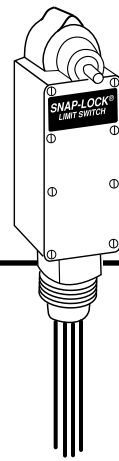
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For technical assistance, call 1-800-NAMTECH

Double Pole
Standard Environment
(Super Sealed)

Limit
Switches

Butt
Contacts



Limit Switches

- Multiple Contacts - DPDT
- Epoxy Sealed
- Generous Overtravel
- Heavy Duty Cam Operated
- Flexibility of Motion CW & CCW

Wide Range of Operation...Modular Construction...Practical Flexibility

The Series EA770 Super Sealed Water & Oil Tight Snap-Lock Limit Switches are the "ultimate" of the industry. By incorporating the moisture seal with these switches, trouble caused by water, soluble oils or condensate interfering with switching mechanism

has been eliminated. The scope of models is tailored to meet today's rugged requirements...there is a model of size and type to meet virtually all demands.

Besides covering all functional requirements this line is designed to meet practically every condition of installation. These Snap-Lock Switches provide reliable "machine-life" service and have the stamina to operate under unusual conditions...at the same time giving millions of consistently fast, accurate contacts.

Here are a few of the outstanding features built into the switch for maximum performance. Generous overtravel and by-pass; Flexibility of motion, clockwise and counterclockwise; Light operating torque; Fast contact action; and Form Z contact arrangement.

Options Available

- Low temperature (-40°C to + 90°C) components and lubricants.
- A variety of levers can be ordered from Namco Controls Series EL. NOTE: Levers must be ordered as separate items.
- Basic design permits mounting from either side or back. Style L or W mounting plates, for back mounting, available at no extra cost.

EA770 Double Pole 2 N.O. - 2 N.C. / Butt Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL											
EA770-20000	EA770-50000	EA770-80000	CW	18°	14°	30°	90°	-	-	27	A
EA770-20001	EA770-50001	EA770-80001	CCW	18°	14°	30°	90°	-	-	27	B
EA770-20100	EA770-50100	EA770-80100	CW/CCW	18°	14°	30°	90°	-	-	27	C

Common Switch Characteristics

DOUBLE POLE, STANDARD (SUPER SEALED) ENVIRONMENT, BUTT CONTACTS	
NEMA Enclosure Type	1, 4, 6, 13
Housing Material	Zinc
Ambient Temperature Range*	-20°C to +90°C
Shipping Weight	4 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Butt, Silver Alloy, Form Z
Lead Wires**	8 lead wires, part no. shown is for 15 ft.

*Some low temperature (-40 to +90°C) versions available. Contact factory.

**Available in increments of 5 ft. Contact factory.

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

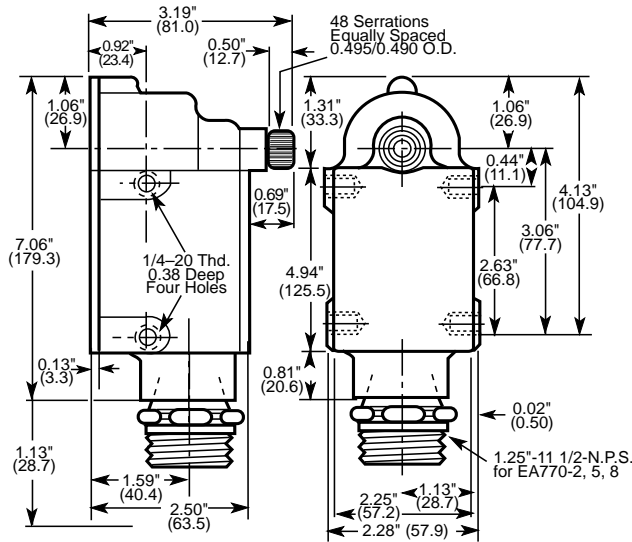
75-100% Power Factor

See Operating Levers Section

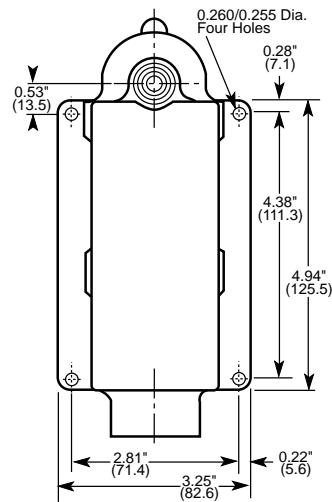
Dimensions and Mounting

EA770

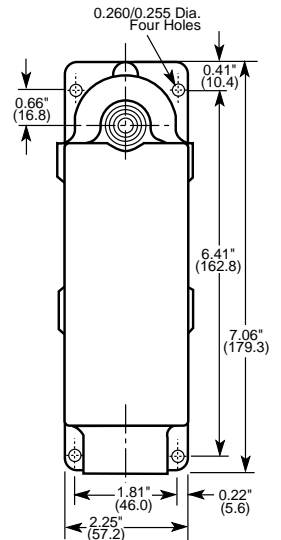
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



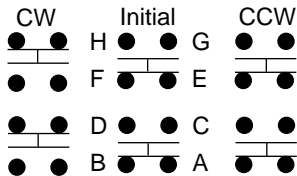
LONG MOUNTING PLATE



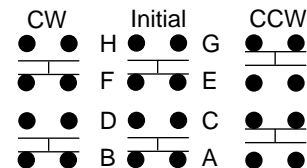
Limit Switches

Contact Configurations

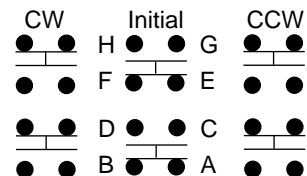
CIRCUIT A



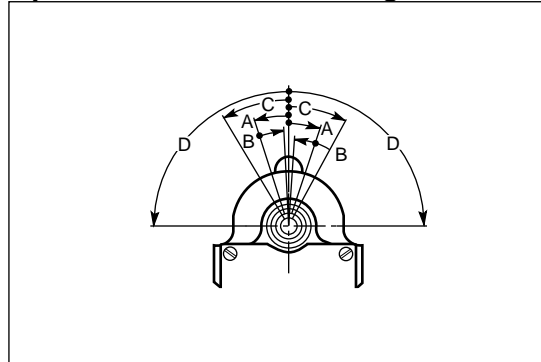
CIRCUIT B



CIRCUIT C



Operational Data Drawing



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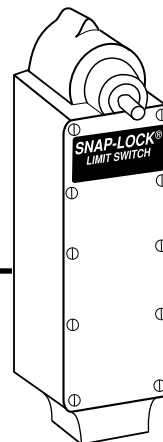
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For technical assistance, call 1-800-NAMTECH

Triple Pole
Standard Environment

Limit Switches

Butt
Contacts



Limit Switches

The versatility of the Snap-Lock mechanism is gained through the use of a series of uniquely designed cams. The cam and cam mechanism allow features such as bi-directional operation and generous overtravel. These features make the EA700 Series one of the most popular. Can be furnished with Standard, Wide or Long mounting.

EA700 Triple Pole 3 N.O. - 3 N.C. / Butt Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL											
EA700-30000	EA700-60000	EA700-90000	CW	18°	14°	30°	90°	-	-	33	A
EA700-30001	EA700-60001	EA700-90001	CCW	18°	14°	30°	90°	-	-	33	B
EA700-30100	EA700-60100	EA700-90100	CW/CCW	18°	14°	30°	90°	-	-	33	C

Common Switch Characteristics

TRIPLE POLE, STANDARD ENVIRONMENT, BUTT CONTACTS	
NEMA Enclosure Type	1, 4, 13
Housing Material	Zinc
Ambient Temperature Range*	-20°C to +90°C
Shipping Weight	5 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Butt, Silver Alloy, Form Z

*Some high temperature (+20°C to 180°C) and low temperature (-40°C to +90°C) versions available. Contact factory.

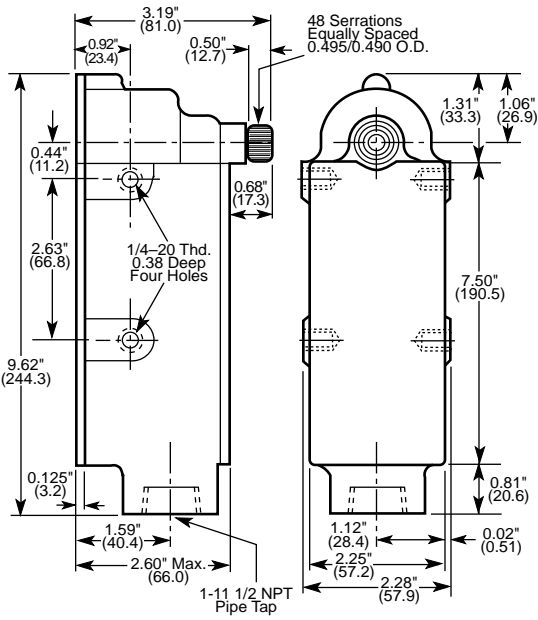
Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

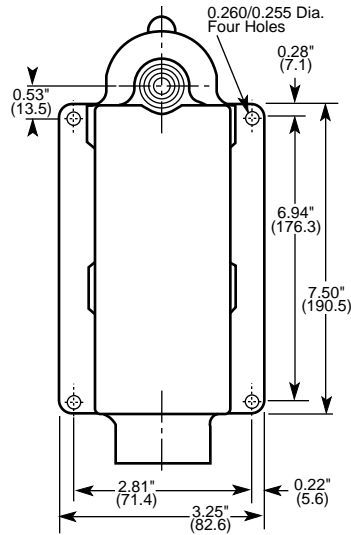
75-100% Power Factor

See Operating Levers Section

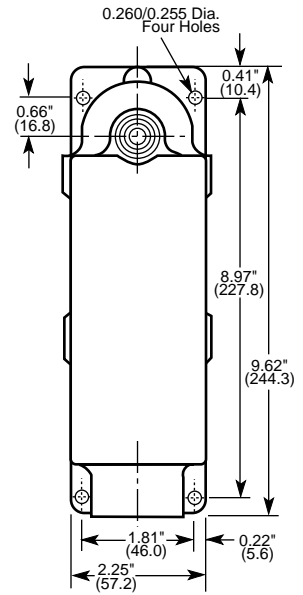
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE

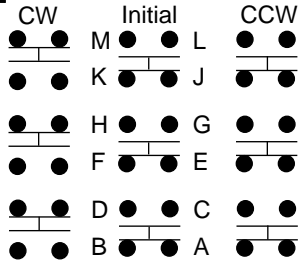


Dimensions: inches/(mm)

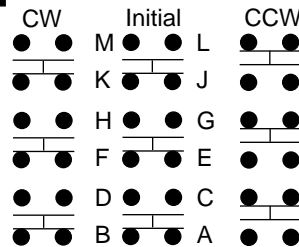
Limit Switches

Contact Configurations

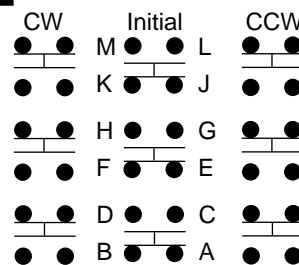
CIRCUIT A



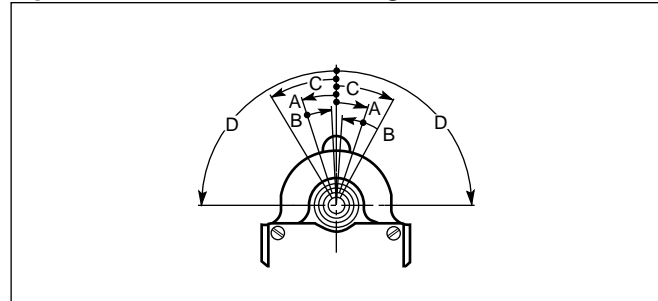
CIRCUIT B



CIRCUIT C



Operational Data Drawings



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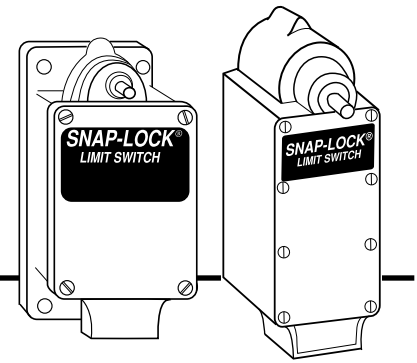
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For technical assistance, call 1-800-NAMTECH

Single Pole
Mild Environment/
Navy Marine

Limit Switches

Butt/ Sliding Contacts



Limit Switches

EA140 — Standard

Single pole, double throw, double break limit switch having mechanical travel of 14.83° to trip with one normally open and one normally closed circuit.

EA130 — Short Travel

Single pole, double throw, double break limit switch having mechanical travel of 5.8° to trip with one normally open and one normally closed circuit.

EA130 — Neutral Position

Single pole, double throw, double break limit switch having mechanical travel of 7° to trip with normally open contacts.

EA730

Construction — The aluminum housing with epoxy paint and high quality stainless steel shaft provide a high degree of corrosion resistance. Sealing against leakage is achieved through the use of high quality gaskets on machined surfaces and "O" ring protection, plus close tolerance between the shaft and bushing.

Durability — All internal components are of high grade stainless steel or copper alloy, chrome plated when required, to protect against bearing surface wear and to provide millions of operations.

Contacts — The EA730 switches are available with sliding contact arrangement 1 N.O.-1 N.C. Operation direction available CW, CCW or CW/CCW.

Levers — A variety of corrosion resistant levers are available to meet specific actuating requirements.

EA130, EA140 & EA730 Single Pole 1 N.O. - 1 N.C. Butt / Sliding Contacts

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL / ROCKER TYPE / BUTT CONTACTS											
EA140-12200	EA140-22200	—	CW	14.83°	12.3°	16.5°	41.5°	—	—	15	A
EA140-11200	EA140-21200	EA140-31200	CCW	14.83°	12.3°	16.5°	41.5°	—	—	15	B
—	EA140-23200	—	Maintain	14.83°	12.3°	16.5°	41.5°	—	—	5.5	-
STANDARD TRAVEL / ROCKER TYPE / BUTT CONTACTS											
—	—	EA140-32300	CW	14.83°	12.3°	16.5°	41.5°	—	—	15	A
EA140-11300	—	—	CCW	14.83°	12.3°	16.5°	41.5°	—	—	15	B
SHORT TRAVEL / ROCKER TYPE / BUTT CONTACTS											
EA130-11202	EA130-21202	EA130-31202	CW	5.8°	4°	8°	26°	—	—	22	A
EA130-12202	EA130-22202	—	CCW	5.8°	4°	8°	26°	—	—	22	B
SHORT TRAVEL / ROCKER TYPE / HI - TEMP / BUTT CONTACTS											
—	—	EA130-31302	CW	5.8°	4°	8°	26°	—	—	22	A
NEUTRAL POSITION / ROCKER TYPE / BUTT CONTACTS											
EA130-14200	EA130-24200	EA130-34200	Neutral	7°	6°	7.5°	26°	—	—	22	C
STANDARD TRAVEL/ CAM ACTION / SLIDING CONTACTS											
EA730-10000	EA730-40000	EA730-70000	CW	18°	14°	30°	90°	—	—	15	D
EA730-10001	EA730-40001	EA730-70001	CCW	18°	14°	30°	90°	—	—	15	E
EA730-10100	EA730-40100	EA730-70100	CW/CCW	18°	14°	30°	90°	—	—	15	F

See Operating Levers Section

EA130/EA140/EA730

Common Switch Characteristics

SINGLE POLE, MILD ENVIRONMENT/NAVY MARINE, BUTT/SLIDING CONTACTS		
	EA130/140	EA730
NEMA Enclosure Type	1, 2, 3, 4, 5, 6	1, 4, 6, 6P, 13
Housing Material	Zinc	Aluminum
Ambient Temperature Range*	-20°C to +90°C	
Shipping Weight	2.3 lbs. approx.	3 lbs. approx.
Lever Adjustment	7°30' Increments thru 167°	7°30' Increments thru 360°
Contacts	Butt, Silver Alloy, Form Z	Sliding, Silver Alloy Alloy, Form Z
Special Switch Features (EA730 Series)	MIL-C-2212F Watertight (3 ft. for 60 min.) and (15 ft. for 30 min.) per MIL-STD-108E Vibration Requirements per MIL-STD-167B, type 1 High Shock per MIL-S-901, grade A, Class 1, type A	

*Some high temperature (0°C to 150°C) versions available (EA130/140).
See chart.

EA130/140

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

75-100% Power Factor

EA730

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	10.0	2.5
250	7.5	.75
480	5.0	-
600	2.5	-

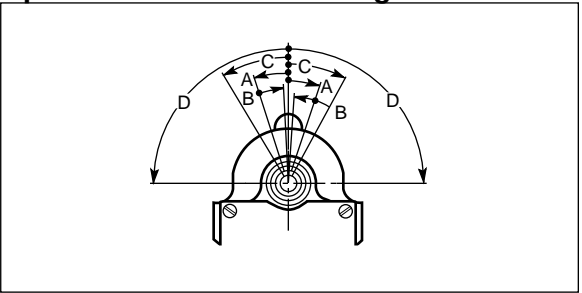
75-100% Power Factor

Limit Switches

Contact Configurations

CIRCUIT A	
CIRCUIT B	
CIRCUIT C	
CIRCUIT D	
CIRCUIT E	
CIRCUIT F	

Operational Data Drawings



NAMCO

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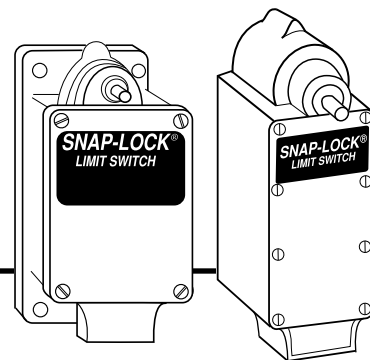
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Single Pole
Mild Environment/
Navy Marine

Limit Switches

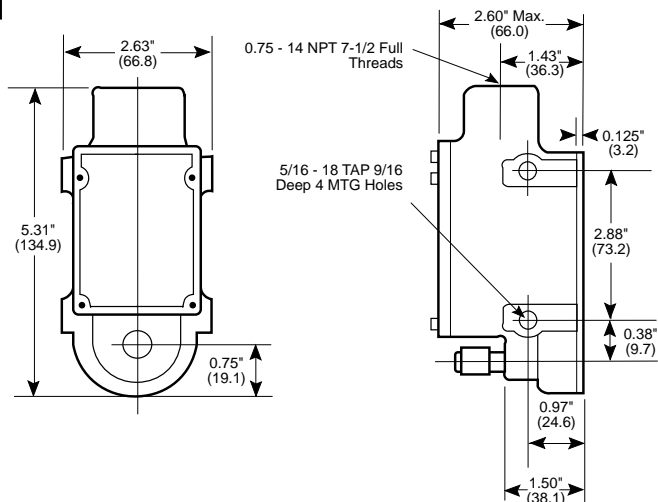
Butt/
Sliding
Contacts



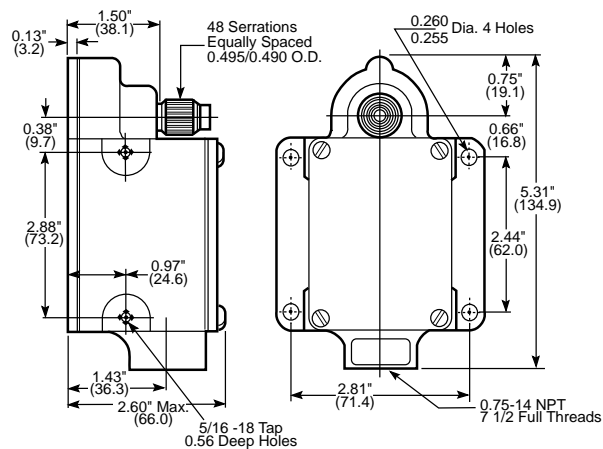
Limit Switches

EA130/140 Series Drawings

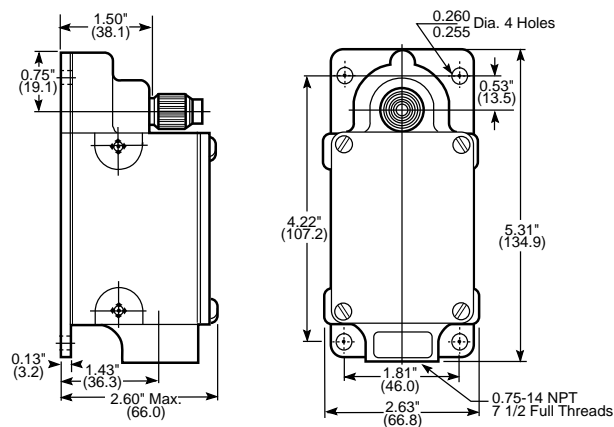
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE

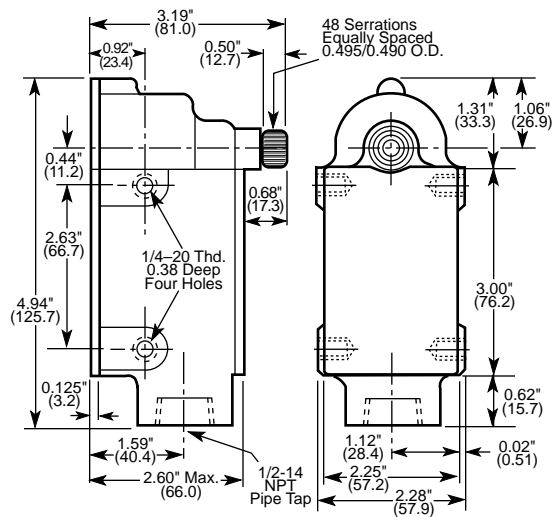


LONG MOUNTING PLATE

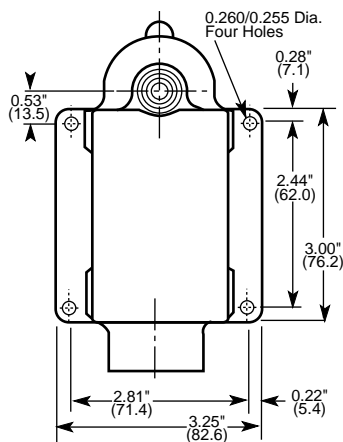


Dimensions: inches/(mm)

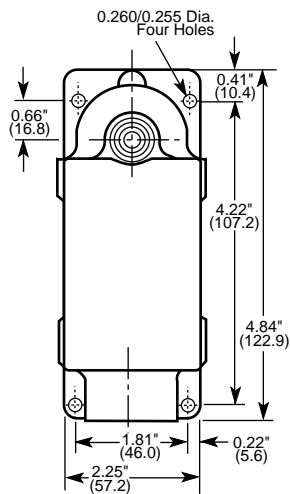
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE



Dimensions: inches/(mm)

Limit Switches

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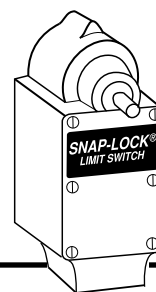
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Single Pole
Harsh Environment/
Navy Marine

Limit Switches

Butt/
Sliding
Contacts



Limit Switches

NAVY meets MIL-C-2212F

Construction — Completely fabricated from non-corrosive materials, its bronze housing and high quality stainless steel shaft insure against external damage to the switch from salt spray corrosive elements. Sealing against leakage is achieved through the use of high quality gaskets on machined surfaces and "O" ring protection, plus close tolerance between the shaft and bushing.

Durability — All internal components are of high grade stainless steel or copper alloy, chrome plated when required, to protect against bearing surface wear and to provide millions of operations.

Both the EA780 and EA790 series switches have heavy duty electrical contacts. The EA780 switches have sliding, double break type contacts built to meet the high shock requirements outlined in MIL-S-901.

EA790 switches have heavy duty, double break butt type contacts.

Contacts — EA780 switches contain sliding contact arrangement which wipe clean with each operation.

EA790 switches contain butt style contacts.

Both series available with operation direction CW, CCW or CW/CCW.

Levers — A variety of corrosion resistant levers are available to meet specific actuating requirements.

NOTE: Levers must be ordered as separate items. See Operating Levers Section.

EA780 Single Pole 1 N.O. - 1 N.C. / Sliding Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA780-10000	EA780-40000	EA780-70000	CW	18°	14°	30°	90°	-	-	15	A	1
EA780-10001	EA780-40001	EA780-70001	CCW	18°	14°	30°	90°	-	-	15	B	1
EA780-10100	EA780-40100	EA780-70100	CW/CCW	18°	14°	30°	90°	-	-	15	C	1
MAINTAINED CONTACTS & LEVER POSITION												
EA780-16000	EA780-46000	EA780-76000	CW	55°	22°	60°	116°	55°	64°	6	D	2
			CCW	25°	25°	60°	124°	54°	56°	9		
MAINTAINED CONTACT-LEVER RETURNED												
EA780-16700	EA780-46700	EA780-76700	CW	30°	26°	45°	90°	30°	-	12	D	3
			CCW	16°	30°	45°	90°	26°	-	13.5		

See Operating Levers Section

EA780/EA790

EA790 Single Pole 1 N.O. - 1 N.C. / Butt Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA790-10000	EA790-40000	EA790-70000	CW	18°	14°	30°	90°	-	-	15	A	1
EA790-10001	EA790-40001	EA790-70001	CCW	18°	14°	30°	90°	-	-	15	B	1
EA790-10100	EA790-40100	EA790-70100	CW/CCW	18°	14°	30°	90°	-	-	15	C	1
MAINTAINED CONTACT & LEVER POSITION												
EA790-16000	EA790-46000	EA790-76000	CW CCW	55° 25°	22° 25°	60° 60°	116° 124°	55° 54°	64° 56°	6 9	D	2
MAINTAINED CONTACT-LEVER RETURNED												
EA790-16700	EA790-46700	EA790-76700	CW CCW	30° 16°	26° 30°	45° 45°	90° 90°	30° 26°	- -	12 13.5	D	3
SHORT TRAVEL												
EA790-10900	EA790-40900	EA790-70900	CW/CCW	13°	10°	30°	90°	-	-	15	C	1
NEUTRAL POSITION - ALL CONTACTS OPEN												
EA790-15700	EA790-45700	EA790-75700	CW CCW	31° 31°	12° 22°	45° 45°	90° 90°	- -	- -	15 19.5	E	1
NEUTRAL POSITION - ALL CONTACTS CLOSED												
EA790-15800	EA790-45800	EA790-75800	CW CCW	31° 31°	12° 22°	45° 45°	90° 90°	- -	- -	15 15	F	1

Limit Switches

Common Switch Characteristics

SINGLE POLE, HARSH ENVIRONMENT NAVY MARINE, BUTT/SLIDING CONTACTS		
	EA780	EA790
NEMA Enclosure Type	1, 4, 4X, 6, 6P, 13	
Housing Material	Bronze	
Ambient Temperature Range*	-20°C to +90°C	
Shipping Weight	4 lbs. approx.	
Lever Adjustment	7°30' Increments thru 360°	
Contacts	Sliding, Silver Alloy Form Z	Butt, Silver Alloy Form Z
Special Switch Features	MIL-C-22122F Watertight (3 ft. for 60 min.) and Submersible (15ft. for 30 min.) per MIL STD-108E Vibration requirements per MIL-STD-167B, Type 1 High Shock per MIL-S-901, grade A, Class 1, type A	

*Some high temperature (0°C to 150°C) and low temperature (-40°C to +90°C) versions available. Contact factory.

EA780

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	10.0	2.5
250	7.5	.75
480	5.0	-
600	2.5	-

75-100% Power Factor

EA790

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

75-100% Power Factor

NAMCO

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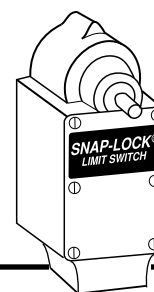
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Single Pole
Harsh Environment/
Navy Marine

Limit Switches

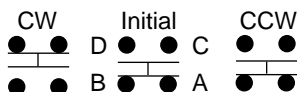
Butt/
Sliding
Contacts



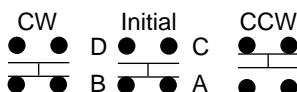
Limit Switches

Contact Configurations

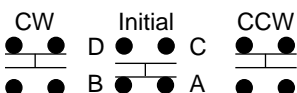
CIRCUIT A



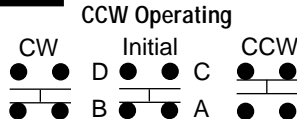
CIRCUIT B



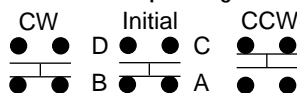
CIRCUIT C



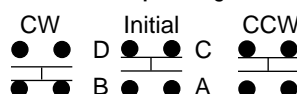
CIRCUIT D



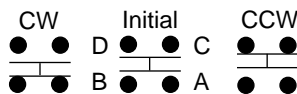
CCW Operating



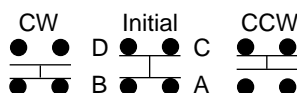
CW Operating



CIRCUIT E

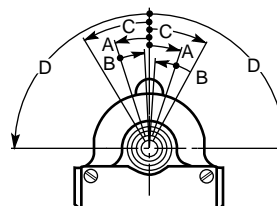


CIRCUIT F



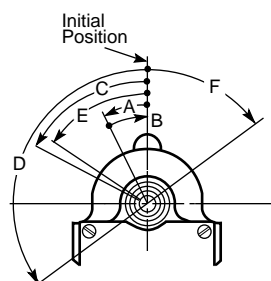
Operational Data Drawings

DRAWING #1

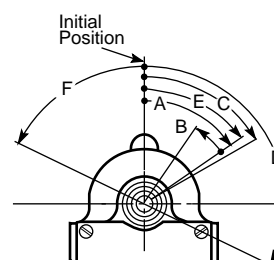


DRAWING #2

CCW Operating



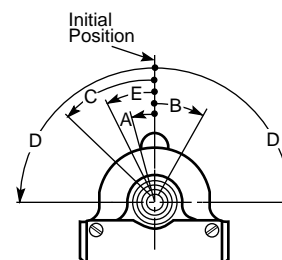
CW Operating



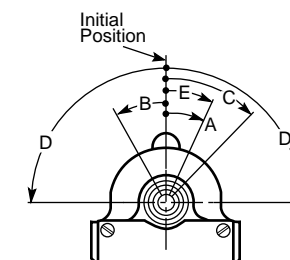
To change switch operation from CW operating to CCW operating, operate switch through angle E. Remove lever and reset at initial position.

DRAWING #3

CCW Operating



CW Operating



To change switch operation from CW operating to CCW operating, operate switch through angle E.

EA780/EA790

Technical drawing of a 3/4-14 NPT Pipe Tap. The drawing includes two views: a side view (left) and a top view (right). Dimensions are provided in inches and millimeters.

Side View Dimensions:

- Total length: 3.19" (81.0)
- Distance from top to first hole: 0.92" (23.4)
- Distance between holes: 0.50" (12.7)
- Distance from bottom to first hole: 0.44" (11.2)
- Distance from bottom to second hole: 2.63" (66.8)
- Distance from bottom to third hole: 4.94" (125.5)
- Distance from bottom to fourth hole: 0.13" (3.3)
- Distance from bottom to fifth hole: 1.59" (40.4)
- Maximum distance between holes: 2.60" Max. (66.0)
- Thread specification: 3/4-14 NPT
- Thread length: 0.68" (17.3)

Top View Dimensions:

- Distance from center to top edge: 1.31" (33.3)
- Distance from center to side edge: 1.06" (26.9)
- Distance from center to bottom edge: 3.00" (76.2)
- Distance from center to side edge (bottom): 0.62" (15.7)
- Distance from center to side edge (bottom): 1.12" (28.4)
- Distance from center to side edge (bottom): 2.25" (57.2)
- Distance from center to side edge (bottom): 2.28" (57.9)
- Distance from center to side edge (bottom): 0.02" (0.51)

Additional Features:

- 48 Serrations Equally Spaced 0.495/0.490 O.D.
- 1/4-20 Thd. 0.38 Deep Four Holes

Technical drawing of a 4-hole flange. The drawing shows a top view and a side view. The top view is a square with rounded corners and four circular holes. The side view shows the flange's profile, including a central raised section and a base. Dimensions are provided in inches and millimeters.

Dimensions:

- Top View:
 - Overall Width: 3.25" (82.6)
 - Overall Height: 3.00" (76.2)
 - Distance from Center to Hole Center (Horizontal): 2.81" (71.4)
 - Distance from Center to Hole Center (Vertical): 2.44" (62.0)
 - Hole Diameter: 0.260/0.255 Dia. Four Holes
 - Distance from Center to Hole Center (Top): 0.53" (13.5)
 - Distance from Center to Hole Center (Right): 0.28" (7.1)
- Side View:
 - Overall Width: 3.25" (82.6)
 - Overall Height: 3.00" (76.2)
 - Distance from Center to Hole Center (Horizontal): 2.81" (71.4)
 - Distance from Center to Hole Center (Vertical): 2.44" (62.0)
 - Hole Diameter: 0.260/0.255 Dia. Four Holes
 - Distance from Center to Hole Center (Top): 0.53" (13.5)
 - Distance from Center to Hole Center (Right): 0.28" (7.1)

NAMCO

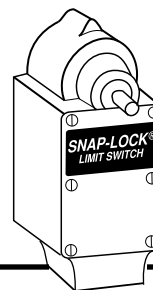
For technical assistance, call 1-800-NAMTECH

Limit Switches

Double Pole
Mild Environment/
Navy Marine

Limit Switches

Sliding Contacts



Limit Switches

Construction

The aluminum housing with epoxy paint and high quality stainless steel shaft provides a high degree of corrosion resistance. Sealing against leakage is achieved through the use of high quality gaskets on machined surfaces and "O" ring protection, plus close tolerance between the shaft and bushing.

Durability

All internal components are of high grade stainless steel or copper alloy, chrome plated when required, to protect against bearing surface wear and to provide millions of operations.

Contacts

The EA730 switches are available with sliding contact arrangement 2 N.O.-2 N.C. Operation direction available in CW, CCW or CW/CCW.

Levers

A variety of corrosion resistant levers is available to meet specific actuating requirements.

EA730 Double Pole 2 N.O. - 2 N.C. / Sliding Contacts

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL / CAM ACTION											
EA730-20000	EA730-50000	EA730-80000	CW	16°	14°	30°	90°	-	-	20	A
EA730-20001	EA730-50001	EA730-80001	CCW	16°	14°	30°	90°	-	-	20	B
EA730-20100	EA730-50100	EA730-80100	CW/CCW	16°	14°	30°	90°	-	-	20	C

Common Switch Characteristics

DOUBLE POLE, MILD ENVIRONMENT/NAVY MARINE, SLIDING CONTACTS	
NEMA Enclosure Type	1, 4, 6, 6P, 13
Housing Material	Aluminum
Ambient Temperature Range*	-20°C to +90°C
Shipping Weight	4 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Sliding, Silver Alloy, Form Z
Special Switch Features	MIL-C-2212F Watertight (3 ft. for 60 min.) & submersible (15 ft. for 30 min.) per MIL-STD-108E Vibration requirements per MIL-STD-167B, type 1 High shock per MIL-S-901, grade A, class 1, type A

*Some high temperature (+20°C to 180°C) and low temperature (-40°C to +90°C) versions available. Contact factory.

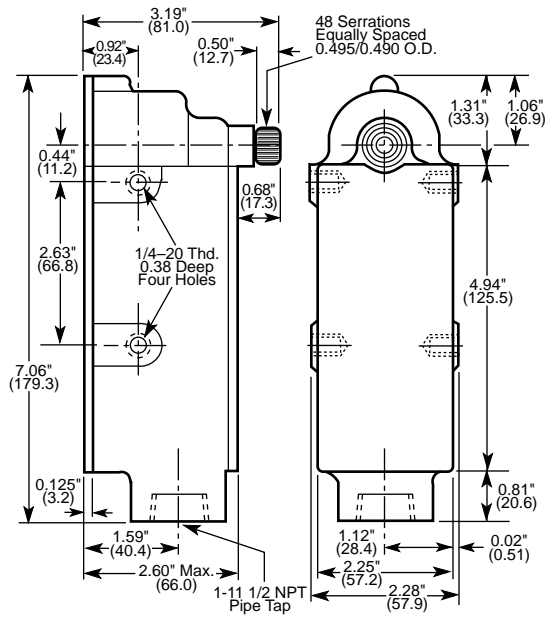
Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	10.0	2.5
250	7.5	.75
480	5.0	-
600	2.5	-

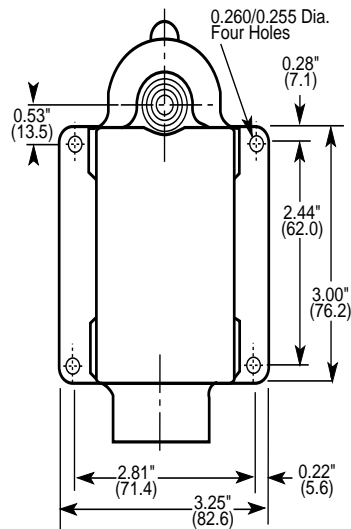
75-100% Power Factor

See Operating Levers Section

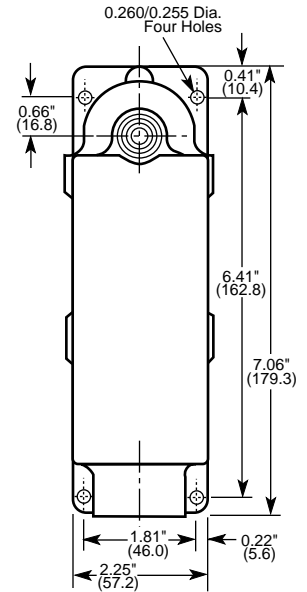
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



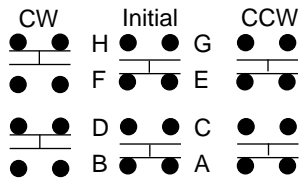
LONG MOUNTING PLATE



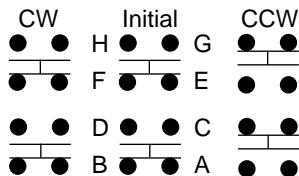
Limit Switches

Contact Configurations

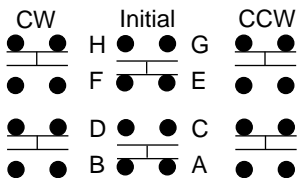
CIRCUIT A



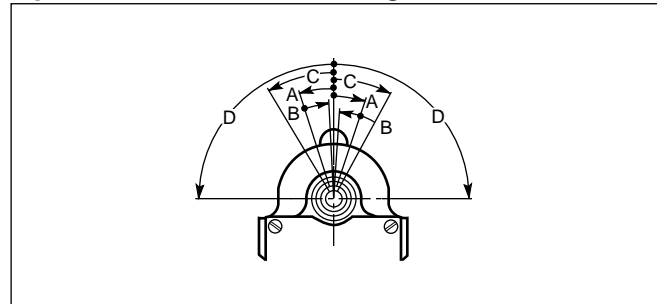
CIRCUIT B



CIRCUIT C



Operational Data Drawings



NAMCO

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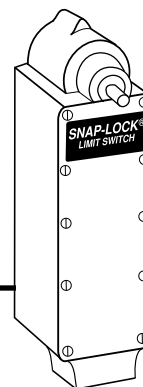
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Double Pole
Harsh Environment/
Navy Marine

Limit Switches

Butt/
Sliding
Contacts



Limit Switches

NAVY meets MIL-C-2212F Current

Construction - Completely fabricated from non-corrosive materials, its bronze housing and high quality stainless steel shaft insure against external damage to the switch from salt spray corrosive elements. Sealing against leakage is achieved through the use of high quality gaskets on machined surfaces and "O" ring protection, plus close tolerance between the shaft and bushing.

Durability - All internal components are of high grade stainless steel or copper alloy, chrome plated when required, to protect against bearing surface wear and to provide millions of operations.

Both the EA780 and EA790 series switches have heavy duty electrical contacts. The EA780 switches have sliding, double-break type contacts built to meet the high shock requirements outlined in MIL-S-901.

EA790 switches have heavy duty, double-break, butt type contacts.

Contacts - EA780 switches contain sliding contact arrangements which wipe clean with each operation.

EA790 switches contain butt-style contacts.

Both series available with operation direction CW, CCW or CW/CCW.

Levers - A variety of corrosion resistant levers are available to meet specific actuating requirements.

NOTE: Levers must be ordered as separate items. See Operating Levers Section.

EA780 Double Pole 2 N.O. - 2 N.C. / Sliding Contacts / Cam Action

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA780-20000	EA780-50000	EA780-80000	CW	18°	14°	30°	90°	-	-	27	A	1
EA780-20001	EA780-50001	EA780-80001	CCW	18°	14°	30°	90°	-	-	27	B	1
EA780-20100	EA780-50100	EA780-80100	CW/CCW	18°	14°	30°	90°	-	-	27	C	1
MAINTAINED CONTACT & LEVER POSITION												
—	EA780-56000	—	CW	55°	22°	60°	116°	55°	64°	6	D	2
			CCW	25°	25°	60°	124°	54°	56°	9		
MAINTAINED CONTACT-LEVER RETURNED												
EA780-26700	EA780-56700	EA780-86700	CW	30°	26°	45°	90°	30°	-	15	D	3
			CCW	16°	30°	45°	90°	26°	-	16.5		

See Operating Levers Section

EA790 Double Pole 2 N.O. - 2 N.C. / Butt Contacts / Cam Action

EA780/EA790

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.	Data Drawing
STANDARD TRAVEL												
EA790-20000	EA790-50000	EA790-80000	CW	18°	14°	30°	90°	-	-	27	A	1
EA790-20001	EA790-50001	EA790-80001	CCW	18°	14°	30°	90°	-	-	27	B	1
EA790-20100	EA790-50100	EA790-80100	CW/CCW	18°	14°	30°	90°	-	-	27	C	1
MAINTAINED CONTACT & LEVER POSITION												
EA790-26000	EA790-56000	EA790-86000	CW	55°	22°	60°	116°	55°	64°	6	D	2
			CCW	25°	25°	60°	124°	54°	56°	9		
MAINTAINED CONTACT-LEVER RETURNED												
EA790-26700	EA790-56700	EA790-86700	CW	30°	26°	45°	90°	30°	-	15	D	3
			CCW	16°	30°	45°	90°	26°	-	16.5		
SHORT TRAVEL												
EA790-20900	EA790-50900	EA790-80900	CW/CCW	13°	10°	30°	90°	-	-	27	C	1
NEUTRAL POSITION ALL CONTACTS OPEN												
EA790-25102	EA790-55102	EA790-85102	CW	31°	12°	45°	90°	-	-	16.5	E	1
			CCW	31°	22°	45°	90°	-	-	16.5		
NEUTRAL POSITION ALL CONTACTS CLOSED												
EA790-25104	EA790-55104	EA790-85104	CW	31°	12°	45°	90°	-	-	16.5	F	1
			CCW	31°	22°	45°	90°	-	-	16.5		

Limit Switches

Common Switch Characteristics

DOUBLE POLE, HARSH ENVIRONMENT/NAVY MARINE, BUTT/SLIDING CONTACTS		
	EA780	EA790
NEMA Enclosure Type	1, 4, 4X, 6, 6P, 13	
Housing Material	Bronze	
Ambient Temperature Range*	-20°C to +90°C	
Shipping Weight	4 lbs. approx.	
Lever Adjustment	7°30' Increments thru 360°	
Contacts	Sliding, Silver Alloy Form Z	Butt, Silver Alloy Form Z
Special Switch Features	MIL-C-2212F Watertight (3 ft. for 60 min.) and Submersible (15ft. for 30 min.) per MIL STD-108E Vibration requirements per MIL-STD-167B, Type 1 High Shock per MIL-S-901, grade A, Class 1, type A	

*Some high temperature (0°C to 150°C) and low temperature (-40°C to +90°C) versions available. Contact factory.

EA780

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	10.0	2.5
250	7.5	.75
480	5.0	-
600	2.5	-

75-100% Power Factor

EA790

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

75-100% Power Factor

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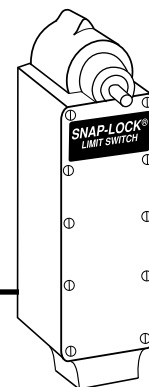
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Double Pole
Harsh Environment/
Navy Marine

Limit Switches

Butt/
Sliding
Contacts



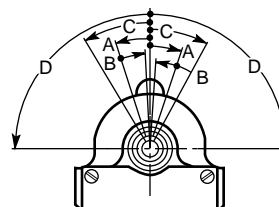
Limit Switches

Contact Configurations

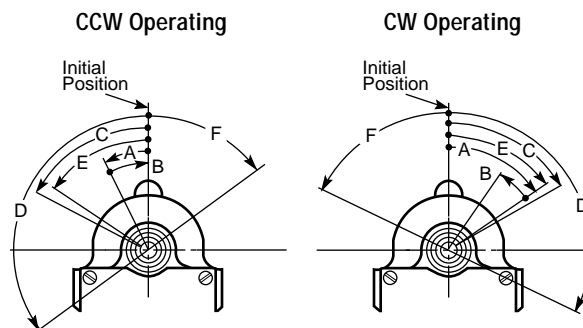
CIRCUIT A		
CW	Initial	CCW
CIRCUIT B		
CW	Initial	CCW
CIRCUIT C		
CW	Initial	CCW
CIRCUIT D		
CCW Operating		
CW	Initial	CCW
CW Operating		
CW	Initial	CCW
CIRCUIT E		
CW	Initial	CCW
CIRCUIT F		
CW	Initial	CCW

Operational Data Drawings

DRAWING #1

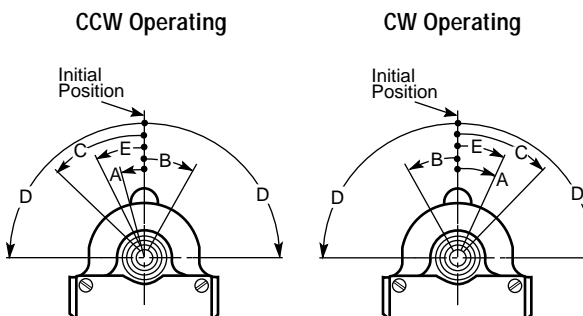


DRAWING #2



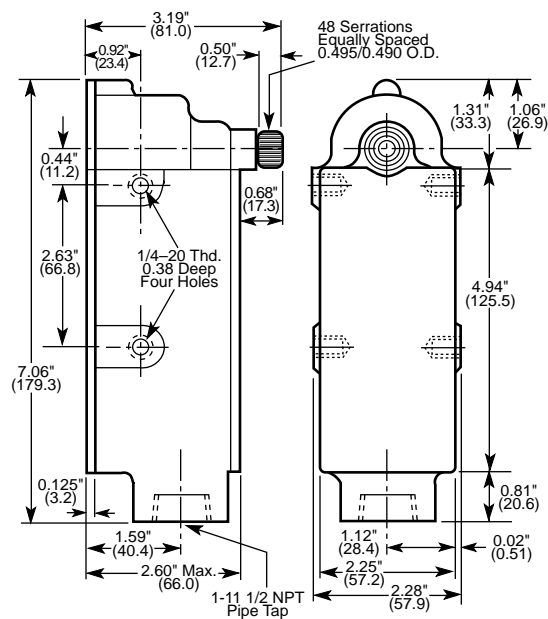
To change switch operation from CW operating to CCW operating, operate switch through angle E. Remove lever and reset at initial position.

DRAWING #3

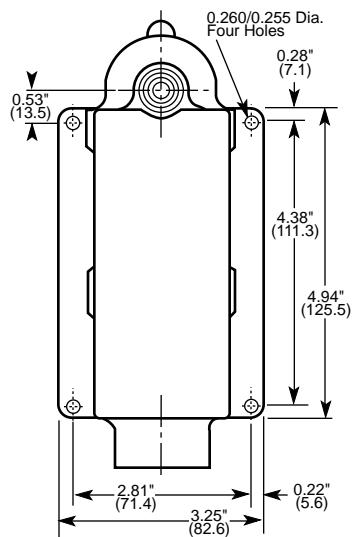


To change switch operation from CW operating to CCW operating, operate switch through angle E.

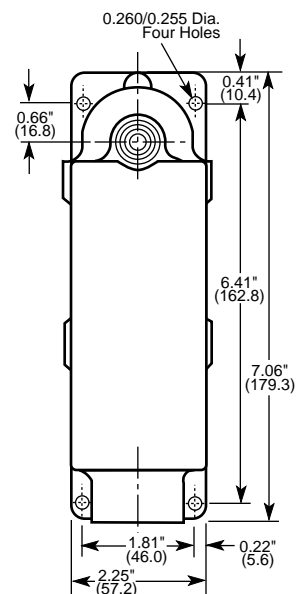
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



LONG MOUNTING PLATE



Dimensions: inches/(mm)

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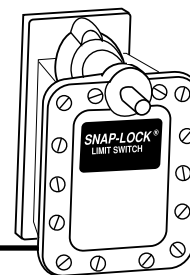
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Single Pole
Severe Environment

Limit Switches

Butt
Contacts



Limit Switches

Severe Environment Limit Switches are available on the three standard series of Snap-Lock switches. Regularly furnished with wide or long mounting.

EA990 Single Pole 1 N.O. - 1 N.C. / Standard / Butt Contacts

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL/ ROCKER TYPE											
CW											
—	EA990-00125	EA990-00115	CW	10°	8°	13°	38°	-	-	14	A
CW / REVERSE SHAFT											
—	EA990-00535	—	CW	10°	8°	13°	38°	-	-	14	A
CCW											
—	EA990-20055	EA990-20035	CCW	10°	8°	13°	38°	-	-	14	B
MAINTAINED CONTACT AND LEVER POSITION											
—	EA990-30025	EA990-30045	Maintain	10°	8°	13°	38°	-	-	5	-

Common Switch Characteristics

SINGLE POLE, SEVERE ENVIRONMENT, BUTT CONTACTS	
Housing Material	Zinc
Ambient Temperature Range	-20°C to +90°C
Shipping Weight	3.7 lbs. approx.
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Butt, Silver Alloy, Form Z

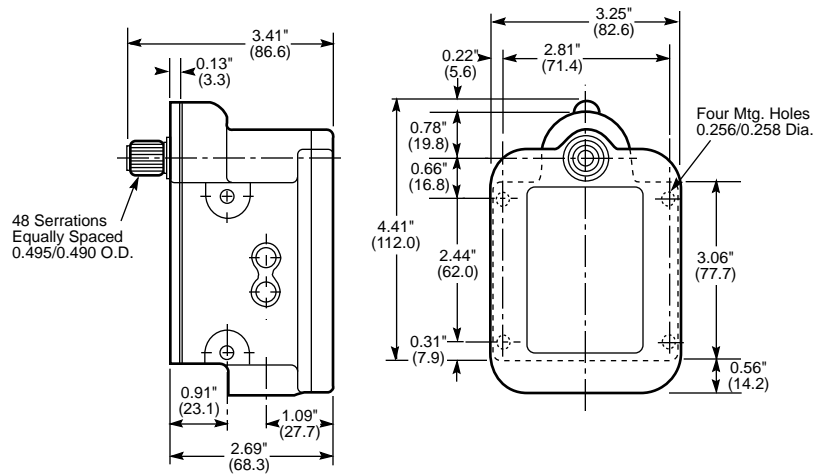
Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

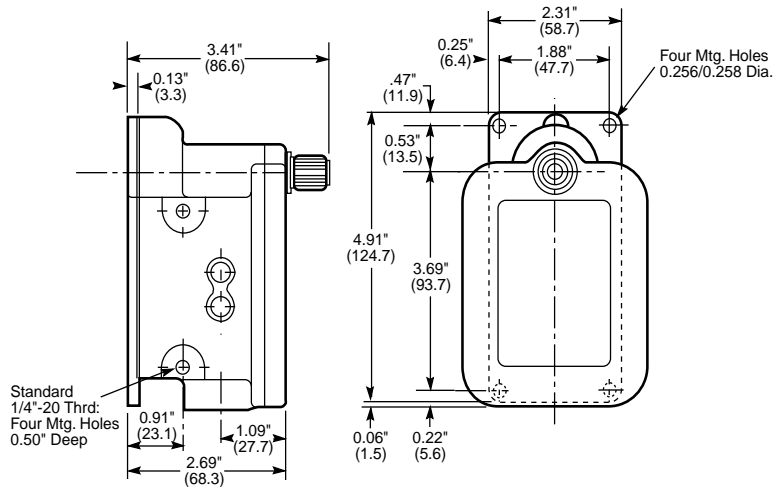
75-100% Power Factor

See Operating Levers Section

WIDE MOUNTING PLATE



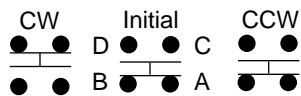
LONG MOUNTING PLATE



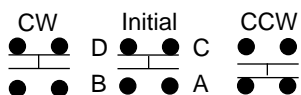
Dimensions: inches/(mm)

Contact Configurations

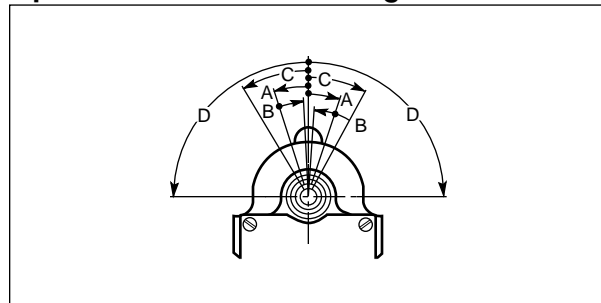
CIRCUIT A



CIRCUIT B



Operational Data Drawings



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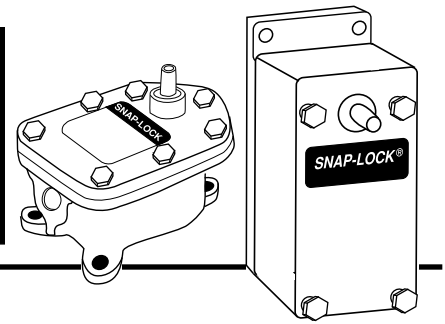
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Single, Double and
Triple Pole
Hazardous Location

Limit
Switches

Butt
Contacts



Limit Switches

- NEMA Rated for Hazardous Location
- 1 NO-1 NC, 2 NO-2 NC, 3 NO-3 NC
- Bronze, Aluminum or Cast Iron Housing
- Generous Overtravel-EA800 Series
- Heavy Duty Cam Operated-EA800 Series
- Heavy Duty Rocker Type-EA880 Series
- Flexibility of Motion, CW and CCW
- Ample Wiring Space

Service Conditions - The Series EA800/EA880 hazardous location limit switches operate dependably where gases, vapors, and dusts are potential explosion hazards. The switch bodies resist corrosion.

Rugged Construction - Approved spark-proof bronze, aluminum, or cast-iron housings can withstand internal and external gas explosions. Silver alloy butt contact arrangement is standard. Wiring space is ample for up to size 12 wire.

Proven Performance - Cycle life is in the millions, when operated at rated current, voltage, and temperature. Standard switches have maximum ambient temperature ratings of 90°C continuous. Switches can be specially ordered with either -40°C or + 150°C capabilities.

Levers Available - A variety of levers for hazardous location limit switches can be ordered from Namco Controls Series EL.

NOTE: Only non-sparking levers should be used in hazardous locations.

Not all models are UL approved.

EA800 Single Pole 1 N.O. - 1 N.C. / Butt Contacts / Cam Action

Bronze Housing	Aluminum Housing	Cast Iron Housing	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL											
EA800-10040	EA800-10050	-	CW	18°	14°	30°	90°	-	-	15	A
EA800-10041	EA800-10051	-	CCW	18°	14°	30°	90°	-	-	15	B
EA800-10140	EA800-10150	-	CW/CCW	18°	14°	30°	90°	-	-	15	C

EA800 Double Pole 2 N.O. - 2 N.C. / Butt Contacts / Cam Action

Bronze Housing	Aluminum Housing	Cast Iron Housing	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL											
EA800-20040	EA800-20050	-	CW	18°	14°	30°	90°	-	-	27	D
EA800-20041	EA800-20051	-	CCW	18°	14°	30°	90°	-	-	27	E
EA800-20140	EA800-20150	-	CW/CCW	18°	14°	30°	90°	-	-	27	F

EA800 Triple Pole 3 N.O. - 3 N.C. / Butt Contacts / Cam Action

Bronze Housing	Aluminum Housing	Cast Iron Housing	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E Min. Travel to Maintain	Angle F Overall Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL											
EA800-30040	EA800-30050	-	CW	18°	14°	30°	90°	-	-	33	G
EA800-30041	EA800-30051	-	CCW	18°	14°	30°	90°	-	-	33	H
EA800-30140	EA800-30150	-	CW/CCW	18°	14°	30°	90°	-	-	33	I

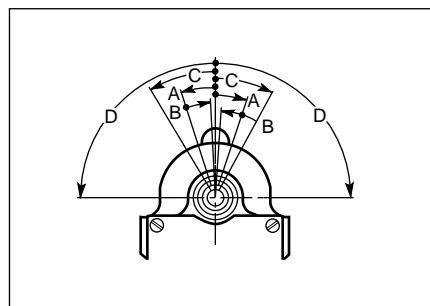
See Operating Levers Section

EA880 Single Pole 1 N.O. - 1 N.C. / Butt Contacts / Rocker Type

Aluminum Housing	Description	Temperature Range	Dir. Of Operation	NEMA Type 4	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Torque (inch lbs)	Contact Config.
STANDARD TRAVEL										
EA880-11100	Standard	-20C to +90C	CW	No	10°	8°	13°	38°	13	A
EA880-11500	Watertight	-20C to +90C	CW	Yes	10°	8°	13°	38°	13	A
EA880-11700	Watertight	-40C to +90C	CW	Yes	10°	8°	13°	38°	13	A
EA880-12100	Standard	-20C to +90C	CCW	No	10°	8°	13°	38°	13	J
EA880-12500	Watertight	-20C to +90C	CCW	Yes	10°	8°	13°	38°	13	J
EA880-12700	Watertight	-40C to +90C	CCW	Yes	10°	8°	13°	38°	13	J
MAINTAINED										
EA880-13100	Standard	-20C to +90C	CW/CCW	No	10°	-	-	38°	5	-
EA880-13500	Watertight	-20C to +90C	CW/CCW	Yes	10°	-	-	38°	5	-
EA880-13700	Watertight	-40C to +90C	CW/CCW	Yes	10°	-	-	38°	5	-
NEUTRAL POSITION										
EA880-17100	Standard	-20C to +90C	CW/CCW	No	7°	6°	7°30'	33°	22	K
EA880-17500	Watertight	-20C to +90C	CW/CCW	No	7°	6°	7°30'	33°	22	K
EA880-17700	Watertight	-40C to +90C	CW/CCW	No	7°	6°	7°30'	33°	22	K

Bronze Housing	Description	Temperature Range	Dir. Of Operation	NEMA Type 4	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Torque (inch lbs)	Contact Config.
MAINTAINED										
EA880-13200	Standard	-20C to +90C	CW/CCW	No	10°	-	-	38°	5	-
EA880-13600	Watertight	-20C to +90C	CW/CCW	Yes	10°	-	-	38°	5	-

Operational Data Drawing



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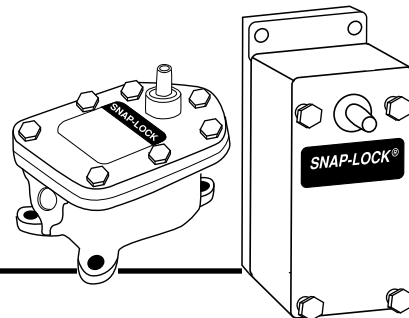
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Single, Double and
Triple Pole
Hazardous Location

Limit Switches

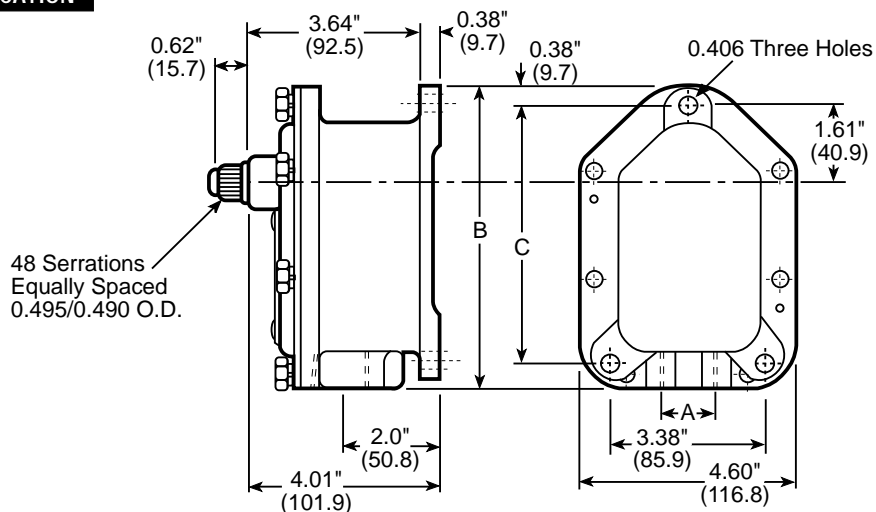
Butt Contacts



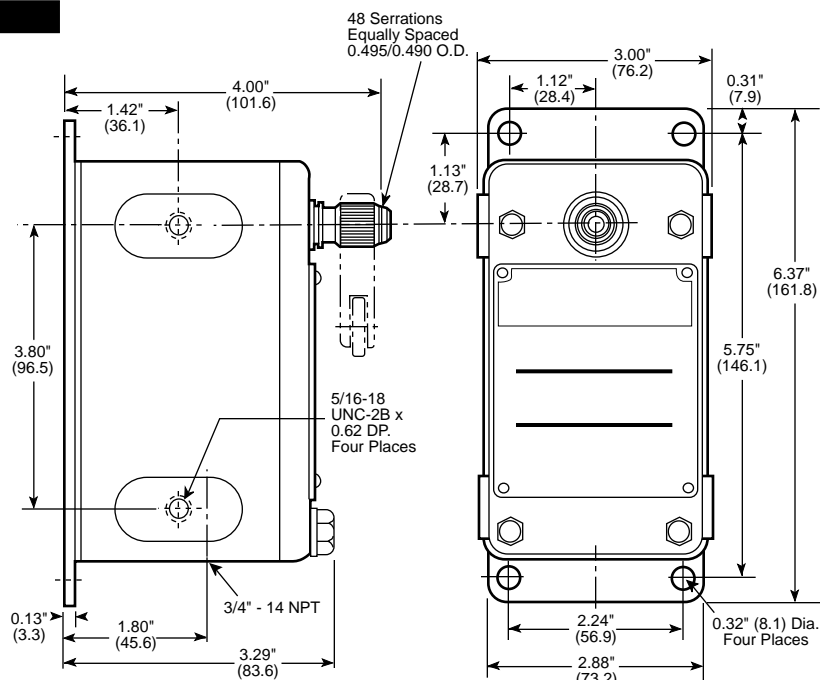
Limit Switches

EA800/880 Series Drawings

EA800 HAZARDOUS LOCATION



EA880 ROCKER



Not to Scale

Dimensions: inches/(mm)

Switch Type	Conduit Opening NPT A	Total Height B	Mounting Height C
EA800-1	3/4"-14	6.47" (164.3)	5.42" (137.7)
EA800-2	1"-11 1/2	8.50" (215.9)	7.58" (192.5)
EA800-3	1 1/4"-11 1/2	10.56" (268.2)	9.67" (245.6)

Contact Configurations

CIRCUIT A 	CIRCUIT B 	CIRCUIT C
CIRCUIT D 	CIRCUIT E 	CIRCUIT F
CIRCUIT G 	CIRCUIT H 	CIRCUIT I
CIRCUIT J 	CIRCUIT K 	

Common Switch Characteristics

SINGLE, DOUBLE & TRIPLE POLE, HAZARDOUS LOCATION, BUTT CONTACTS		
	EA800	EA880
NEMA Enclosure Type	4, 4X, 6, 6P, 7 Class I, Group C & D, 9 Class II, Group E, F & G	7 Class I, Group C & D, 9 Class II, Group E, F & G (Some 4, see p/n chart)
Housing Material	Bronze/Aluminum/ Cast Iron (See p/n chart)	Bronze/Aluminum
Ambient Temperature Range*	-20°C to +90°C	
Shipping Weight	EA800-1: Al-6 lbs. Brz-12 lbs. EA800-2: Al-7 lbs. Brz-16 lbs. EA800-3: Al-8 lbs. Brz-19 lbs.	Aluminum: 5 lbs. Bronze: 8 lbs.
Lever Adjustment	7°30' Increments thru 360°	
Contacts	Butt, Silver Alloy, Form Z	

*Some high and low temperature versions available. For EA880, see p/n chart. For EA800, contact factory.

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

75-100% Power Factor

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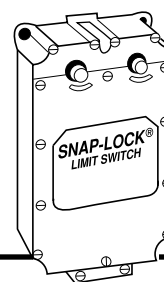
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Multi Station

Limit Switches

Butt Contacts



Limit Switches

The Multiple Station Switch now makes it possible to incorporate from two to four EA700 Namco Series Snap-Lock Limit Switches into a single assembly. Here's a unit that can be adapted to most any application where individual limit switches are mounted side by side. This single assembly reduces installation time, cuts wiring costs and presents a more compact

appearance than individually mounted switches. Furthermore, you can now perform an almost unlimited number of switching functions within a single enclosure by combining the Single Action type switches.

EA760 1 N.O. - 1 N.C. / Butt Contacts / Cam Action

Part Number	Station 1	Station 2	Station 3	Station 4	Conduit Diameter**	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Contact Configuration	Conduit Location	Torque (inch/lbs)
STANDARD TRAVEL / 2 STATION												
EA760-10000*	CW	CW	-	-	1.50"-11.50 N.P.T.	18°	14°	30°	90°	B	Bottom	33
EA760-10001*	CCW	CCW	-	-	1.50"-11.50 N.P.T.	18°	14°	30°	90°	B	Bottom	33
EA760-10005	CCW	CW	-	-	0.75"	13°	10°	30°	90°	A	Left	16.5
STANDARD TRAVEL / 4 STATION												
EA760-00265	CW	CW	CW	CCW	1.00"	18°	14°	30°	90°	A	Left	15
EA760-00445	CCW	CW	CCW	CCW	1"-11.50 NPT	13°	10°	30°	90°	A	L & R	16.5
EA760-00455	CW	CW	CCW	CW	1"-11.50 NPT	13°	10°	30°	90°	A	L & R	16.5
EA760-30002	CW	CW	CCW	CCW	1.716"	18°	14°	30°	90°	A	Left	15
EA760-30003	CW	CW	CCW	CCW	1.38"	18°	14°	30°	90°	A	Left	15
EA760-30004	CW	CW	CCW	CCW	1.38"	18°	14°	30°	90°	A	Right	15
EA760-30006	CW	CW	CCW	CCW	1"-11.50 NPT	13°	10°	30°	90°	A	L & R	16.5

* All switch stations are single pole except EA760-10000 and EA760-10001, which are 3 pole.

** Non-threaded, smooth-hole type, except "N.P.T."

Common Switch Characteristics

MULTI-STATION, SINGLE POLE, STANDARD ENVIRONMENT, BUTT CONTACTS	
NEMA Enclosure Type	1
Housing Material	Aluminum
Ambient Temperature Range***	-20°C to +90°C
Lever Adjustment	7°30' Increments Thru 360°
Contacts	Butt, Silver Alloy, Form Z

*** EA760-10000 and -10001 rated +20°C to +180°C

EA760-00445, EA760-00455 and EA760-30006 rated 0°C to +150°C

Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

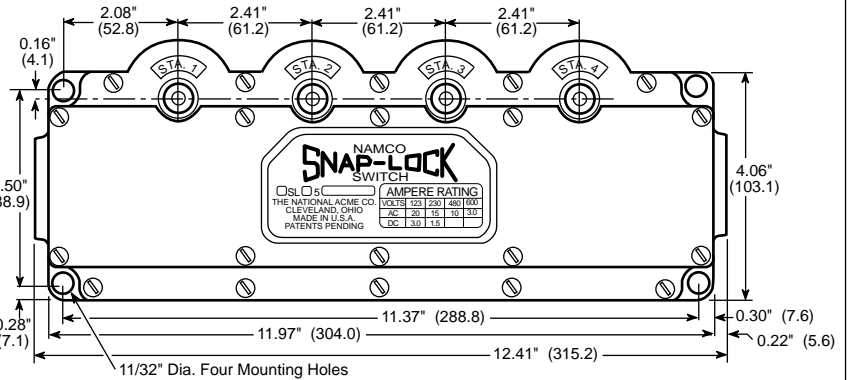
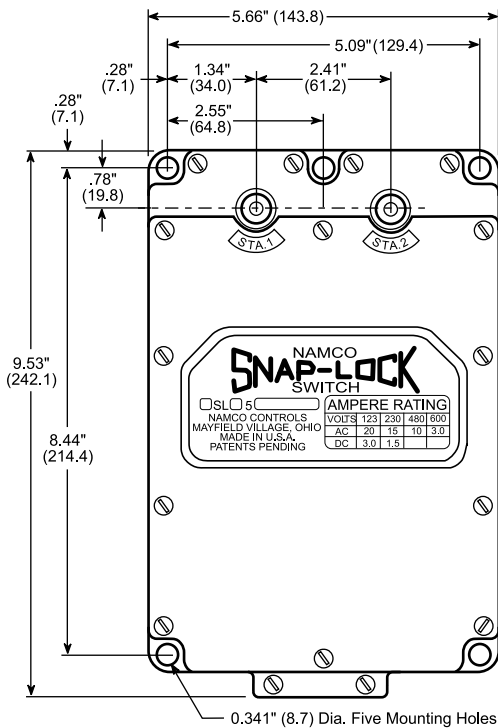
75-100% Power Factor

See Operating Levers Section

TWO STATION - THREE POLE

FOUR STATION - SINGLE POLE

See table on opposite page for location, diameter, and type.



Dimensions: inches/(mm)

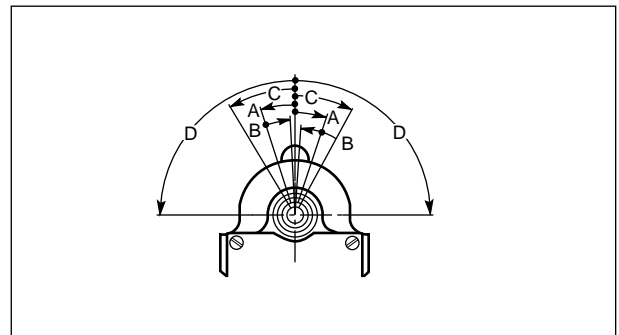
Limit Switches

Contact Configurations

Contact configuration A			
Clockwise Stations		Counter Clockwise Stations	
D ● ● C	D ● ● C	D ● ● C	D ● ● C
B ● ● A	B ● ● A	B ● ● A	B ● ● A
CW	Initial	Initial	CCW
Polarity must be the same on each pole			

Contact configuration B			
Counter Clockwise Stations		Clockwise Stations	
M ● ● L	M ● ● L	M ● ● L	M ● ● L
K ● ● J	K ● ● J	K ● ● J	K ● ● J
H ● ● G	H ● ● G	H ● ● G	H ● ● G
F ● ● E	F ● ● E	F ● ● E	F ● ● E
D ● ● C	D ● ● C	D ● ● C	D ● ● C
B ● ● A	B ● ● A	B ● ● A	B ● ● A
Initial	CCW	CW	Initial
Polarity must be the same on each pole			

Operational Data Drawing



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EA190 —
Crank Interlock Switch

Crank Interlock Switches provide an interlock between the boat davit hand crank and gear box. Specify either left or right hand. Switch cannot be converted in the field.

EA190 —
Brake Interlock Switch

The Brake Interlock Switch provides an interlock for braking of the boat davit and is available in either left or right hand models. Please specify by correct part number since these cannot be modified in the field.

EA190 —
Trackway Limit Switch

The Trackway Switch limits the up or down travel of the boat davit and, like the other switches, is offered in right or left hand units and normally open or closed contact arrangements. Specify whether left hand or right hand is required and whether normally open or normally closed contacts are required.

EA190

Model Number	Lever Location	Arrangement	Trip Travel
CRANK INTERLOCK SWITCH			
EA190-00055	Left hand	-	20°
EA190-00065	Right hand	-	20°
BRAKE INTERLOCK SWITCH			
EA190-00035	Left hand	-	20°
EA190-00045	Right hand	-	20°
TRACKWAY LIMIT SWITCH			
EA190-00015	Left hand	N.C.	6°
EA190-00025	Right hand	N.C.	6°
EA190-00016	Left hand	N.O.	6°
EA190-00026	Right hand	N.O.	6°

Common Switch Characteristics

SINGLE POLE, SPECIAL NAVY MARINE, SLIDING CONTACTS	
Ambient Temperature Range	-50°C min.
Enclosure	Watertight (3 ft. for 2 hrs.) per MIL-STD-108E

Crank Interlock

MIL-C-2212
Navy "A" High Shock
Continuous Current Carrying - 15 amps @ 440 VAC or 230 VDC
Insulation Class B

Brake Interlock

MIL-C-2212, MIL-C-2214
Navy "A" High Shock
Continuous Current Carrying - 15 amps @ 440 VAC or 230 VDC
Insulation Class B

Trackway

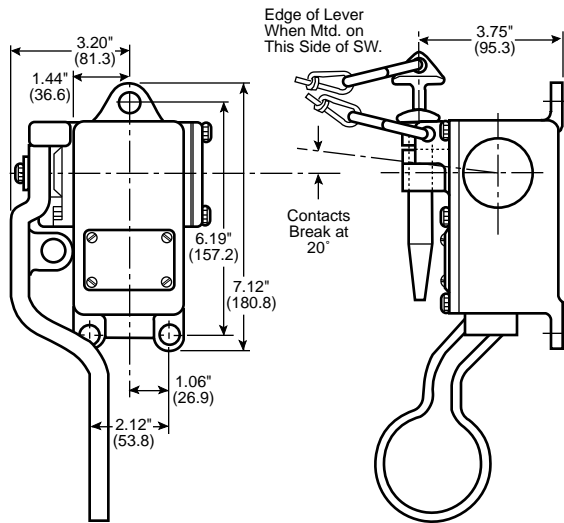
MIL-C-2174, MIL-C-2212
Continuous Current Carrying - 20 amps @ 440 VAC or
5 amps @ 230 VDC
Non-Magnetic/Fungistatic Materials
Lever Adjustment - 10° increments thru 360°

See Operating Levers Section

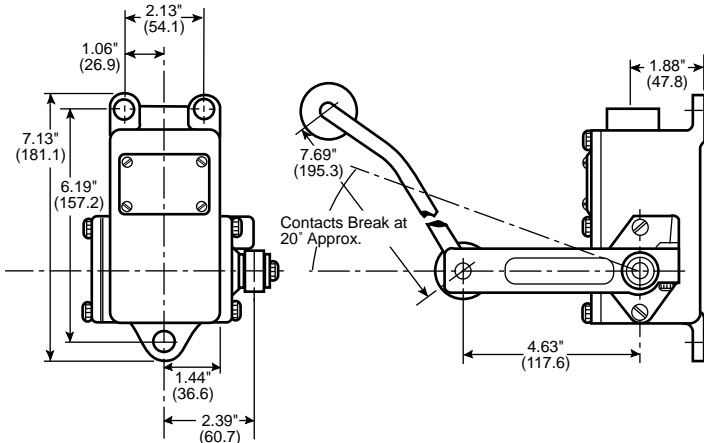
Dimensions and Mounting

EA190

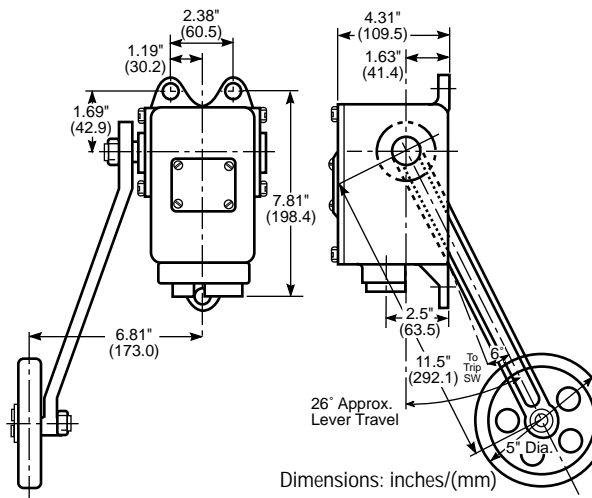
CRANK INTERLOCK SWITCH



BRAKE INTERLOCK SWITCH

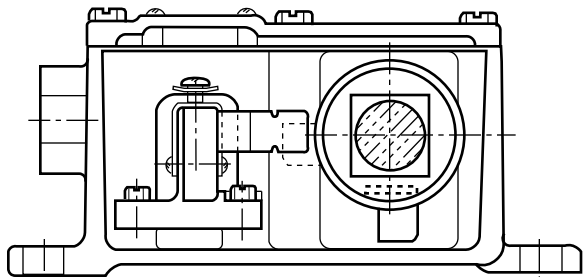
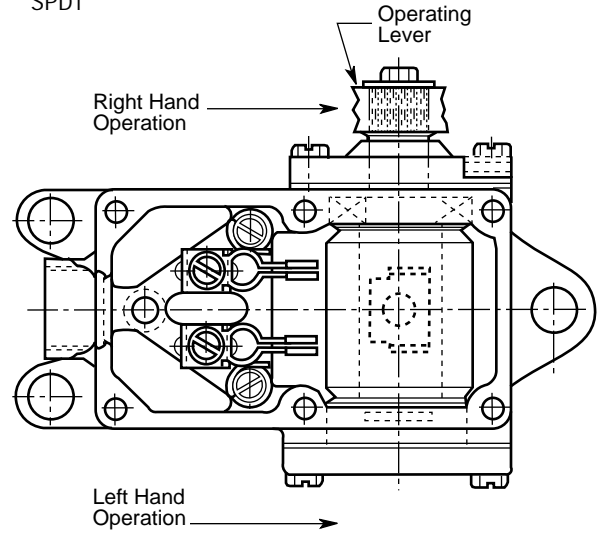


TRACKWAY LIMIT SWITCH



Operational Data Drawing

Contacts:
Knife-Disconnect
SPDT



Limit Switches

NAMCO

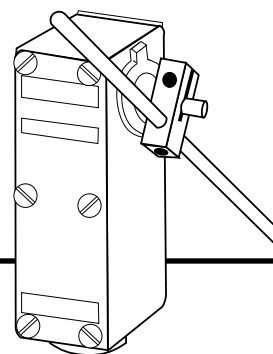
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**Super
Sensitive**

Limit Switches

**Butt
Contacts**



Limit Switches

Designed for sensing small, lightweight objects. Rotary units are gravity return and have 360° total travel either clockwise or counterclockwise. Trip torques range from 1.5 to 7 inch-ounces. Oscillating units are spring return versions with 15 inch-ounce trip torque.

Outputs include SPDT (1 NO and 1 NC) and DPDT (2 NO and 2 NC). Output indicator lights are optional.

Ideal for fill detection on vibratory feeder bowls, small parts sensing or counting, gauging devices, time delay mechanisms, safety interlock switch applications, liquid level control and governors.

EA150 1 N.O. - 1 N.C. & 2 N.O. - 2 N.C / Super Sensitive / Butt Contacts

Model Number	Description	Dir. of Operation	Travel to Make or Break Contacts	Torque Inch Oz	Over Travel	Total Travel
OSCILLATING TYPE (INCLUDES 1/8" X 10" STEEL ROD UNLESS NOTED OTHERWISE)						
EA150-10013	Standard Unit 1 N.O. 1 N.C.	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
EA150-10313	Standard Unit with L.E.D. Top Cover	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
EA150-10173	Standard Unit with 1/8" x 10" Fiber Rod	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
EA150-10083	Standard Unit with 1/4" x 9" Steel Rod	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
EA150-10093	Same as EA150-10083 with L.E.D. Top Cover	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
EA150-10143	Standard Unit 2 N.O. - 2 N.C.	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
EA150-10343	Standard Unit 2 N.O. - 2 N.C. w/ L.E.D. Top Cover	CW/CCW	Adjustable (4° - 90°)	15	Adj. to 86°	180°
ROTARY TYPE (INCLUDES 1/4" X 9" STEEL ROD UNLESS NOTED OTHERWISE)						
EA150-30014	Standard Unit 1 N.O. - 1N.C.	CW/CCW	4°	5	180°	360°
EA150-30303	Standard Unit with L.E.D. Top Cover	CW/CCW	4°	5	180°	360°
EA150-30283	Standard Unit with 1/4" x 12" Fiber Rod	CW/CCW	4°	5	180°	360°
EA150-30223	Standard Unit with 1/8" x 10" Steel Rod	CW/CCW	4°	5	180°	360°
EA150-30233	Same as EA150-30223 w/ L.E.D. Top Cover	CW/CCW	4°	5	180°	360°
EA150-30396	Standard Unit with LH shaft extension	CW/CCW	4°	5	180°	360°
EA150-30143	Standard Unit 2 N.O. - 2N.C.	CW/CCW	4°	5	180°	360°
EA150-30145	Standard Unit 2 N.O. - 2N.C. w/ L.E.D. Top Cover	CW/CCW	4°	5	180°	360°
EA150-30500	Low Torque, 1 N.O. - 1N.C., 1/4" clamp w/o Rod	CW/CCW	4°	1.5°	180°	360°
EA150-30274	Standard Unit, 1 N.O. - 1 N.C., Double-ended Shaft	CW/CCW	4°	5°	180°	360°
EA150-30275	Standard Unit, 1 N.O. - 1 N.C., Double-ended Shaft w/o Rod and Clamp	CW/CCW	4°	5°	180°	360°

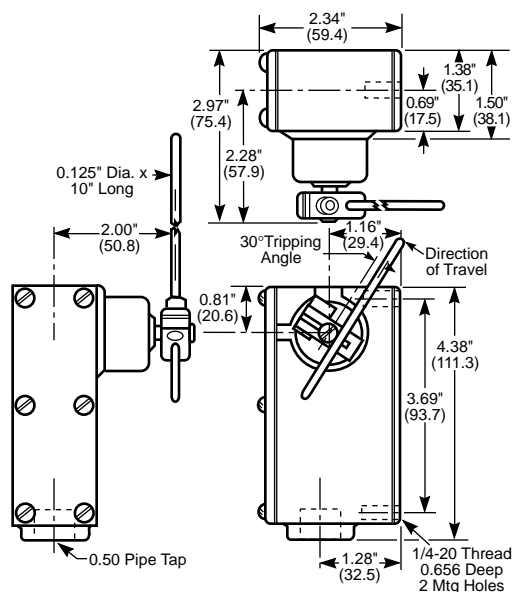
Spare Lever Clamp Kits*

EL140-18900	1/4" x 9" Steel Rod
EL140-18901	1/8" x 10" Steel Rod
EL140-18902	1/4" x 12" Fiber Rod
EL140-18903	1/8" x 10" Fiber Rod

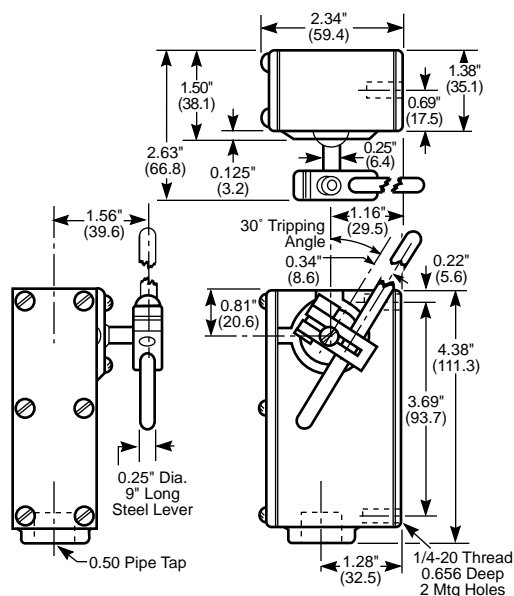
*contains Rod, Lever Clamp, Lockwasher, Set Screw and Cap Screw

See Operating Levers Section

OSCILLATING



ROTARY



Dimensions: inches/(mm)



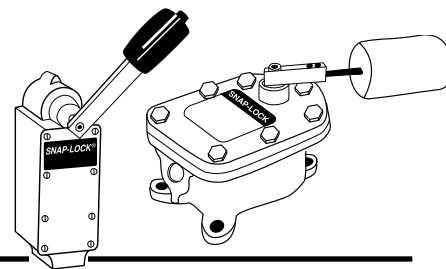
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Belt
Misalignment

Limit Switches



Limit Switches

Switches for use on conveyor systems. Standard as well as Hazardous Location versions. One step maintained, two step and two step maintained versions available. Generous overtravel, Snap Action contacts action, Form Z Contact arrangement.

EA700 Cam Action 2 N.O. - 2 N.C.

Standard Mounting Model No.	Wide Mounting Model No.	Long Mounting Model No.	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E 2nd Trip Travel	Angle F 2nd Reset Travel	Torque (inch lbs)
ONE STEP-MAINTAINED LEVER AND CONTACTS										
EA700-20137	EA700-50137	EA700-80137	CW/CCW	18°	14°	30°	90°	-	-	27
TWO STEP-MAINTAINED LEVER AND CONTACTS										
EA700-28437	EA700-58437	EA700-88437	CW/CCW	12°	10°	45°	90°	22°	10°	-
TWO STEP-SPRING RETURN										
EA700-20176	EA700-50176	EA700-80176	CW/CCW	12°	10°	45°	90°	22°	10°	-

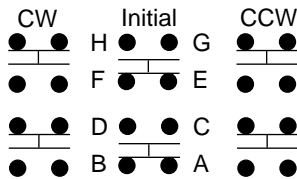
EA800 Cam Action 2 N.O. - 2 N.C.

Bronze Housing	Aluminum Housing	Cast Iron Housing	Dir. Of Operation	Angle A Trip Travel	Angle B Reset Travel	Angle C Recom. Travel	Angle D Total Travel	Angle E 2nd Trip Travel	Angle F 2nd Reset Travel	Torque (inch lbs)
ONE-STEP MAINTAINED LEVER AND CONTACTS										
-	EA800-20157	-	CW/CCW	18°	14°	30°	90°	-	-	27
TWO STEP-SPRING RETURN										
EA800-28440	EA800-28450	-	CW/CCW	12°	10°	45°	90°	22°	10°	-

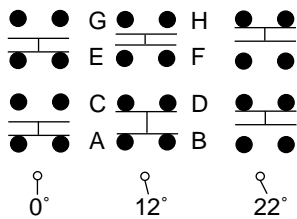
See Operating Levers Section

Contact Configurations

ONE-STEP SWITCH



TWO-STEP SWITCH / BI-DIRECTIONAL OPERATION



Common Switch Characteristics

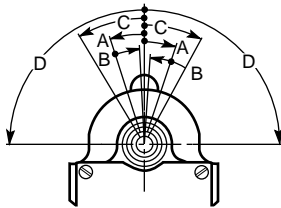
DOUBLE POLE, STANDARD/HAZARDOUS LOCATION ENVIRONMENT, BUTT CONTACTS

	EA700	EA800
NEMA Enclosure Type	1, 4, 13	4, 4X, 6, 6P, 7 Class I, Group C & D, 9 Class II, Group E, F & G
Housing Material	Zinc	Bronze/Aluminum/ Cast Iron
Ambient Temperature Range*	-20°C to +90°C	
Lever Adjustment	7° 30' Increments thru 360°	
Contacts	Butt, Silver Alloy, Form Z	

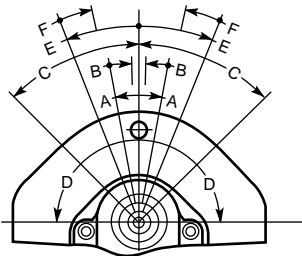
*Some high temperature (0° to 150°C) and low temperature (-40° to +90°C) versions available. Contact factory.

Operational Data Drawing

ONE-STEP SWITCH



TWO-STEP SWITCH



Continuous Current Rating - Amperes

VOLTAGE	AC	DC
125	20.0	5.0
250	15.0	1.5
480	10.0	-
600	5.0	-

75-100% Power Factor

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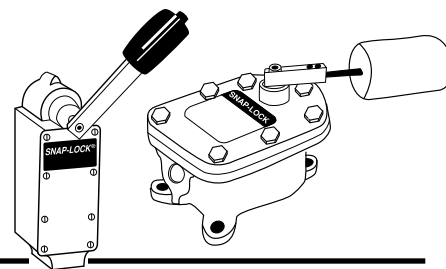
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Belt
Misalignment

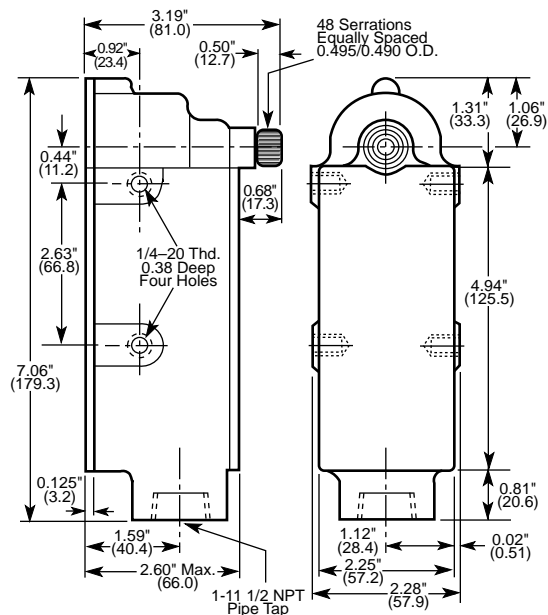
Limit Switches



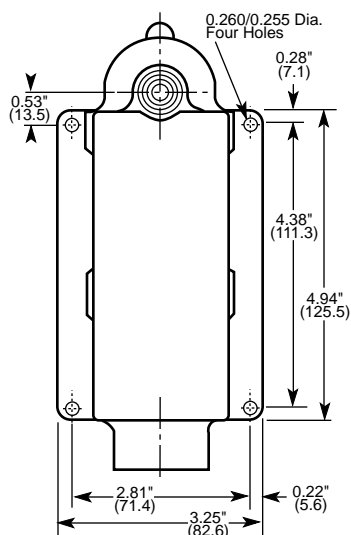
Limit Switches

EA700 Series Drawings

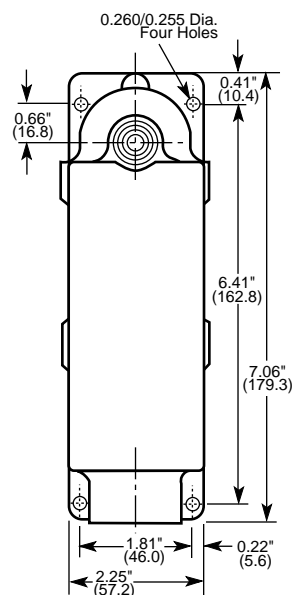
STANDARD MOUNTING PLATE



WIDE MOUNTING PLATE



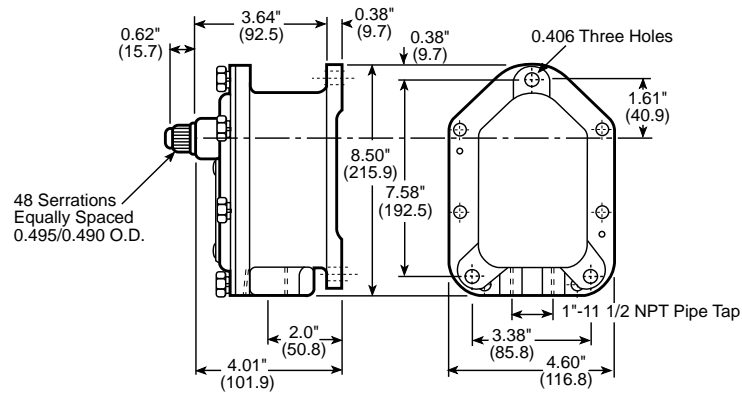
LONG MOUNTING PLATE



Dimensions: inches/(mm)

EA800 Series Drawings

STANDARD MOUNTING PLATE



Dimensions: inches/(mm)

Limit Switches

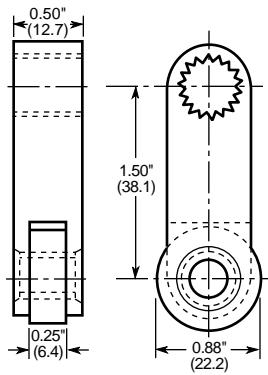
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Standard Operating Lever
EL010-53420 (D-1260)
(for .500 Dia. Shaft Switches)

For Series:

EA040, EA060, EA080,
EA130, EA140, EA170,
EA700, EA710, EA730,
EA760, EA770, EA780,
EA790, EA800, EA880,
EA990

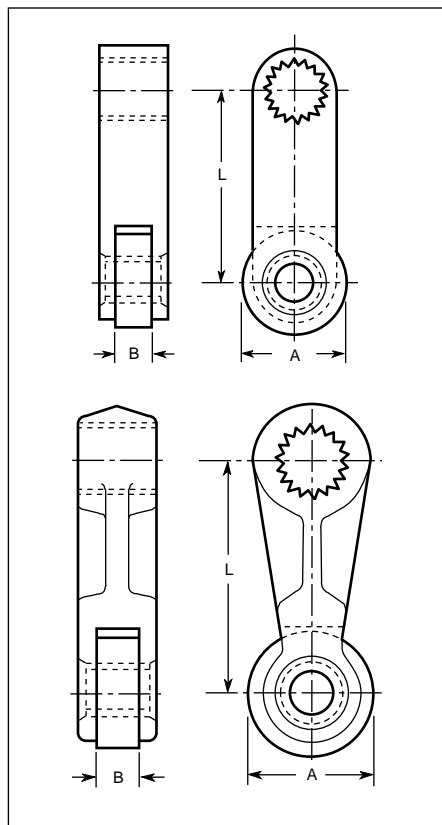
Select the operating lever for your application with regards to dimensions and materials required.

Requests for operating levers not shown should include lever style and all pertinent information as to limit switch number, dimensions, materials, etc.

Depending upon your application, levers are available in cold rolled steel, stainless steel, or bronze. Rollers are available in steel, nylon, Beryl Cop., stainless steel or steel ball bearings. Please consult materials column of the lever of your choice.

This style and size operating lever is considered standard for the majority of snap-lock switch installations. The EL010-53420 (D1260) lever is steel with a nylon roller and a stainless steel roller pin. Like all snap-lock levers, the serrated mounting hole matches the serrated lever shaft of the switches to provide fixed adjustment of the lever in 7.5° increments.

For Series EA040, 060, 080,
130, 140, 170, 700, 710,
730, 760, 770, 780, 790,
800, 880, 990



Style R - Regular Straight Type

EL Series

Ordering Numbers					Material	
Part Number	Reference	L	A	B	Lever	Roller
EL060-50320	D1260BA	3/4	3/4	1/4	C.R.S.	C.R.S.
EL060-51319	—	1	3/4	1/4	C.R.S.	Bryl. Cop.
EL060-52321	D1260GQ	1-1/4	3/4	1/4	C.R.S.	C.R.S.
EL060-53923	D1260BH	1-1/2	1-1/4	1/4	C.R.S.	C.R.S.
EL010-53338	DS1260	1-1/2	3/4	1/4	Steel	C.R.S.
EL060-53300	—	1-1/2	3/4	1/4	Brass	Bryl. Cop.
EL010-53336	—	1-1/2	3/4	1/4	Steel	S.S.
EL010-53337	—	1-1/2	3/4	1/4	Steel	Bryl. Cop.
EL060-53401	D1260RF	1-1/2	7/8	9/32	Brass	Nylon
EL060-53402	—	1-1/2	7/8	9/32	Brass	Bryl. Cop.
EL010-53420	D1260	1-1/2	7/8	9/32	Steel	Nylon
EL010-53429	D1260Y	1-1/2	7/8	9/32	Steel	B.B.
EL060-53536	D1260Z	1-1/2	1	1/4	C.R.S.	C.R.S.
EL060-53926	D1260CL	1-1/2	1-3/8	1/4	C.R.S.	C.R.S.
EL060-55327	D1260E	2	3/4	1/4	C.R.S.	C.R.S.
EL060-55300	—	2	3/4	1/4	C.R.S.	Bryl. Cop.
EL060-55520	D1260AC	2	1	1/4	C.R.S.	C.R.S.
EL060-55601	—	2	1	1/4	C.R.S.	Bryl. Cop.
EL060-55530	D1260RT	2	1	1/4	Brass	Bryl. Cop.
EL060-55927	D1260GT	2	1-1/2	1/4	C.R.S.	C.R.S.
EL060-50321	D1260BC	2-1/8	3/4	1/4	C.R.S.	C.R.S.
EL060-50501	D1260B	2-1/8	1	1/4	C.R.S.	C.R.S.
EL060-50334	D1260M	2-1/4	3/4	1/4	C.R.S.	C.R.S.
EL060-59300	D1260KC	2-3/8	3/4	1/4	C.R.S.	C.R.S.
EL010-56427	D1260K	2-1/2	7/8	9/32	Steel	Nylon
EL010-56334	DS1260K	2-1/2	3/4	1/4	Steel	C.R.S.
EL010-55421	D1260DF	2-1/2	1	1/4	C.R.S.	C.R.S.
EL060-56500	D1260RR	2-1/2	1	1/4	Brass	Bryl. Cop.
EL060-56920	D1260CP	2-1/2	1-1/2	1/4	C.R.S.	C.R.S.
EL060-50322	D1260BD	2-3/4	3/4	1/4	C.R.S.	C.R.S.
EL060-57300	—	2-3/4	3/4	1/4	C.R.S.	Bryl. Cop.
EL010-58300	—	3	3/4	1/4	Steel	Bryl. Cop.
EL010-58337	DS1260L	3	3/4	1/4	Steel	C.R.S.
EL060-58305	—	3	3/4	1/4	Brass	Bryl. Cop.
EL010-58400	—	3	7/8	9/32	Steel	Bryl. Cop.
EL010-58423	D1260L	3	7/8	9/32	Steel	Nylon
EL010-58451	—	3	7/8	9/32	Steel	C.R.S.
EL060-58401	—	3	7/8	9/32	Brass	Nylon
EL060-58403	D1260VQ	3	7/8	9/32	S.S.	Bryl. Cop.
EL010-58521	D1260CJ	3	1	1/4	Steel	C.R.S.
EL010-58522	—	3	1	1/4	C.R.S.	Bryl. Cop.
EL010-58923	D1260CN	3	1-1/4	1/4	Steel	C.R.S.
EL060-58923	—	3	1-1/4	1/4	Brass	Steel
EL010-58900	D1260VR	3	1-1/2	1/4	Steel	Nylon
EL010-58920	D1260AE	3	1-1/2	1/4	Steel	C.R.S.
EL060-58320	D1260BB	3-1/2	3/4	1/4	C.R.S.	C.R.S.
EL060-58431	D1260AP	3-1/2	1	1/4	C.R.S.	C.R.S.
EL060-58932	—	3-1/2	3/4	1/4	Brass	Bryl. Cop.
EL060-58930	—	3-1/2	1-1/2	1/4	Brass	Bryl. Cop.
EL060-58326	D1260C	4	3/4	1/4	C.R.S.	C.R.S.
EL060-58304	D1260WD	4	3/4	1/4	C.R.S.	Bryl. Cop.
EL060-50523	D1260BL	4	1	1/4	C.R.S.	C.R.S.
EL060-58925	—	4	1-1/4	1/4	Brass	Bryl. Cop.
EL060-58920	D1260AB	4	1-1/2	1/4	C.R.S.	C.R.S.
EL060-58901	—	4	1-1/2	9/32	C.R.S.	Nylon
EL060-50335	D1260N	5	3/4	1/4	C.R.S.	C.R.S.
EL060-50925	D1260BW	5	1-1/2	1/4	C.R.S.	C.R.S.
EL060-50305	D1260CQ	6	3/4	1/4	C.R.S.	C.R.S.
EL060-50338	—	6	3/4	1/4	C.R.S.	Bryl. Cop.
EL060-50930	D1260JE	6	1-1/4	1/4	C.R.S.	C.R.S.
EL060-50703	D1260KD	6	3	1/4	C.R.S.	C.R.S.

All dimensions are in inches.

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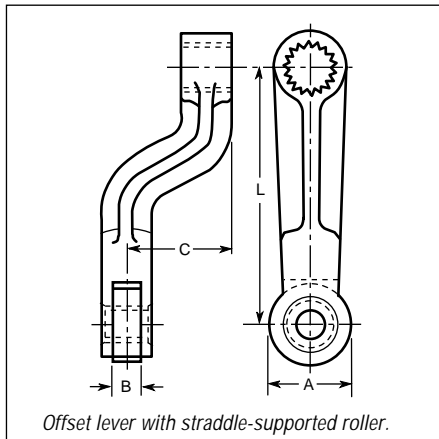
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Miscellaneous Types

Operating Levers

Limit Switches

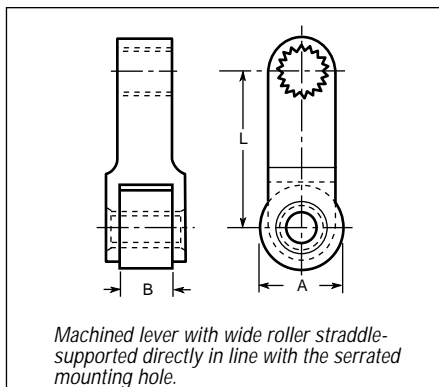
For Series EA040, 060, 080, 130,
140, 170, 700, 710, 730, 760,
770, 780, 790, 800, 880, 990 Only



Style RLO - Regular Lever Offset Type

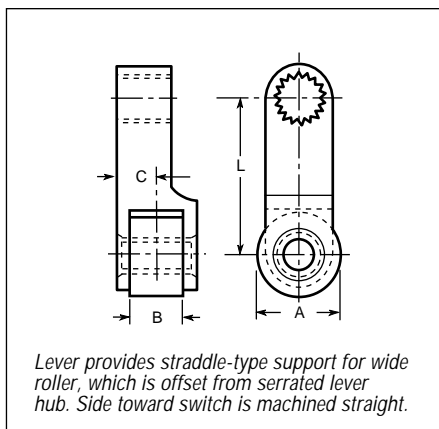
Ordering Numbers						Material	
Part Number	Reference	L	A	B	C	Lever	Roller
*EL020-53326	D1260GX	1-1/2	3/4	1/4	1-1/4	Mang. Br.	Steel
*EL020-53325	D1260GU	1-1/2	3/4	1/4	1-3/16	Mang. Br.	Steel
EL020-55327	D1260HZ	2	3/4	1/4	1-1/8	Mang. Br.	Steel
*EL020-55300	D1260JD	2	3/4	1/4	1-1/2	Mang. Br.	Steel
EL020-56320	D1260BT	2-1/2	3/4	1/4	1	Mang. Br.	Steel
*EL020-56321	D1260DW	2-1/2	3/4	1/4	2-1/4	Mang. Br.	Steel
EL020-56421	D1260DG	2-1/2	1	1/4	1	Mang. Br.	Steel
EL020-58922	D1260FT	3	1-1/4	1/4	1-1/4	Mang. Br.	Steel
EL020-58923	—	3	1-1/4	1/4	1-1/4	Mang. Br.	S.S.
EL020-59900	D1260AY	5-1/2	1-1/2	1/4	1-3/4	C.R.S.	Steel

*On Series EA040/060/080/170, Lever will not clear top of switch when mounted with Roller facing the rear.



Style RW - Wide Roller Regular Type

Ordering Numbers					Material	
Part Number	Reference	L	A	B	Lever	Roller
EL070-53501	D1260AJ	1-1/2	1	1/2	C.R.S.	Bryl. Cop.
EL070-50507	D1260CY	1-5/8	1	1/2	C.R.S.	Bryl. Cop.
EL070-56921	D1260DY	2-1/2	1-1/4	1/2	C.R.S.	Steel
EL060-00024	D1260AL	3	1-1/2	1/2	C.R.S.	Steel
EL070-50921	D1260BE	4	1-1/4	1/2	C.R.S.	Steel



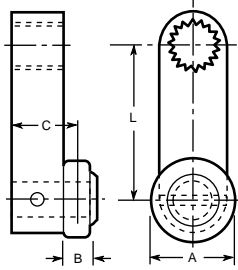
Style RWO - Wide Roller Offset Type

Ordering Numbers						Material	
Part Number	Reference	L	A	B	C	Lever	Roller
EL080-53329	D1260R	1-1/2	3/4	1/2	3/8	Mang. Br.	Steel
EL080-53932	D1260P	1-1/2	1-1/2	1/2	3/8	C.R.S.	Steel
EL080-55323	D1260FR	2	3/4	1/2	3/8	C.R.S.	Steel
EL080-54905	D1260DD	2	1-1/2	1/2	3/8	C.R.S.	C.R.S.
EL080-56301	D1260AH	2-1/2	3/4	1/2	3/8	C.R.S.	Steel
EL080-56305	—	2-1/2	3/4	1/2	3/8	C.R.S.	Bryl. Cop.
EL080-58322	D1260GN	3	3/4	1/2	3/8	C.R.S.	Steel
EL080-58901	D1260DE	3	1-1/2	1/2	3/8	C.R.S.	Steel
EL080-58906	D1260DZ	3-1/2	1-1/2	1/2	3/8	C.R.S.	Steel
EL080-58909	D1260HA	4	1-1/2	1/2	3/8	C.R.S.	Steel
EL080-50924	D1260BS	6	1-1/2	1/2	3/8	C.R.S.	Steel

For Series EA040, 060, 080, 130,
140, 170, 700, 710, 730, 760,
770, 780, 790, 800, 880, 990 Only

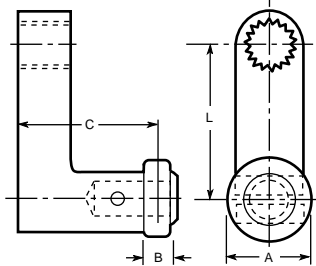
EL Series

Style S - Side Roller Type



Side supported roller offset on front side
of lever machined with straight sides

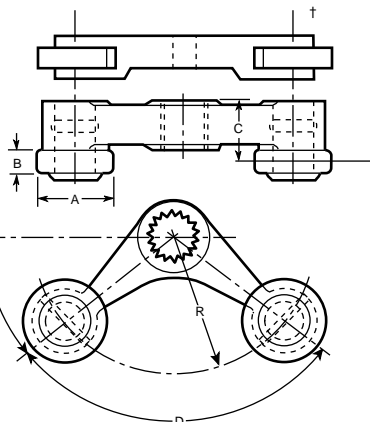
Ordering Numbers						Material	
Part Number	Reference	L	A	B	C	Lever	Roller
EL150-53303	—	1-1/2	3/4	3/4	7/8	C.R.S.	Bryl. Cop.
EL150-53301	D1260A	1-1/2	3/4	1/4	5/8	C.R.S.	Steel
EL150-53300	D1260DU	1-1/2	3/4	3/4	7/8	C.R.S.	Steel
EL150-53901	D1260HV	1-1/2	1-1/4	1/4	5/8	C.R.S.	Steel
EL150-55300	—	2	3/4	1/2	3/4	C.R.S.	Bryl. Cop.
EL150-55303	D1260DT	2	3/4	1/4	5/8	C.R.S.	Steel
EL150-55301	D1260JJ	2	3/4	1/2	3/4	C.R.S.	C.R.S.
EL150-56300	D1260DX	2-1/2	3/4	1/4	5/8	C.R.S.	C.R.S.
EL150-56500	—	2-1/2	1	1/2	3/4	C.R.S.	S.S.
EL150-57300	D1260DO	2-3/4	3/4	1/4	5/8	C.R.S.	C.R.S.
EL150-58901	—	4	1-1/4	1/4	5/8	Bronze	Nylon
EL150-58902	—	4	1-1/4	1/4	5/8	Bronze	Steel



Right angle offset lever has side-
supported roller mounted on end.

Style SLO - Side Roller Lever Offset Type

Ordering Numbers						Material	
Part Number	Reference	L	A	B	C	Lever	Roller
EL090-53324	D1260GZ	1-1/2	3/4	1/4	1	Bronze	Steel
EL090-53336	—	1-1/2	3/4	1/4	1-3/8	Bronze	Nylon
EL090-53321	D1260CT	1-1/2	3/4	1/4	1-3/8	Bronze	Steel
EL090-53322	—	1-1/2	3/4	1/4	1-3/8	Bronze	Bryl. Cop.
EL090-53328	D1260GV	1-1/2	3/4	1/4	2	Bronze	Steel



Angle type rocker arm has both side-
supported rollers mounted on same side.

Style TS - Two Roller Same Side

Ordering Numbers							Material		
Part Number	Reference	R	A	B	C	D	E	Lever	Roller
EL040-50327	D1260CM	1-3/8	3/4	1/4	5/8	107°34'	36°	Bronze	Steel
EL040-50328	D1260JQ	1-3/8	3/4	1/2	3/4	107°34'	36°	Bronze	Steel
†EL040-58904	D1260JH	3	1-1/2	1/2	3/4	150°	15°	Bronze	Steel
†EL040-58905	—	3	1-1/2	1/2	3/4	150°	15°	Bronze	Bryl. Cop.

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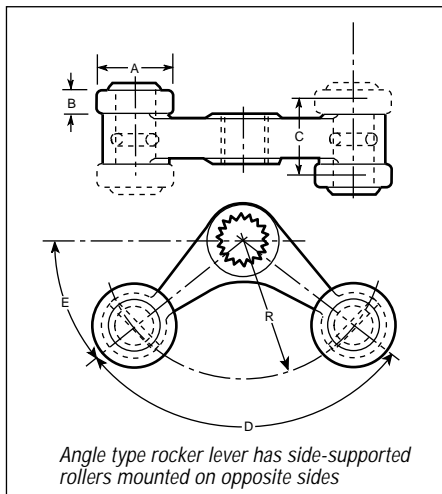
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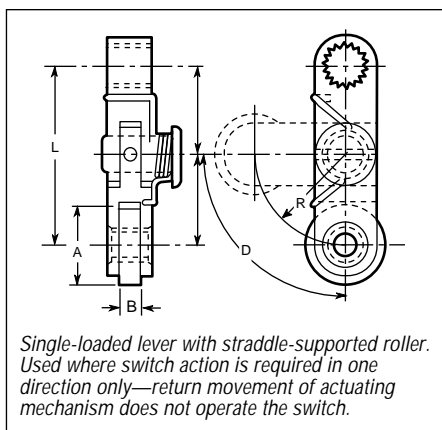
Limit Switches

For Series EA040, 060, 080, 130,
140, 170, 700, 710, 730, 760,
770, 780, 790, 800, 880, 990 Only



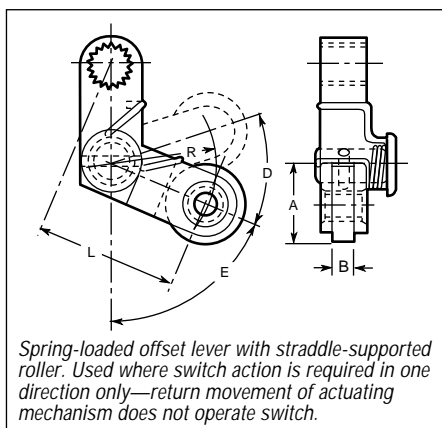
Style TSO - Two Roller Opposite Side

Ordering Numbers								Material	
Part Number	Reference	R	A	B	C	D	E	Lever	Roller
EL030-50301	D1260AA	1-3/8	3/4	1/4	3/4	107°34'	36°13'	Bronze	Steel
EL030-50302	D1260DH	1-3/8	3/4	1/2	1	107°34'	36°13'	Bronze	Steel
EL030-52322	D1260DQ	1-1/2	3/4	3/4	1-1/4	90°	45°	Bronze	Steel



Style KR - Knee Action Straight Type

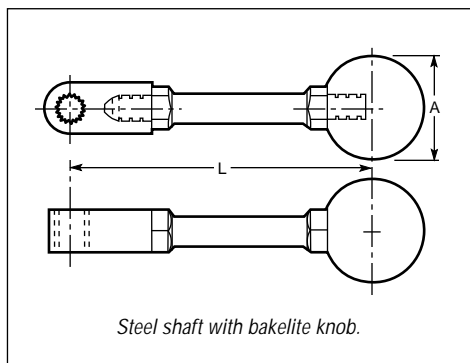
Ordering Numbers							Material	
Part Number	Reference	R	A	B	D	L	Lever	Roller
EL100-55401	D1260JM	1	7/8	1/4	90°	2	Steel	Steel
EL100-55402	—	1	7/8	1/4	90°	2	Steel	Bryl. Cop.
EL100-55403	—	1	7/8	1/4	90°	2	Steel	S.S.



Style KRO - Knee Action Offset Type

Ordering Numbers								Material	
Part Number	Reference	R	A	B	D	E	L	Lever	Roller
EL110-50401	D1260JV	1-1/8	7/8	1/4	41°30'	67°30'	1-7/8	Steel	Steel

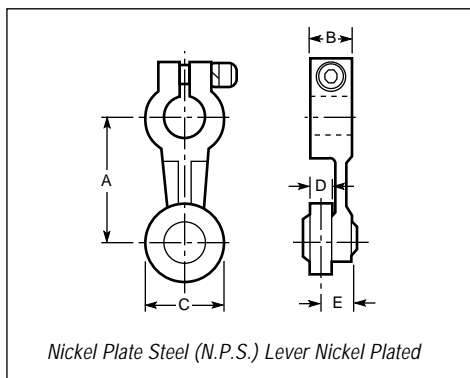
For Series EA040, 060, 080, 130,
140, 170, 700, 710, 730, 760,
770, 780, 790, 800, 880, 990 Only



Style M - Manual Type

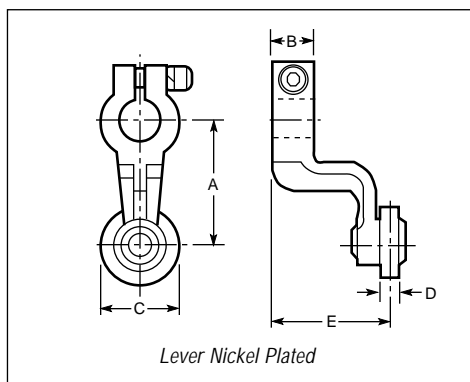
Ordering Numbers				Material	
Part Number	Reference	L	A	Lever	Knob
EL050-58900	D1260EP-3	3	1-3/8	Steel	Bakelite
EL050-59901	D1260EP-1	4-1/16	1-3/8	Steel	Bakelite
EL050-59900	D1260EP	6-5/16	1-3/8	Steel	Bakelite

For Series EA700, 710, 730, 760,
770, 780, 790, 800, 880, 990 Only



Straight

Ordering Numbers							Material	
Part Number	Reference	A	B	C	D	E	Lever	Roller
EL010-62401	SL-160	1-1/2	1/2	7/8	9/32	25/64	Zinc	Steel
EL010-63414	SL-160K	1-1/2	1/2	7/8	9/32	25/64	Zinc	S.S.
EL010-63415	SL-160N	1-1/2	1/2	7/8	9/32	25/64	Zinc	Nylon



Offset

Ordering Numbers							Material	
Part Number	Reference	A	B	C	D	E	Lever	Roller
EL020-63412	SL-160C	1-1/2	1/2	7/8	9/32	1-7/16	Zinc	Steel
EL020-63414	SL-160L	1-1/2	1/2	7/8	9/32	1-7/16	Zinc	Nylon
EL020-63415	SL-160S	1-1/2	1/2	7/8	9/32	1-7/16	Zinc	S.S.

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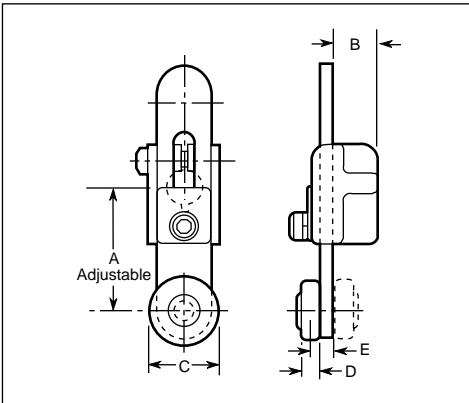
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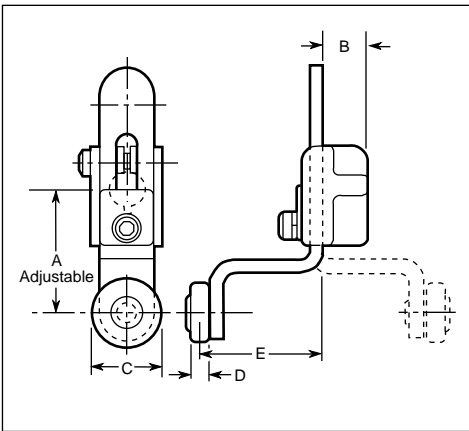
For technical assistance, call 1-800-NAMTECH

For Series EA700, 710, 730, 760,
770, 780, 790, 800, 880, 990 Only



Adjustable Straight

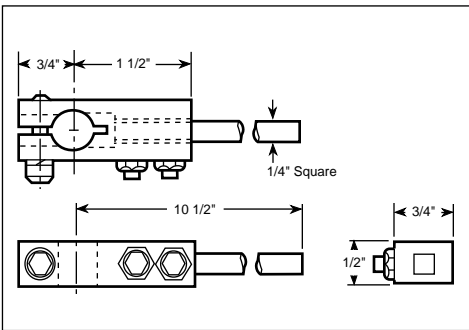
Ordering Numbers							Material	
Part Number	Reference	A	B	C	D	E	Lever	Roller
EL120-60400	SL-170A	1-3/4-3	21/32	7/8	9/32	11/32	Steel	Steel
EL120-60600	SL-170C	1-7/8-3	21/32	2	9/32	11/32	Steel	Steel
EL120-69415	SL-170K	1-3/4-3	21/32	7/8	9/32	11/32	Steel	Nylon
EL120-69421	SL-170R	3-3/4-5	21/32	7/8	9/32	11/32	Steel	Steel
EL120-60601	—	3-3/4-5	21/32	2	9/32	11/32	Steel	Steel



Adjustable Offset

Ordering Numbers							Material	
Part Number	Reference	A	B	C	D	E	Lever	Roller
EL130-64410	SL-170	1-3/4-3	21/32	7/8	9/32	1-25/32	Steel	Steel
EL130-69410	SL-170D	1-3/4-3	21/32	7/8	9/32	1-25/32	Steel	Nylon
EL130-69412	SL-170F	1-3/4-3	21/32	7/8	9/32	2-3/8	Steel	Steel
EL130-69413	SL-170G	1-3/4-3	21/32	7/8	9/32	3-1/2	Steel	Steel
EL130-69414	SL-170J	1-3/4-3	21/32	7/8	9/32	15/16	Steel	Steel
*EL130-69411	SL-170E	1-3/4-3	21/32	7/8	9/32	1-9/32	Steel	Steel
EL130-20401	—	1-3/4-3	21/32	7/8	17/64	3-1/2	Steel	Nylon

*Roller mounted on opposite side

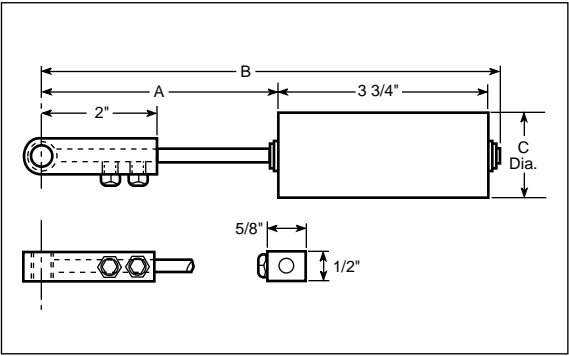


Rod Lever

Ordering Numbers			
Part Number	Reference	Dimensions	Material
EL140-69917	SL170M-1	Other rod lengths available to suit requirements	Steel Rod

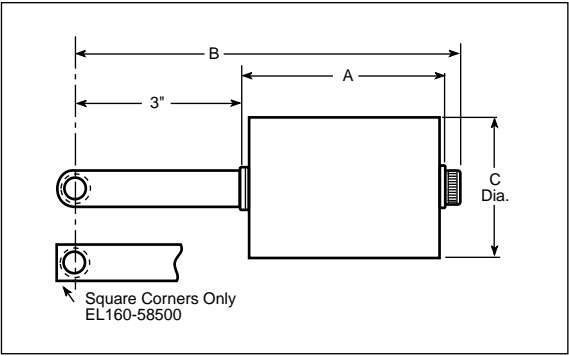
EL Series

For Series EA040, 060, 080, 130,
140, 170, 700, 710, 730, 760, 770,
780, 790, 800, 880, 990 Only



Style VR - Belt Mis-Alignment Lever-Adjustable

Ordering Number	"A"	"B"	"C"	Material	
	(Adjustable)	Max.	Dia.	Lever	Roller
EL140-58500	4.45/3.82"	8.38"	1.50"	Steel	Delrin
EL140-58600	4.45/3.82"	8.38"	2.50"	Steel	Delrin



Style YR - Belt Mis-Alignment Lever

Ordering Number	"A"	"B"	"C"	Material	
		Max.	Dia.	Lever	Roller
EL160-58500	2.24"	5.64"	1.25"	Steel	Nylon
EL160-58600	3.50"	6.90"	2.50"	Steel	Nylon

Limit Switches

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Proper Application of Limit Switches General Information

Limit switches are used to convert a mechanical motion into an electrical control signal. The mechanical motion is usually in the form of a cam, a machine component or an object moving toward a predetermined position. The cam engages the limit switch lever or plunger and this in turn makes or breaks an electrical contact inside the switch. This electrical control signal is then used to limit position or reverse the machine travel, or to initiate another operating sequence. It can also be used for counting, sorting or as a safety device.

Typical limit switch applications are in the control circuits of solenoids, control relays and motor starters which control the motion of machine tools, conveyors, hoists, elevators and practically every type of motor driven machine.

Experience has shown that most limit switch failures are the fault of the installation. In some cases an installation that is not perfect cannot be avoided, but in the majority of cases, proper application of the limit switch would have prevented failure. For application assistance, call 1-800-NAMTECH.

Definition of Limit Switch Terms

Actuator - Mechanism of the switch or switch enclosure which operates the contacts, i.e. lever arm, plunger, wobble stick.

Break - To open an electrical circuit.

Cam - Machine part or component that applies force to switch actuator causing actuator to move as intended. See also "Dog."

Cam Track - Distance from switch mounting surface to a specified point on actuator.

Differential Travel - Distance or angle from the operating position to the reset position.

Direct-Acting Contacts - Contacts are moved directly by the operating shaft. In general should only be used where movement of actuator must break welded contacts, as in a crane safety limit switch.

Dog - Machine part or component that applies force to switch actuator causing actuator to move as intended. See also "Cam."

Double Break - Contacts open circuit at two points.

Double Pole Double Throw (DPDT) - Switches which make and break two separate circuits. This circuit provides a normally open and normally closed contact for each pole.

Free Position - Position of switch actuator when no external force (other than gravity) is applied on the actuator. See also "Initial Position" and "Normal Position."

Initial Position - Position of switch actuator when no external force (other than gravity) is applied on the actuator. See also "Free Position" and "Normal Position."

Maintained Contact Switch - Designed for applications requiring sustained contact after actuator has been released, but with provision for resetting.

Make - To close or establish an electrical circuit.

Momentary Contact Switch - A switch which returns from the operated condition to normal condition when actuating force is removed. See also "Spring Return."

Neutral Position Limit Switch - Lever arm type switch with two sets of contacts, one of which operates when the shaft is rotated clockwise and the other of which operates when the shaft is rotated counter-clockwise.

Normal Position - Position of switch actuator when no external force (other than gravity) is applied to actuator. See also "Free Position" and "Initial Position."

Normally Closed Contact (N.C.) - Contacts that move to the closed position when no external force is on the actuator.

Normally Open Contacts (N.O.) - Contacts that move to the open position when no external force is on the actuator.

Operating Force - Amount of force applied to the actuator to cause contact operation.

Operating Position - Position of the actuator at which the contacts move to the operated position. See also "Trip Position."

Overtravel - Movement of the actuator beyond the operating position.

Pilot Duty Rating - Rating of contacts when making and breaking inductive loads such as coil and solenoids.

Pole - Parts necessary to control one conductor of a circuit.

Precision Snap Acting Switch - An electromechanical switch having predetermined and accurately controlled characteristics and having a spring loaded, quick make-and-break contact action.

Pretravel - Distance or angle through which the actuator moves from the normal position to the operating position.

Reset Position - Position of actuator at which contacts return to the normal position. See also "Releasing Position."

Releasing Position - Position of actuator at which contacts return to the normal position. See also "Reset Position."

Repeat Accuracy - Ability of a switch to repeat its characteristics precisely from one operation to the next operation. See also "Repeatability."

Repeatability - Ability of a switch to repeat its characteristics precisely from one operation to the next operation. See also "Repeat Accuracy."

Single Pole Double Throw (SPDT) - Switches which make and break one circuit. Circuit provides one normally open and one normally closed contact.

Slow Make-and-Break Contacts - The speed of contact transfer is directly dependent on the speed of the operating shaft.

Snap Action - Rapid motion of the contacts from one position to another position or their return. This action is relatively independent of the rate of travel of the actuator.

Snap Back - Sudden return of actuator to normal position.

Spring Return Switch - A switch which returns from operated condition to normal condition when actuating force is removed. See also "Momentary Contact Switch."

Trip Position - Position of the actuator at which the contacts move to the operated position. See also "Operating Position."

Total Travel - Distance from actuator-free position to over-travel limit position.

Actuator Design

For maximum limit switch life, the force applied to the lever arm by a cam should be perpendicular to the lever arm. This means that the cam angle and lever arm angle should be the same.

A good recommended cam angle and lever arm angle at moderate cam speeds (up to 90 fpm) is 45°, see Figure 1-1. Here lever acceleration is less and deceleration is also less at the lower cam edge.

The arrangement shown in Figure 1-2 is satisfactory only at cam speeds below 50 fpm. At higher speeds, the impact due to high lever acceleration causes excess roller bounce. Rapid deceleration occurs at the lower cam edge.

The cam trailing edge on overriding cams must also be considered for maximum switch life, see Figure 1-3. Lever arm snap back causes shock loads which reduce switch life. Also, with reversing cams the trailing edge becomes a leading edge on the return stroke.

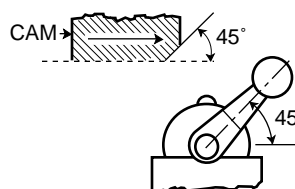


Figure 1.1

*Recommended for moderate cam speeds - up to 90 fpm
Non-overriding cams*

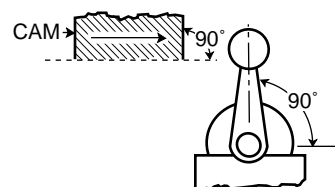


Figure 1.2

*Satisfactory only for low cam speeds - 50 fpm or less
Non-overriding cams*

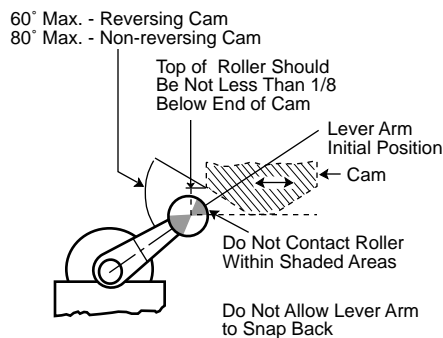


Figure 1.3

For overriding cams - up to 90 fpm

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Electrical Ratings

RATINGS —

Many control applications involve high inductive loads such as starter, contactor and relay coils; solenoids and clutches. In order to apply a control device correctly, the inductive rating must be known. Ratings are generally listed in three ways:

1. Resistive or non-inductive.
2. Inductive (pilot duty).
3. Continuous.

Resistive or non-inductive ratings - This rating indicates the resistive load only that the contacts make or break. Resistive ratings are generally based on a 75% minimum power factor for AC.

Inductive (pilot duty) ratings - The inductive rating indicates the non-motor inductive load, such as the contactors, relays and other remotely controlled devices that the contacts can make or break. These ratings usually are based on a 35% power factor for AC.

Continuous rating - Continuous rating indicates the load that the contacts can carry continuously without making or breaking the circuit.

The inductive rating is always less than the resistive or continuous rating. When contacts break an inductive circuit, the inductance in the load tends to keep the current flowing in the same direction. The result is an arc across the contacts which causes heating and burning of the contacts. Because of the extra heat generated, the allowable inductive current must be less than the resistive current for equal contact life.

Quick make and quick break (snap-action) contacts reduce the arcing time and allow higher inductive ratings than with slow make-or-break contacts. AC inductive coil loads have a momentary inrush current of approximately 10 times the sealed current. Contacts must be able to break or interrupt the inrush current in an emergency.

Excessive load - If the load exceeds the ratings of the limit switch being used, a control relay (CR) or contactor with proper ratings can be used as in Figure 1-4.

The DC current ratings of a device can be increased by placing contacts in series. This effectively increases the contact gap allowing a higher current rating. In general, the following ratings can be applied:

2 contacts in series — DC rating x 2.5

3 contacts in series — DC rating x 5

Current should never exceed the maximum continuous current rating of the device.

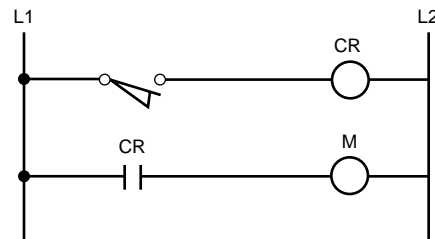


Figure 1.4

Contact Resistance

RESISTANCE OF SNAP SWITCHES

Snap switch resistance is the total electrical resistance that a snap switch adds to the circuit and consists of:

Conducting Path. Includes all terminals, inserts, stationary contact material resistance, movable contact material resistance, movable blade assembly, and any other parts in the conducting circuit.

Constriction Resistance of all joints, discontinuities, or interfaces. This is the resistance caused by limited mating surfaces through which the load must pass. If the movable and stationary contact tips are viewed through a microscope, it can be seen that they only touch at a very few points. Thus, increased resistance is presented to the current. If the current is high enough, the points of constriction are softened and enlarged through thermal effects and the resistance decreases.

Film resistance. It is well known that silver accumulates a surface resistance due to chemical reaction with its environment. The most common reaction is with sulfur and oxygen which creates a sulfide and an oxide of silver. Such a surface is known to have some resistance which can be read with a low voltage instrument such as an ohmmeter. These surfaces, however, have the characteristic of being self-clearing. When current is passed through such a surface, it creates heat which, in turn, reduces the compound to pure silver again and restores the contact to a low ohmic value. This has long been the characteristic which has made silver such a good selection for contact materials.

Standard contacts can be gold plated to reduce switch resistance, but may not provide sufficient increase in reliability to warrant the added cost. For example, if the contact material underneath is exposed at any point due to excessive current or normal mechanical wear, a contaminating film may develop and will eventually creep over the plated portion. Long-term reliability is then no better than with standard contacts.

Particle resistance. Contamination in the form of foreign material can also produce resistance. Carefully controlled production processes are used to prevent contamination during assembly of snap switches.

Namco limit switches are designed for use with industrial control equipment where voltages are relatively high — normally 120 volts or higher — and current levels are high — normally .25 amperes or higher. An increase in switch resistance may appear to be more critical in high energy circuits because it represents a greater percentage of total circuit impedance; however, the arcing produced breaks down or burns away the contaminants, reducing the actual resistance seen by the load.

Switch resistance in dry circuit (low voltage, low current) applications is more of a problem, but the resistance has to be quite high to significantly affect operation. For example, a solid state circuit operating at 20 volts and 1 ma has a circuit resistance of 20 divided by (1×10^{-3}) or 20,000 ohms. A Snap-Lock switch with 10 ohms resistance would have little effect. The problem arises with film or particle resistance which can be quite high or even present an open circuit. Use of snap switches with dry circuits is not recommended because these voltages and currents are not high enough to reduce the silver sulfide or silver oxide to pure silver or to burn away other contaminants present.

An ohmmeter test on Snap-Lock switches is unreliable because the most common voltage source in an ohmmeter is a 1.5 volt battery and to snap switch contacts being tested, this is just another dry circuit load. Several ohmmeter readings of the same contacts may vary from a few hundredths of an ohm to several ohms, yet the contacts will work perfectly with a nominal coil load.

Recommendations for Application and Testing of Limit Switch Contacts

Standard Namco limit switches are normally recommended for use with industrial control devices, not dry circuits. If lower voltages are present, the current drawn through the contacts should be on order of .25 amperes in order to maintain proper continuity.

To test continuity in the field, a six volt, .25 ampere pilot light is recommended.

Do not use an ohmmeter to test continuity.

An ohmmeter is a reliable test only if the snap switch is to be used with a dry circuit and, as stated above, this is normally not recommended.

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Mayfield Village, OH 44143

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Wiring and Mounting

- Unless specifically designed for such service, limit switches **SHOULD NOT BE** submerged in or splashed with oils, coolants or other liquids. **CONSULT FACTORY.**
- Limit switches **MUST NOT BE** used in locations where temperature or atmospheric conditions are beyond those for which they have been specifically designed.
- Power from different sources **MUST NOT BE** connected to the contact of one limit switch unless specifically designed for such service.
- Limit switches **MUST BE** used within their contact ratings. Refer to switch label on cover for electrical ratings and the appropriate limit switch bulletin for acceptable environmental conditions in which the switch has been designed to function properly.
- Limit switches **SHOULD BE** mounted rigidly and in readily accessible locations, with suitable clearances to permit easy service and replacement when necessary. Cover plates **SHOULD** face the maintenance access point.
- Limit switches **SHOULD BE** placed in locations where machining chips do not accumulate under normal operating conditions to avoid chip interference with the lever operation.
- Opposite polarities **MUST NOT BE** connected to the contacts of one limit switch unless the limit switch is specifically designed for such service.

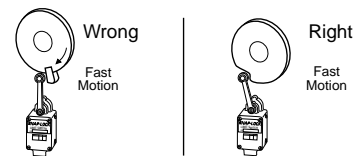
Limit Switch Selection

Selection of the proper electro-mechanical limit switch for an application generally breaks down into two major decisions, choosing the proper actuator (lever) and choosing the proper enclosure. There are other considerations, such as what operating sequences are available, temperature rating and electrical rating. These vary from switch type to switch type.

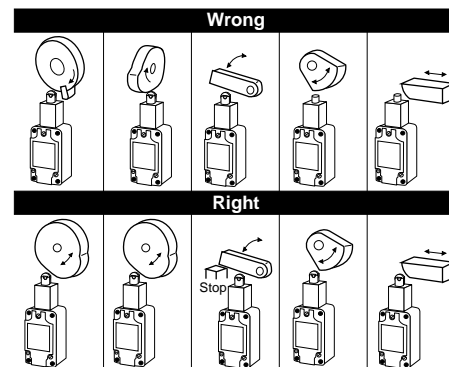
Selection of Limit Switch Actuator — Selection of a suitable actuator depends on the shape, speed, direction and total travel of the cam or part being used to trip the limit switch and the accuracy desired. See Operating Levers Section for levers offered fitting Namco limit switches.

Actuator Consideration

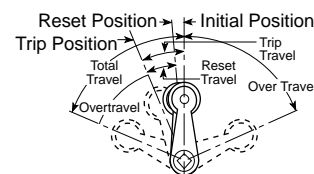
- Where relatively slow motions operate the limit switch, a snap-acting or snap-lock design **SHOULD BE** used.
- Where relatively fast motions are involved, cam arrangement **SHOULD BE** such that the actuator does not receive a severe impact.
- Where relatively fast motions are involved, cams **MUST BE** designed such that the limit switch will be held operated long enough to operate relays, valves, etc.



- For limit switches with pushrod actuators, the actuating force **SHOULD BE** applied as nearly as possible in line with the pushrod axis.

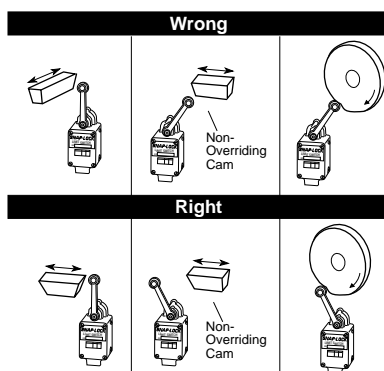


- Limit switches **MUST NOT BE** operated beyond the manufacturer's recommended travel. Operating positions and lever travel terminology are illustrated in drawing below. For specifications of a specific switch, refer to the switch bulletin.



NOTE: When loosening or tightening the pipe plug or set screw used to clamp the actuating lever in the desired position, care must be exercised to restrain the shaft/lever assembly so as not to transmit the applied torque to the switch itself.

- Cam or dog arrangements **SHOULD BE** such that the actuator is not suddenly released to snap back freely unless specifically designed for such service.
- For limit switches with lever actuators, the actuating force **SHOULD BE** applied as nearly perpendicular to the lever as practical and perpendicular to the shaft axis in which the lever rotates.



- A limit switch actuator **MUST BE** allowed to move far enough for positive operation of the contacts.
- Limit switches **MUST BE** mounted in locations which will prevent false operation by normal movements of operator or machine components.
- Limit switches are designed for proper performance with the actuators with which they are supplied. Supplementary actuators **SHOULD NOT BE** used unless the limit switches are specifically designed for them.
- Operating mechanisms for limit switches **MUST BE** so designed that, under any operating or emergency conditions, the limit switch is not operated beyond its overtravel limit position. A limit switch **MUST NOT BE** used as a mechanical stop.

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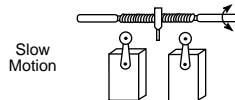
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Cam Design

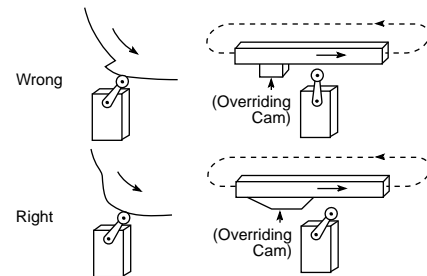
The most important consideration in the proper application of limit switches is external cam design. The majority of limit switch failures can be traced to poor cam design. Excessive overtravel and/or excessive snap back of the operating lever arm are the most common abuses. Good cam design will greatly increase the life of a limit switch.

Listed below are general rules for the proper design and application of limit switch cams published by NEMA in Standards Publication ICS2-225.

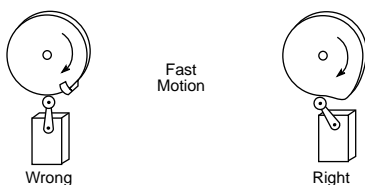
ICS2-225.83 - Where relatively slow motions operate the limit switch, it should generally be snap acting.



ICS2-225.85 - Cam or dog arrangements should be such that the actuator is not suddenly released to snap back freely.



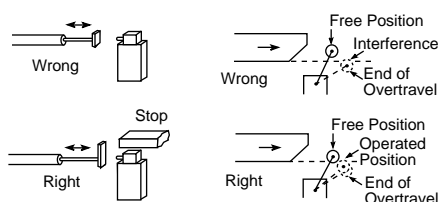
ICS2-225.84 - Where relatively fast motions are involved, cam arrangements should be such that the actuator does not receive a severe impact



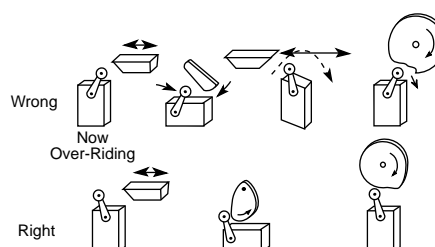
ICS2-225.86 - Where relatively fast motions are involved, cams should be designed such that the limit switch will be held operated long enough to operate relays, valves, etc.



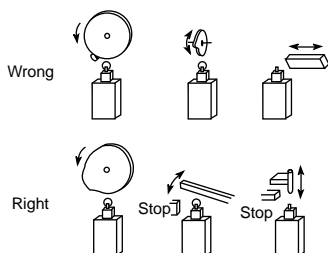
ICS2-225.88 - Operating mechanisms for limit switches should be so designed that under any operating or emergency conditions, the limit switch is not operated beyond its overtravel limit position. A limit switch should not be used as a mechanical stop.



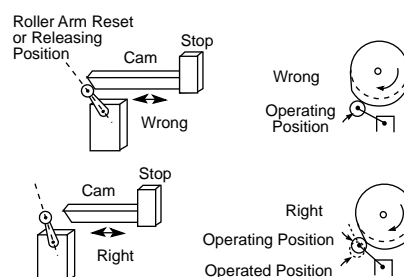
ICS2-225.90 - For limit switches with lever actuators, the actuating force should be applied as nearly perpendicular to the lever as practical, and perpendicular to the shaft axis about which the lever rotates.



ICS2-225.89 - For limit switches with pushrod actuators, the actuating force should be applied as nearly as possible in line with the push rod axis.



ICS2-225.91 - A limit switch actuator must be allowed to move far enough for positive operation of the contacts.



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UL Listing of Namco Switches

The following is a list of all switches which are listed with Underwriters Laboratories:

File: E12967 Special Use Switches

Switch Marking: Underwriters Laboratory Inc. Recognized Snap Switch

Listed Switches: EA700-10000, -10001, -10100, -40000, -40001, -40100, -70000, -70001, -70100, -20000, -20001, -20100, -50000, -50001, 50100, -80000, -80001, -80100, -30000, -30001, -30100, -60000, -60001, -60100, -90000, -90001, -90100

File: E23331, Snap Switches for Use in Hazardous Locations

Switch Marking: Listed 921M

Listed Switches: EA800-10040, -10050, -10060, -10944, -10954, -10964, -20040, -20050, -20060, -20944, -20954, -20964, -30040, -30050, -30060, -30944, -30954, -30964

File: E59180, Industrial Control Equipment, Auxiliary Devices

Switch Marking: Listed Industrial Control EQ145M

Listed Switches: EA040-11105, EA040-21105, EA060-11105, EA060-21105, EA080-11105, EA080-21105

File: E62691, Industrial Control Equipment, Auxiliary Devices for use in Hazardous Locations

Switch Marking: Listed Industrial Control EQ for Haz Loc 727U

Listed Switches: EA880-11100, -11200, -11500, -11600, -12100, -12200, -12500, -12600, -13100, -13200, -13500, -13600

As presently produced, the EA170 and EA180 switches are not listed.

ICS 6-110.01 Definitions

Acid-resistant - Acid-resistant means so constructed that it will not be injured readily by exposure to acid fumes.
NEMA Standard 12-8-1972.

Dripproof - Dripproof means so constructed or protected that falling dirt or drops of liquid will not interfere with the successful operation of the apparatus under specified test conditions. See ICS 6-110.52.
NEMA Standard 7-16-1969.

Driptight - Driptight means so constructed or protected as to exclude falling dirt or drops of liquid under specified test conditions. See ICS 6-110.52.
NEMA Standard 7-16-1969.

Dusttight - Dusttight means so constructed as to meet the requirements of a specified dusttightness test. See ICS 6-110.54.
NEMA Standard 7-16-1969.

External Mounting - External mounting means enclosure mounting provisions external to the apparatus cavity.
NEMA Standard 7-16-1969.

Flush Mounting - Flush mounting means so designed as to have a minimal front projection when set into and secured to a flat surface.
NEMA Standard 7-16-1969.

Knockout - A knockout is a portion of the wall of a box or cabinet so fashioned that it may be removed readily by a hammer, screwdriver, and pliers at the time of installation in order to provide a hole for the attachment of a raceway cable or fitting.
NEMA Standard 7-16-1969.

Hazardous Locations - Hazardous locations are those areas which may contain hazardous materials in sufficient quantity to create an explosion. See Article 50 of the *National Electrical Code*.
NEMA Standard 7-16-1969.

Nonventilated - Nonventilated means so constructed as to provide no intentional circulation of external air through the enclosure.
NEMA Standard 7-16-1969.

Outdoor - Outdoor means suitable for installation where exposed to the weather.
NEMA Standard 7-16-1969.

Proof (Used as a Suffix) - Proof (used as a suffix) means so constructed, protected or treated that successful operation of the apparatus is not interfered with when subjected to the specified material or condition.
NEMA Standard 7-16-1969.

Rainproof - Rainproof means so constructed, protected or treated as to prevent rain under specified test conditions from interfering with successful operation of the apparatus. See ICS 6-110.53.
NEMA Standard 7-16-1969.

Raintight - Raintight means so constructed or protected as to exclude rain under specified test conditions. See ICS 6-110.53
NEMA Standard 7-16-1969.

Resistant (Used as a Suffix) - Resistant (used as a suffix) means so constructed, protected, or treated that the apparatus will not be damaged when subjected to the specified material or conditions for a specified time.
NEMA Standard 7-16-1969.

Sleetproof - Sleetproof means so constructed or protected that the accumulation of sleet (ice) under specified test conditions will not interfere with the successful operation of the apparatus including external operating mechanism(s). See ICS 6-110.55.
NEMA Standard 7-16-1969.

Sleet-resistant - Sleet-resistant means so constructed that the accumulation and melting of sleet (ice) under specified test conditions will not damage the apparatus. See ICS 6-110.55.
NEMA Standard 7-16-1969.

Submersible - Submersible means so constructed as to exclude water when submerged in water under specified test conditions of pressure and time.
NEMA Standard 7-16-1969.

Tight (Used as a Suffix) - Tight (used as a suffix) means so constructed that the enclosure will exclude the specified material under specified conditions.
NEMA Standard 7-16-1969.

Watertight - Watertight means so constructed as to exclude water applied in the form of a hose stream under specified test conditions. See ICS 6-110.56.
NEMA Standard 7-16-1969.

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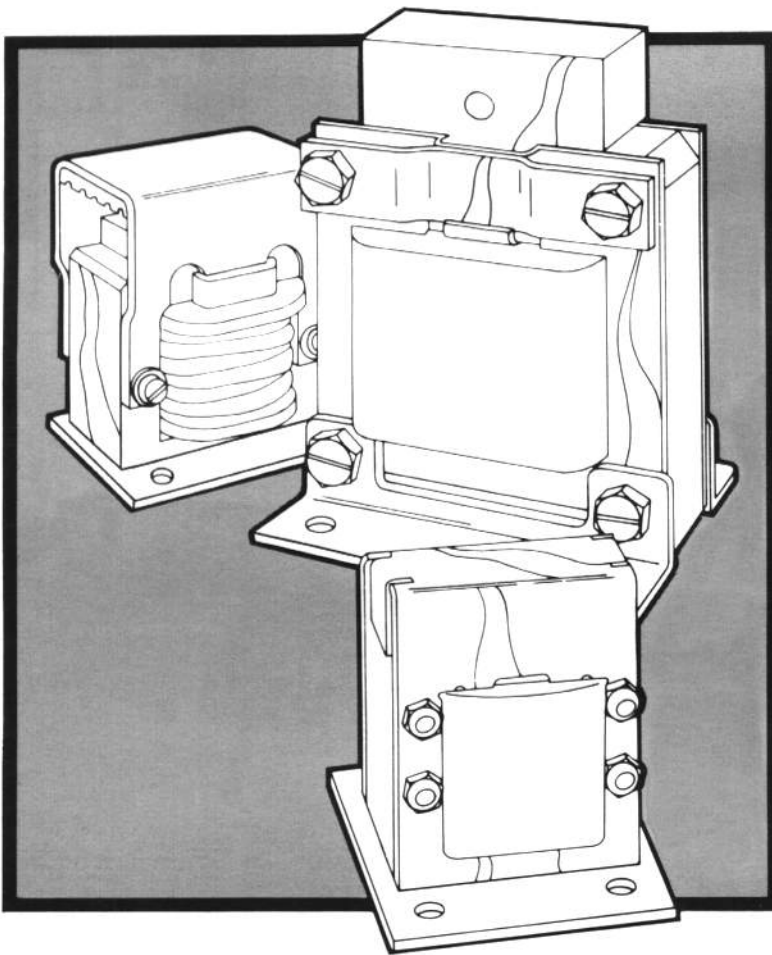
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Mayfield Village, OH 44143
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EB

SOLENOIDS

General Catalog



NAMCO

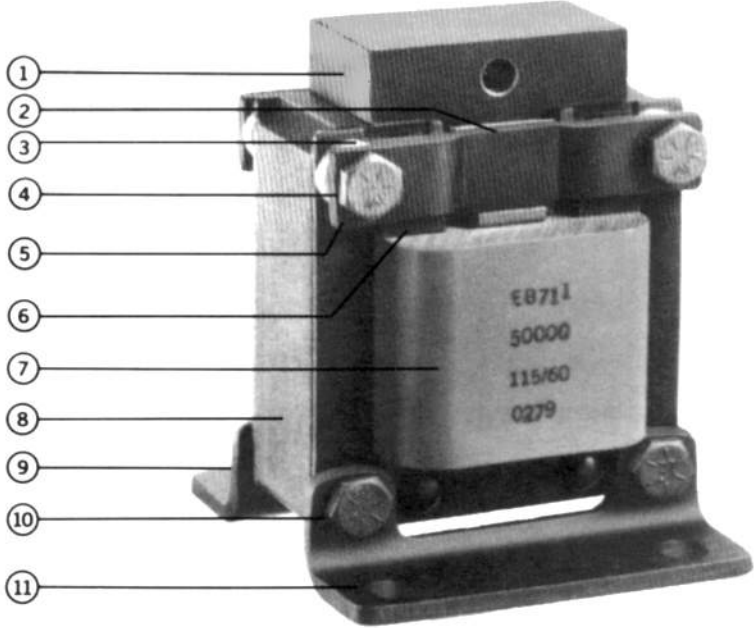
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Typical Solenoid Components

Item	Component Part
1	Plunger
2	Coil Liner
3	Spacer
4	Hex Head Bolt — Base Mtg.
	Hex Head Bolt — Side Mtg.
	Hex Head Bolt — Throat Mtg.
5	Liner Bracket
6	Coil Wedge
7	Coil
8	Core Assembly
9	Locknut for Hex Bolt
10	Hex Head Bolt
	Hex Hd. Bolt — Base & Side Mtg.
11	Mounting Bracket



Solenoids are electromechanical devices which convert an electromotive force into mechanical motion and a useable force. The simplest form of a solenoid might be the solenoid used in door chimes at your home.

The most common solenoids are generally referred to as linear solenoids which can be designed as push or pull types. Rotary solenoids are also available, but are more complex in design.

When the coil is energized, by passing current through the coil, the electromotive force established pulls the solenoid plunger into the coil. Push type solenoids work exactly like the pull type; however, the useable force is transmitted by a push rod or equivalent which extends through and is free to move through the solenoid stop.

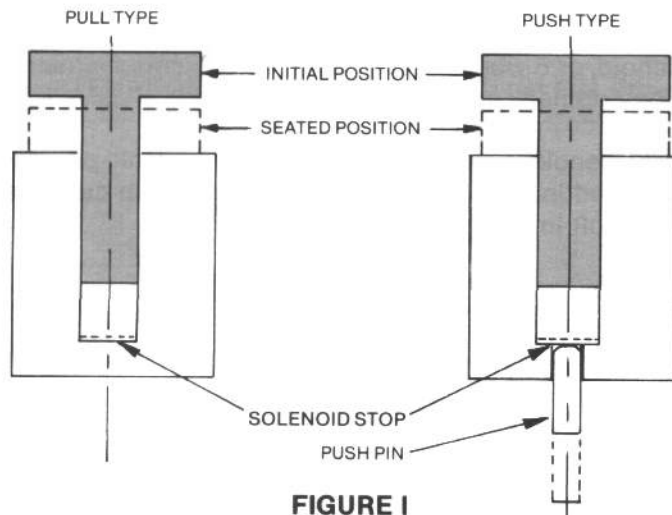


FIGURE 1

Application and Selection

In order to properly select and apply solenoids regardless of the type used, important factors in their selection must be considered. These are:

- Force and Stroke Requirements
- Power source (current and voltage)
- Duty Cycle
- Ambient temperature
- Allowable coil temperature
- Environment
- Envelope dimensions

Glossary

• Force

Pull or push force developed by the solenoids when the coil is energized.

• Stroke

The distance the plunger must travel from its initial installed position until it is in the seated position. (Refer to Figure 1.)

• Duty Cycle

The ratio of "on" time (energized) to the total cycle time.

$$\text{Duty cycle \%} = \frac{\text{"on" time}}{(\text{"on" time} + \text{"off" time})} \times 100$$

Continuous duty: 100% duty or "on" 100% of time of a cycle.

Intermittent duty: Less than 100%.

The duty cycle is important because the temperature reached during the "on" time may exceed the allowable design temperature of the coil, thereby damaging the coil.

As cycle rates increase, temperature of the solenoid will increase and force will decrease. Therefore, solenoids which are to be used in a continuous duty cycle have reduced force ratings, while solenoids designed for intermittent applications provide greater force values.

• Allowable Coil Temperature

The maximum operating temperature at which the solenoid may be operated without adversely affecting the materials used in the construction of the solenoid.

Normally this temperature is established by the limits of the materials used in the coil system insulation material.

Class A	105 °C Maximum
Class B	130 °C Maximum
Class F	155 °C Maximum
Class H	180 °C Maximum

• Voltage Current

The voltage to the coil must be determined and the low tolerance on line voltage taken into consideration when selecting a solenoid. For example, if the voltage falls below a certain value, say to 100 volts although the line voltage may be rated at 120 volts, the solenoid should be selected to provide the force required at the lower voltage, or 100 volts.

Conversely, over voltage will cause over heating and could damage the solenoid. (When selecting a solenoid, make sure allowance is made for the ambient temperature of the environment in which the solenoid is expected to operate.)

Stroke

Use the shortest stroke possible. This will reduce wear and the impact force when the plunger seats, extending service life of the solenoid.

Solenoid Load

Select a solenoid with rated force close to the load requirements imposed on it; again at the shortest stroke. Be sure to take into consideration fluctuations in voltage and mechanical losses in the system, particularly if the actuating system consists of linkages or there is inherent drag or friction in the system. A rule of thumb is to design for 85% of the "book" value for force/stroke.

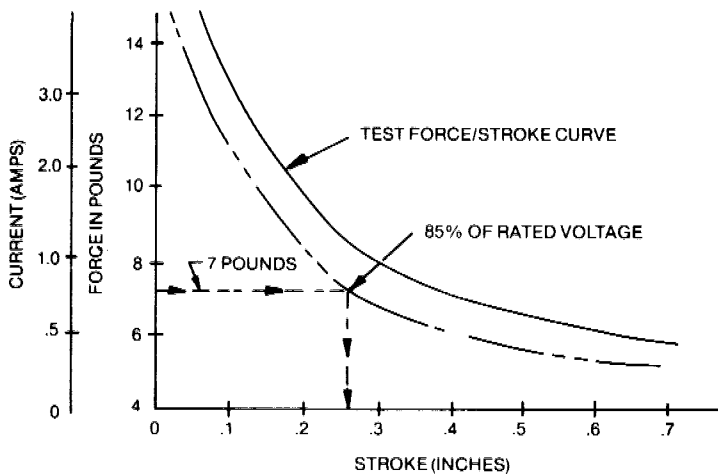


FIGURE II

Example: In Figure II, if a force of 7 pounds is required, it would be better to achieve the required force at a stroke of .25 inches as opposed to the ideal test stroke value of .4 inches, thereby, allowing for mechanical losses and fluctuation in line voltage.

Mounting

Special care should be taken in mounting the solenoid. The solenoid plunger should be free to move in and out of the coil in a straight line with the load. Side loads cause drag and wear. If the solenoid plunger is in any way restricted in its force path or does not seat properly onto the shading coils the solenoid will become noisy and "buzz".

The solenoid should be mounted in the vertical position as shown in Figure III if at all possible. Mounting the solenoid on its side causes wear of the coil liner and the friction developed should be treated as a mechanical loss in the system.

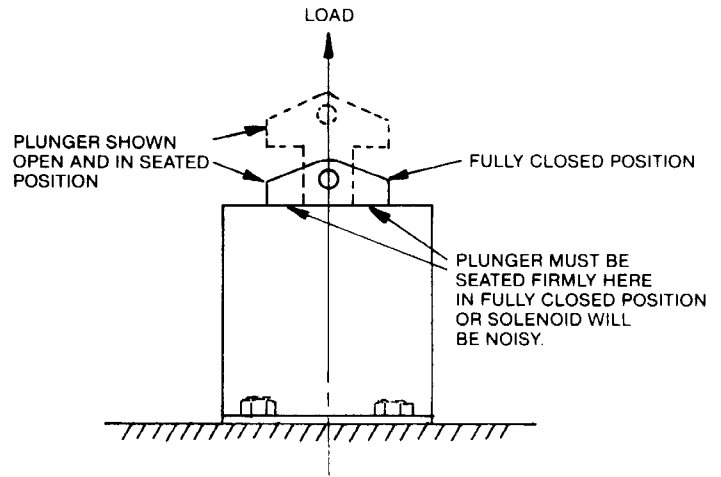


FIGURE III

Mount the solenoid rigidly so the load does not move the solenoid, or if vibration is present, the solenoid remains in the originally installed position.

If the solenoid is mounted such that the solenoid plunger is blocked in the open position, higher in-rush currents may result in burning out the coil.

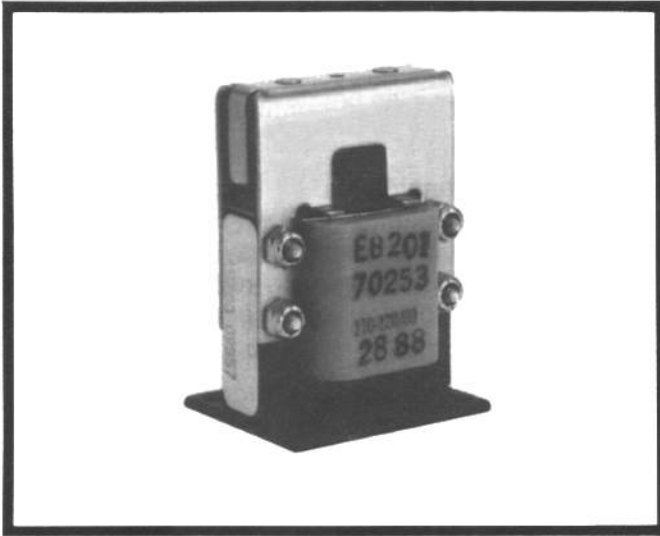
Applying Solenoids

Therefore, when applying solenoids, consideration should be given to the following items:

- Mount solenoid in a vertical plane which will reduce wear between plunger and coil liner.
- Solenoid life varies depending on application and environmental conditions. Service life can be improved through lubrication and periodic inspection. Continuing periodic inspections should be made to maintain trouble free operation.
- Refer to solenoid label for electrical ratings and the appropriate solenoid bulletin for acceptable environmental conditions in which the solenoid has been designed to function properly. Check with the factory if there is any doubt regarding the application and/or service required. Use factory service components only. Do not mix different components or unidentifiable parts.
- Check to assure ambient temperature plus solenoid temperature rise is well within the maximum insulation rating of solenoid.
- SOLENOIDS SHOULD BE mounted rigidly and in readily accessible locations, with suitable clearances to permit easy service and replacement when necessary.
- SOLENOIDS SHOULD BE placed in locations where foreign material do not accumulate under normal operating conditions to avoid interference with the operation.

-
- Unless specifically designed for such service **SOLENOIDS SHOULD NOT BE** submerged in or splashed with oils, coolants or other liquids.
 - **SOLENOIDS MUST NOT BE** used in locations where temperature or atmospheric conditions are beyond those for which they have been specifically designed.
 - Check line voltage. Solenoids should not be subjected to voltages and currents other than those printed or stamped on coil or solenoid. Use a coil designed for a specific power supply.
 - Solenoids should not be used in applications where the coil will be subjected to voltage spikes.
 - Use solenoids rated for the intended application. Solenoids should not be cycled at a rate which will prevent cooling of the coil. A continuous current in-rush may occur which can burn out the coil.
 - Mounting for solenoids should be designed to avoid blocking solenoid plunger in open positions resulting in a high in-rush current which may burn out coil. Use the shortest possible stroke to reduce impact force and wear. Mount solenoid on a heat sink if possible.
 - Do not use solenoids in an overloaded or underloaded condition and do not apply side loads to the plunger. The load force line should be in a straight line with the plunger.

The user should refer to NFPA 70B, **RECOMMENDED PRACTICE FOR ELECTRICAL EQUIPMENT MAINTENANCE**, published by the National Fire Protection Association, for additional information.



Pull and Push Type Solenoids

The **EB200** series industrial solenoids are available in standard base and side mountings and have stainless steel saddle type retainers. They are available in stacking widths of 1/2, 3/4, 1 and 1-1/4 inches. Available with side or bottom mountings and in 50 Hz and DC models. Standard versions available for 115, 230, 460V, 60 Hz.

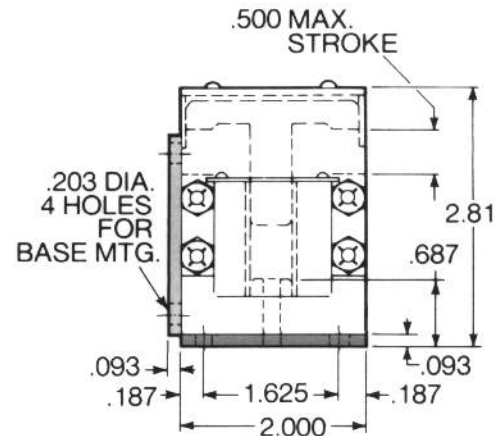
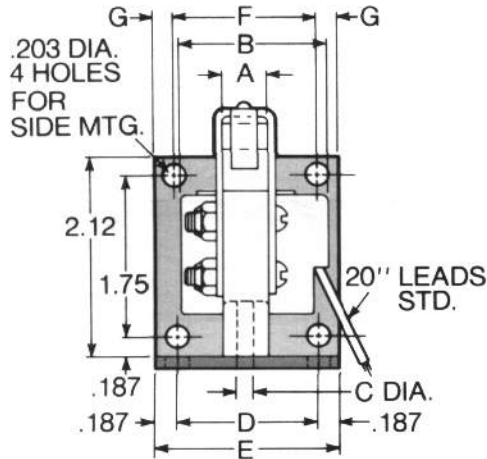
Features include:

- 1/2 inch stroke
- 115, 230, and 460 V, 60 Hz models
- 2 to 10 pound pull or push force
- Standard side and base mounting
- 1-1/2" long stainless steel round loose push pin available at additional charge
- Captive pin is also available at additional cost. (Pin has head or shoulder which serves to hold it in place in the solenoid.)

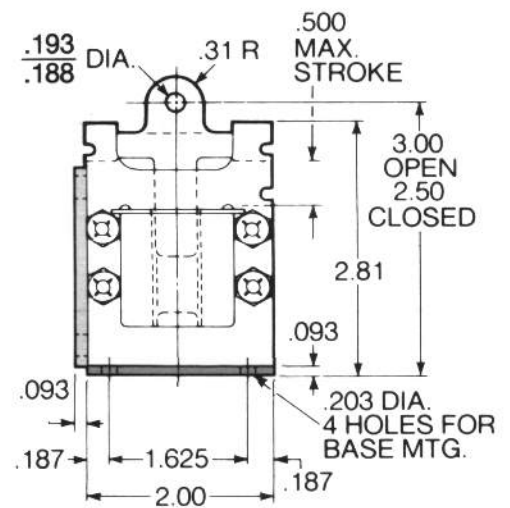
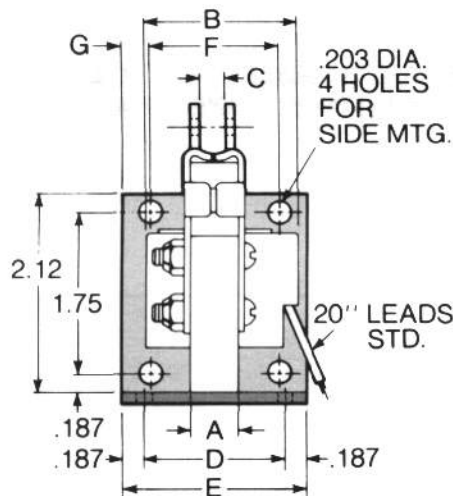
Stacking Size	Part Number	Type	Mounting	V & C	(Inches) Stroke	(Lbs.) Force	Description or Special Features
.50	EB200-00067	Pull	Standard Base	110/120/60	.50	2	
	EB200-00219	Pull	Standard Base	110/120/60	.50	1.5	Same as EB200-00067 except special coil
	EB200-00141	Pull	Standard Side	110/120/60	.50	2	
	EB200-00140	Pull	Standard Side	110/DC	.50	.55	Same as EB200-00141 except D.C. coil and force
	EB200-00264	Pull	Standard Side	110/120/60	.50	2	Same as EB200-00141 except special ret. stops cut off
	EB200-00653	Pull	Non-Standard Side	115/50	.62	1.5	Special core, special plunger, special retainer, special coil, spring return
	EB200-00675	Pull	Non-Standard Side	110/120/60	.62	2.0	Same as EB200-00653 except force, special coil
	EB200-09543	Push	Non-Standard	110/120/60	.125	5.25	Special core, special plunger, special coil, special pin
.75	EB200-09857	Push	Standard Base	110/120/60	.50	2.0	
	EB200-10034	Pull	Standard Base	110/120/60	.50	6.	
	EB200-10093	Pull	Standard Base	220/240/60	.50	6.	Same as EB200-10034 except voltage
	EB200-10215	Pull	Standard Side	110/120/60	.50	6.	
	EB200-10700	Pull	Standard Side	115/50/60	.50	6.	Special plunger with .205 link hole
	EB200-10343	Pull	Non-Standard Side	110/120/60	.50	6.	Special core, special coil, coil information on both sides
	EB200-10216	Pull	Standard Side	220/240/60	.50	6.	Same as EB200-10215 except voltage
	EB200-19704	Push	Standard Side	110/120/60	.50	6.	
1.00	EB200-19894	Push	Standard Side	48 VDC	.50	1.75	Special plunger, special saddle stop
	EB200-20067	Pull	Standard Base	110/120/60	.50	7.5	
	EB200-20114	Pull	Standard Side	110/120/60	.50	7.5	
	EB200-20464	Pull	Non-Standard Side	110/120/60	.50	7.5	Special mounting, special plunger, special retainer
	EB200-29865	Push	Standard Base	110/120/60	.50	7.5	
1.25	EB200-30025	Pull	Standard Base	220/240/60	.50	10.	Same as EB200-30046 except voltage
	EB200-30046	Pull	Standard Base	110/120/60	.50	10.	
	EB200-30123	Pull	Standard Base	440/480/60	.50	10.	Same as EB200-30046 except voltage
	EB200-30195	Pull	Standard Side	110/120/60	.50	10.	
	EB200-30843	Pull	Standard Side	110/50/60	.50	10.	Same as EB200-30195 except voltage 110/50/60
	EB200-39896	Push	Standard Base	110/120/60	.50	10.	
	EB200-39116	Push	Non-Standard Base	115/50/60	.375	7.0	
	EB200-39117	Push	Non-Standard Base	115/50/60	.50	7.0	Special mounting, special coil, 36" leads
	EB200-39143	Push	Non-Standard Base	115/60	.50	10.	Special mounting, special coil
	EB200-39115*	Push	Standard Base	110/50/60	.50	10.	Special spring return
	EB200-39904*	Push	Standard Base	220/50/60	.50	10.	Same as EB200-39115 except voltage
	EB200-39193	Push	Non-Standard Side	440/60	.50	10.	Special coil, special lead wire
	EB200-39363	Push	Non-Standard Side	110/60	.50	15.0	Same as EB200-39383 except coil is reversed
	EB200-39383	Push	Non-Standard Side	110/60	.50	15.0	Captive pin 13/16" in closed position, special coil
	EB200-39386	Push	Non-Standard Side	125/60	.50	15.0	Same as EB200-39383 except voltage
	EB200-39366	Push	Non-Standard Side	125/60	.50	15.0	Same as EB200-39363 except voltage

EB200 Series

EB200 Push Type, Base and Side Mount



EB200 Pull Type, Base and Side Mount



Mounting Information and Dimensions

Push Type, Base and Side Mount

Code: ■ Base Base Mounting

Stacking Size A	B	C	D	E	F	G
.50	1.56	.172	1.250	1.62	—	—
.75	Not available as standard unit. See special solenoid catalog.					
1.00	2.12	.205	1.750	2.12	—	—
1.25	2.38	.199	2.125	2.50	—	—

Code: ■ Side Side Mounting

Stacking Size A	B	C	D	E	F	G
.50	1.56	.172	—	—	1.500	.250
.75	1.88	.172	—	—	1.500	.250
1.00	Not available as standard unit. See special solenoid catalog.					
1.25	Not available as standard unit. See special solenoid catalog.					

Pull Type, Base and Side Mount

Code: ■ Base Base Mounting

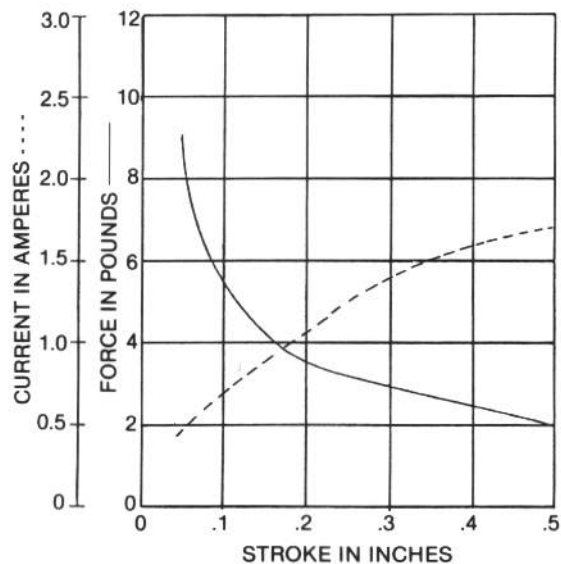
Stacking Size A	B	C	D	E	F	G
.50	1.56	.25	1.250	1.62	—	—
.75	1.88	.25	1.500	1.88	—	—
1.00	2.12	.38	1.750	2.12	—	—
1.25	2.38	.50	2.125	2.50	—	—

Code: ■ Side Side Mounting

Stacking Size A	B	C	D	E	F	G
.50	1.56	.25	—	—	1.500	.250
.75	1.88	.25	—	—	1.500	.250
1.00	2.12	.38	—	—	2.125	.187
1.25	2.38	.50	—	—	2.125	.187

Typical Force and Current Curves

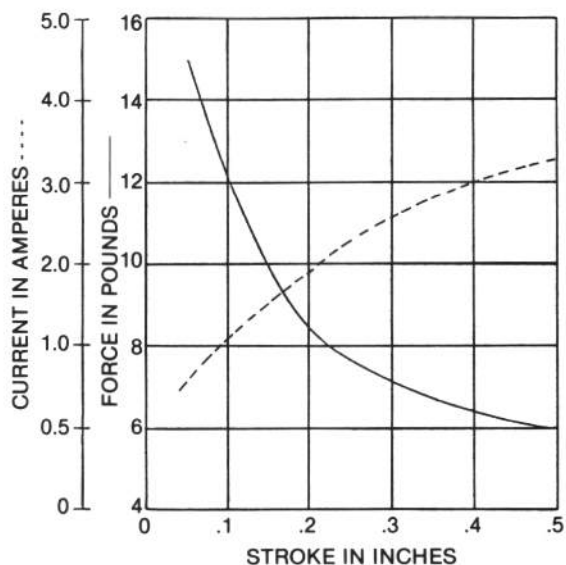
.50 Stacking Size Curves Shown for 115 volt, 60 Hz



STROKE (inches)	PULL TYPE		PUSH TYPE	
	FORCE lbs.	CURRENT amps.	FORCE lbs.	CURRENT amps.
.1	5.5	.7	5.5	.7
.2	3.5	1.1	3.5	1.1
.3	3.0	1.4	3.0	1.4
.4	2.5	1.6	2.5	1.6
.5	2.0	1.7	2.0	1.7

REFERENCE PART NUMBERS FOR .50 STACKING SIZE
EB200-09857, EB200-00067, EB200-00141

.75 Stacking Size Curves Shown for 115 volt, 60 Hz



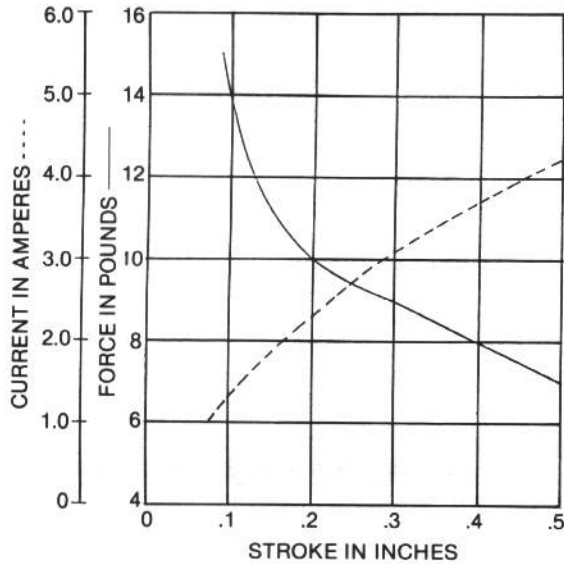
STROKE (inches)	PULL TYPE		PUSH TYPE	
	FORCE lbs.	CURRENT amps.	FORCE lbs.	CURRENT amps.
.1	12.1	1.1	12.1	1.1
.2	8.5	1.9	8.5	1.9
.3	7.0	2.6	7.0	2.6
.4	6.5	3.0	6.5	3.0
.5	6.0	3.3	6.0	3.3

REFERENCE PART NUMBERS FOR .75 STACKING SIZE
EB200-19704, EB200-10034

EB200 Series

Typical Force and Current Curves

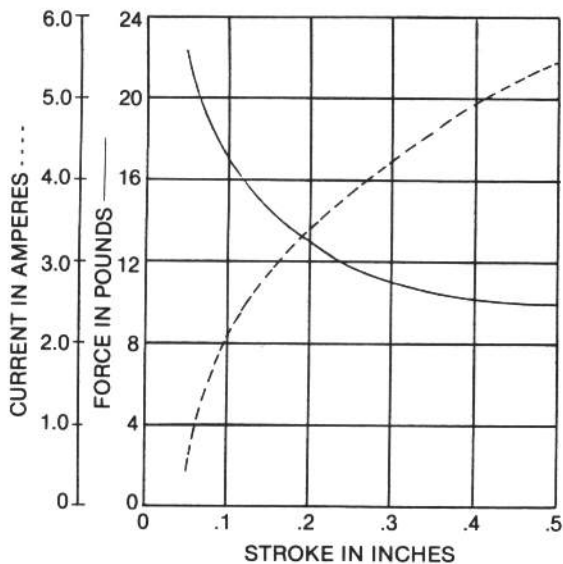
1.00 Stacking Size Curves Shown for 115 volt, 60 Hz



STROKE (inches)	PULL TYPE		PUSH TYPE	
	FORCE lbs.	CURRENT amps.	FORCE lbs.	CURRENT amps.
.1	14.0	1.3	14.0	1.3
.2	10.0	2.3	10.0	2.3
.3	9.0	3.1	9.0	3.1
.4	8.0	3.7	8.0	3.7
.5	7.5	4.2	7.5	4.2

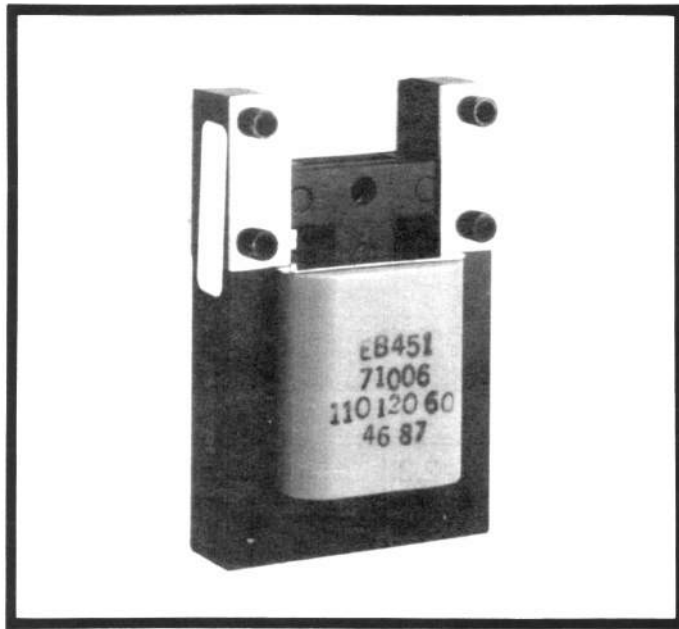
REFERENCE PART NUMBERS FOR 1.00 STACKING SIZE
EB200-29865, EB200-20067, EB200-20114

1.25 Stacking Size Curves Shown for 115 volt, 60 Hz



STROKE (inches)	PULL TYPE		PUSH TYPE	
	FORCE lbs.	CURRENT amps.	FORCE lbs.	CURRENT amps.
.1	17.0	2.1	17.0	2.1
.2	13.0	3.4	13.0	3.4
.3	11.2	4.1	11.2	4.1
.4	10.4	4.9	10.4	4.9
.5	10.0	5.4	10.0	5.4

REFERENCE PART NUMBERS FOR 1.25 STACKING SIZE
EB200-39896, EB200-30046, EB200-30195



Pull and Push Type Solenoids

Series **EB450** solenoids are available with pull and push force of 7 to 11 pounds and a stroke up to 1 inch. The EB450 series is rated for continuous duty. Available in stacking widths of 3/4 and 1 inch. They are designed with stainless steel saddle stops. All models have through holes in stack for mounting.

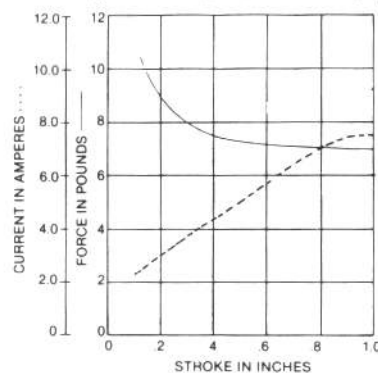
Features include:

- 1 inch stroke
- 115, 460 V, 60 Hz standard
- 7 to 11 pound pull or push force
- — 10°C to 30°C ambient environment
- Rated for continuous duty

Stacking Size	Part Number	Type	Mounting	V & C	(Inches) Stroke	(Lbs.) Force	Description or Special Features
.75	EB450-10006	Pull	Standard Thru	110/120/60	1.0	7.0	Special plunger, Special coil 5 foot leads, special core
	EB450-10130	Pull	Non-Standard Thru	110/120/60	1.0	7.0	
1.00	EB450-20046	Pull	Standard Thru	110/120/60	1.0	11.7	Same as EB200-20254 except voltage
	EB450-20254	Pull	Standard Side	110/120/60	1.0	11.7	
	EB450-20284	Pull	Standard Side	440/480/60	1.0	11.7	
	EB450-29874	Push	Standard Thru	110/120/60	1.0	11.7	Same as EB450-29874 except special coil 90" leads
	EB450-29610	Push	Standard Thru	110/120/60	1.0	11.7	

Typical Force and Current Curves

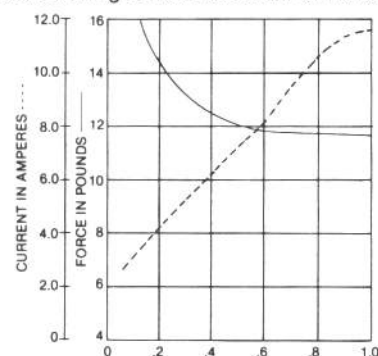
.75 Stacking Size Curves Shown for 115 volt, 60 Hz



STROKE (Inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.2	9.0	2.8
.4	7.5	4.2
.6	7.2	5.5
.8	7.1	6.5
1.0	7.0	7.4

REFERENCE PART NUMBERS FOR .75 STACKING SIZE
EB450-10006

1.00 Stacking Size Curves Shown for 115 volt, 60 Hz

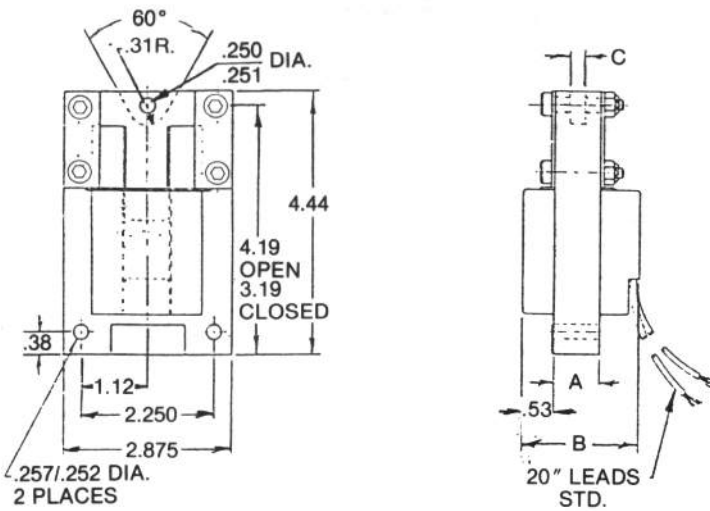


STROKE (Inches)	PULL TYPE		PUSH TYPE	
	FORCE lbs.	CURRENT amps.	FORCE lbs.	CURRENT amps.
.2	14.5	4.1	14.5	4.1
.4	12.5	6.2	12.5	6.2
.6	11.9	8.0	11.9	8.0
.8	11.8	10.9	11.8	10.9
1.0	11.7	11.8	11.7	11.8

REFERENCE PART NUMBERS FOR 1.00 STACKING SIZE
EB450-20046, EB450-29874

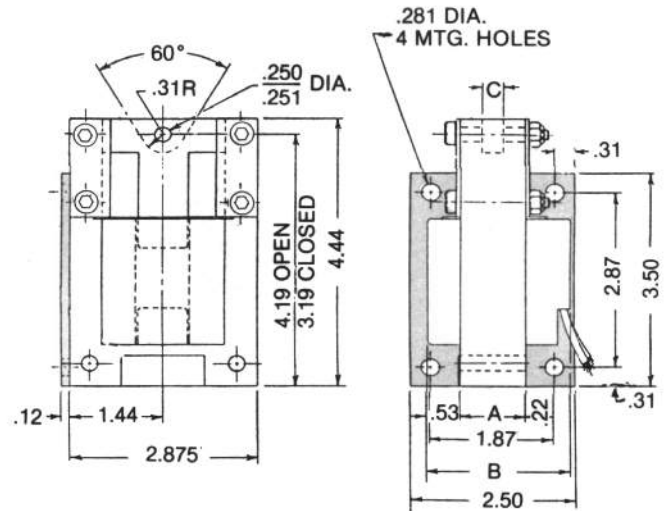
EB450 Series

EB450 Pull Type



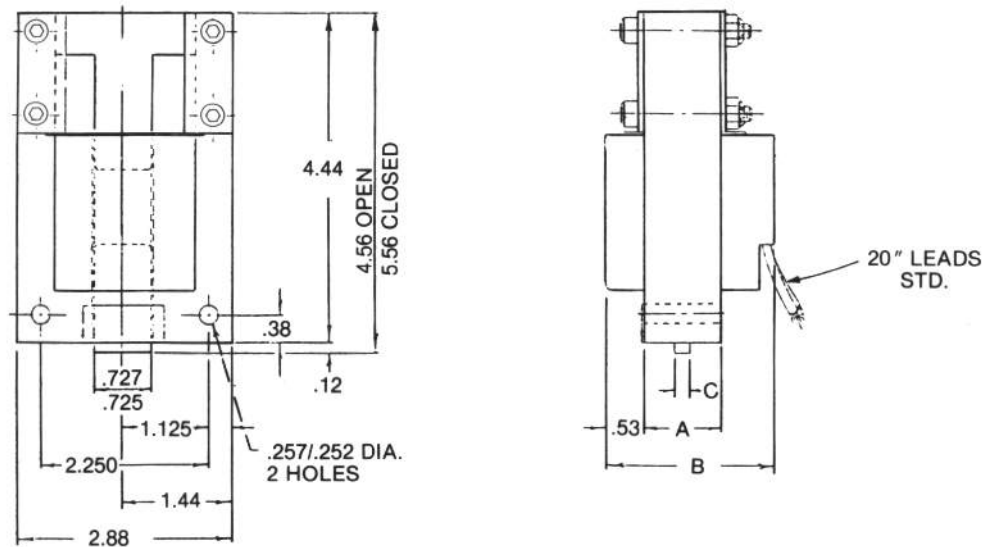
Through Mounting

New Mount



Side Mounting

EB450 Push Type

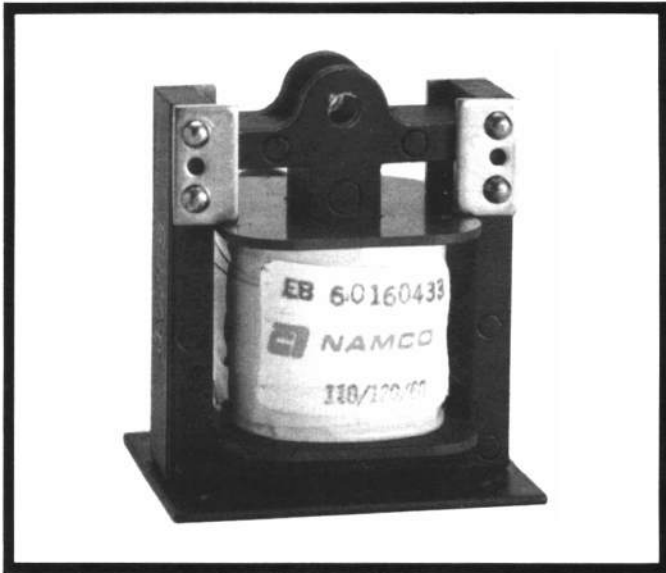


Through Mounting

Variable Dimensions in Inches

EB450 PULL TYPE		
Stacking Size A	B	C
.75	2.00	.250
1.00	2.25	.312

EB450 PUSH TYPE		
Stacking Size A	B	C
.75	Not available as standard unit. See special solenoid catalog.	
1.00	2.25	.312



Pull and Push Type Solenoids

Series **EB600** solenoids are available in pull or push versions with stacking widths of 1/2, 3/4 and 1. Designed with stainless steel saddle stops and have .5 inch stroke maximum. All models have through holes in stack for mounting.

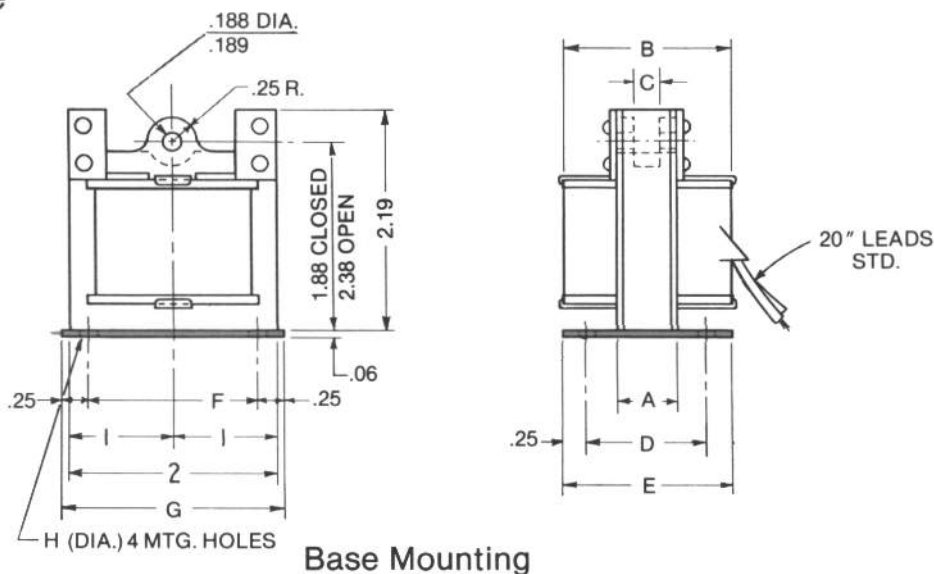
Features include:

- .5 inch stroke
- 115, 230, 60 Hz
- 3 to 8 pound pull or push force
- — 10°C to 30°C ambient environment
- Rated for continuous service

Stacking Size	Part Number	Type	Mounting	V & C	(Inches) Stroke	(Lbs.) Force	Description or Special Features
.562	EB600-00005	Pull	Standard Base	110/120/60	.50	2.8	Same as EB600-00005 except voltage
	EB600-00083	Pull	Standard Base	220/240/60	.50	2.8	
.75	EB600-10120	Pull	Standard Base	110/120/60	.50	5.0	
1.00	EB600-20015	Pull	Standard Base	110/120/60	.50	8.0	Special coil, standard winding, 4 ft. long special lead wire
	EB600-20333	Pull	Non-Standard Thru	110/60	.50	8.0	
	EB600-29885	Push	Standard Base	110/120/60	.50	8.0	Special coil Special coil, 32# at 1/4" stroke Flathead Plunger
	EB600-29673	Push	Standard Side	110/60	.50	4.5	
	EB600-29693	Push	Standard Side	42 VDC	.50	8.0	

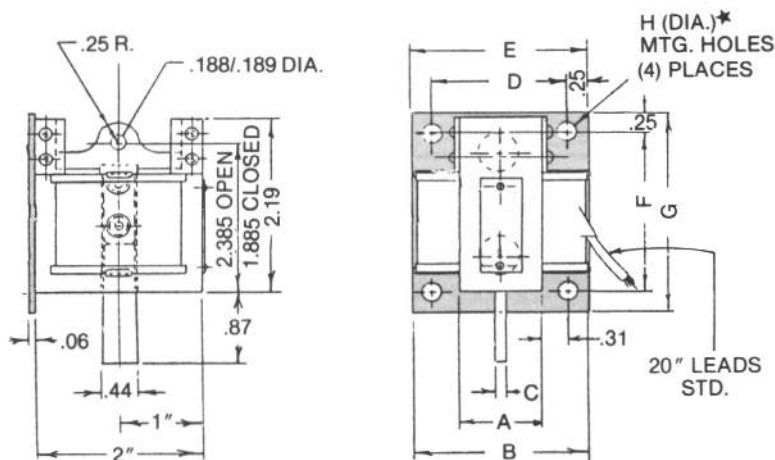
EB600 Series

EB600 Pull Type

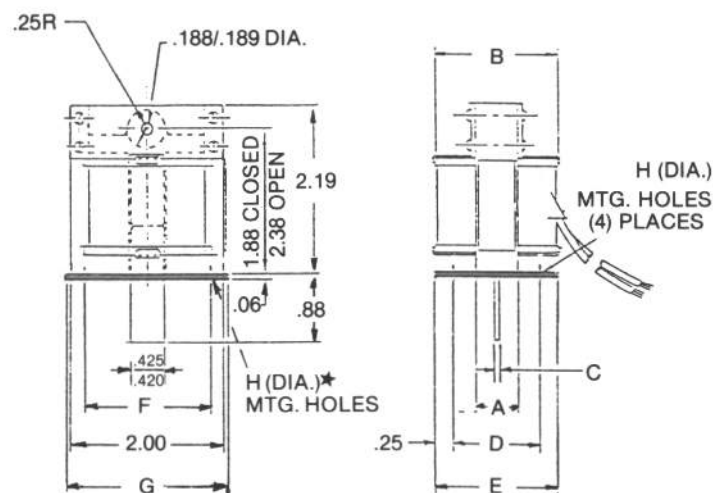


Base Mounting

EB600 Push Type



Side Mounting



Base Mounting

EB600 Pull Type, VARIABLE DIMENSIONS IN INCHES

Stacking Size	A	B	C	D	E	F	G	H★
.562	.562	1.62	.25	1.12	1.62	1.62	2.12	.17
.75	.75	1.81	.31	1.38	1.88	2.00	2.50	.20
1.00	1.00	2.06	.38	1.62	2.12	2.00	2.50	.25

★ Diameter of 4 Holes for Mounting.

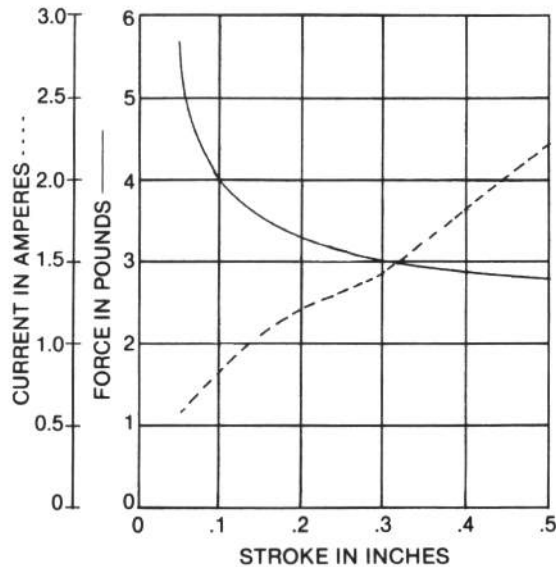
EB600 Push Type. VARIABLE DIMENSIONS IN INCHES

Stacking Size	A	B	C	D	E	F	G	H★
.562	Not available as standard unit. See special solenoid catalog.							
1.00	1.00	2.06	.12	1.62	2.12	2.00	2.50	.25

★ Diameter of 4 Holes for Mounting.

Typical Force and Current Curves

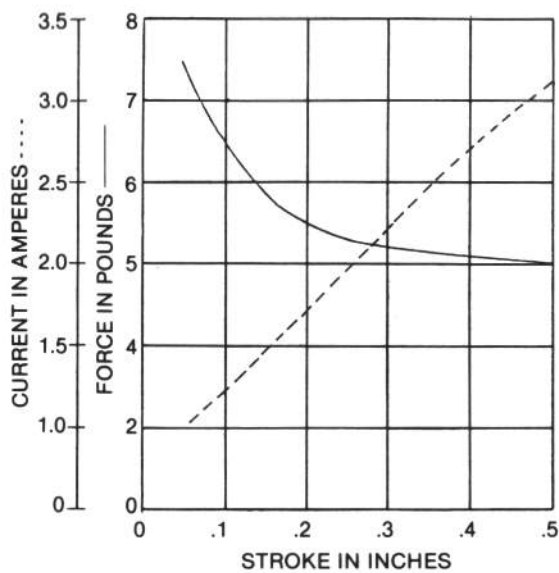
.562 Stacking Size Curves Shown for 115 volt, 60 Hz



STROKE (inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.1	4.0	.8
.2	3.3	1.2
.3	3.0	1.4
.4	2.9	1.8
.5	2.8	2.2

REFERENCE PART NUMBERS FOR .562 STACKING SIZE
EB600-00005

.75 Stacking Size Curves Shown for 115 volt, 60 Hz

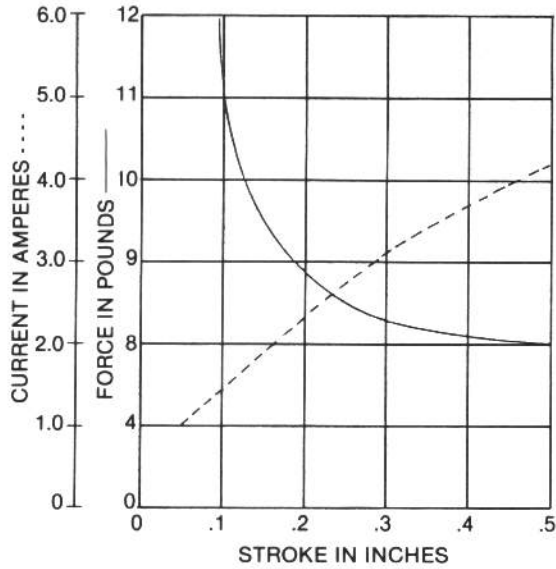


STROKE (inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.1	6.5	1.2
.2	5.4	1.7
.3	5.2	2.2
.4	5.1	2.7
.5	5.0	3.1

REFERENCE PART NUMBERS FOR .75 STACKING SIZE
EB600-10120

Typical Force and Current Curves

1.00 Stacking Size Curves Shown for 115 volt, 60 Hz



STROKE (Inches)	PUSH TYPE		PULL TYPE	
	FORCE lbs.	CURRENT amps.	FORCE lbs.	CURRENT amps.
.1	11.2	1.4	11.2	1.4
.2	8.9	2.3	8.9	2.3
.3	8.2	3.1	8.2	3.1
.4	8.1	3.7	8.1	3.7
.5	8.0	4.2	8.0	4.2

REFERENCE PART NUMBERS FOR 1.00 STACKING SIZE
EB600-20015, EB600-29885, EB600-20333



Pull Type Solenoids

The **EB710** series industrial solenoids are designed for use in Class B insulation systems with ambient temperatures ranging from -10°C to 30°C with occasional excursions to 40°C . They are available in stacking widths of 3/4, 1, 1-1/4 and 2 inches and feature universal mounting brackets. They can be equipped with special coils to enable them to function under a wide range of severe industrial environments.

Features include:

- 10 to 30 pound push or pull force
- Stainless steel saddle-type retainers
- 115, 230, and 460, 60 Hz model
- 1 inch stroke

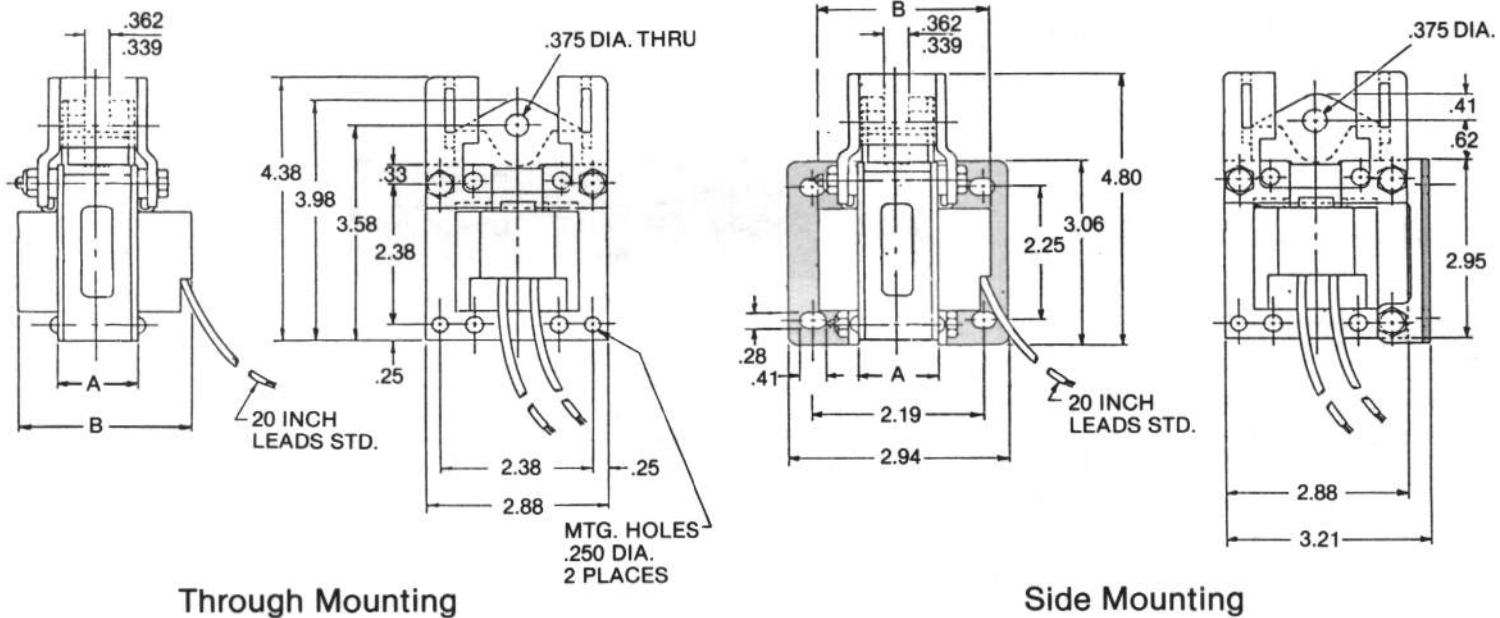
The EB710 series is intended to replace the EB700 series.

Consult factory for special solenoids.

Stacking Size	Part Number	Type	Mounting	V & C	(Inches) Stroke	(Lbs.) Force	Description or Special Features
.75	EB710-11200	Pull	Standard Side	115/60	1.0	12.5	With round head plunger and guides
	EB710-11000	Pull	Standard Thru	115/60	1.0	12.5	With round head plunger and guides
1.00	EB710-30000	Pull	Standard Thru	115/60	1.0	18.0	With round head plunger
1.25	EB710-50001	Pull	Standard Thru	230/60	1.0	19.0	With round head plunger
	EB710-50002	Pull	Standard Thru	460/60	1.0	19.0	Same as EB710-50001 except voltage
2.0	EB710-90001	Pull	Standard Thru	230/60	1.0	28.0	With round head plunger
	EB710-90002	Pull	Standard Thru	460/60	1.0	28.0	With round head plunger

EB710 Series

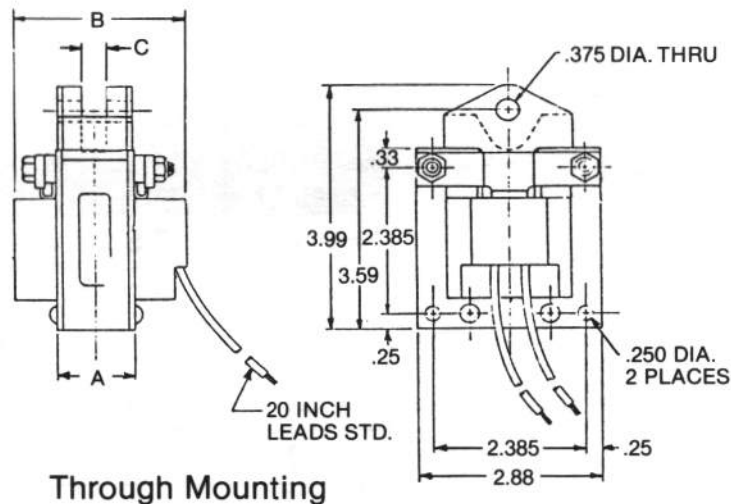
EB710 Pull Type, Round Head Plunger, with Guide



Dimensions

Stacking Size A	B	C
.75	2.19	.362/.339

EB710 Pull Type, Round Head Plunger

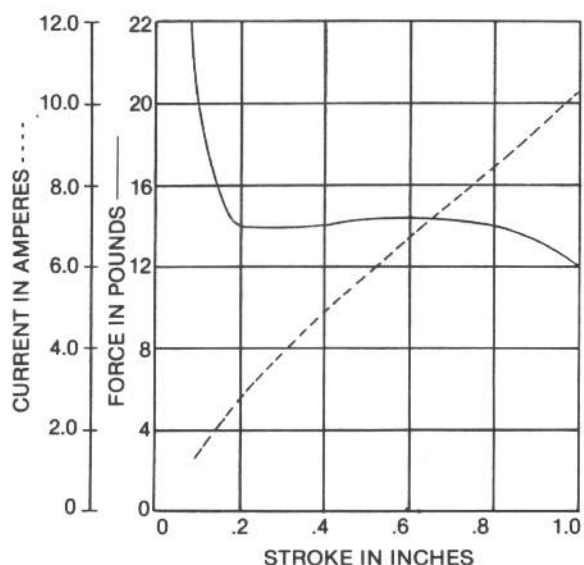


Dimensions

Stacking Size A	B	C
1.00	2.44	.362/.339
1.25	2.69	.410/.387
2.00	3.44	.650/.637

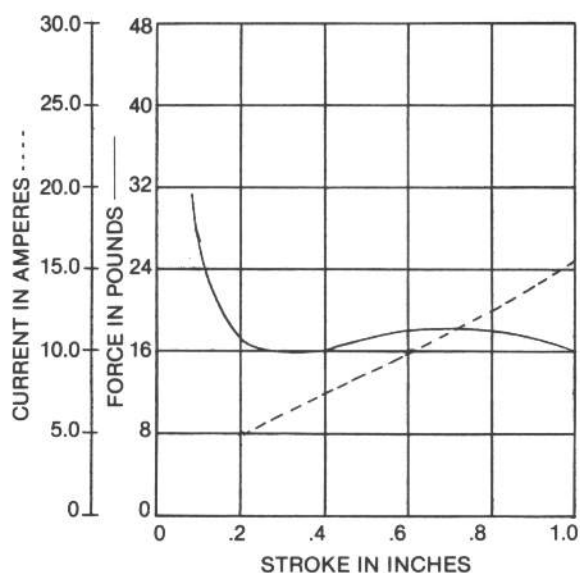
Typical Force and Current Curves

.75 Stacking Size Curves Shown for 115V, 60 Hz



STROKE (inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.2	14.0	2.8
.4	14.0	4.9
.6	14.5	6.7
.8	14.0	8.4
1.0	12.0	10.3

1.00 Stacking Size Curves Shown for 115V, 60 Hz

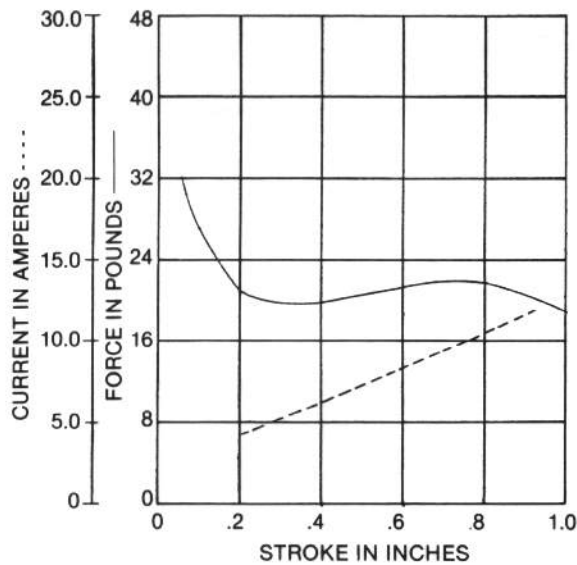


STROKE (inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.2	17.5	5.0
.4	16.0	7.3
.6	18.0	10.0
.8	18.0	12.6
1.0	16.0	15.5

REFERENCE PART NUMBERS FOR 1.00 STACKING SIZE
EB710-30000

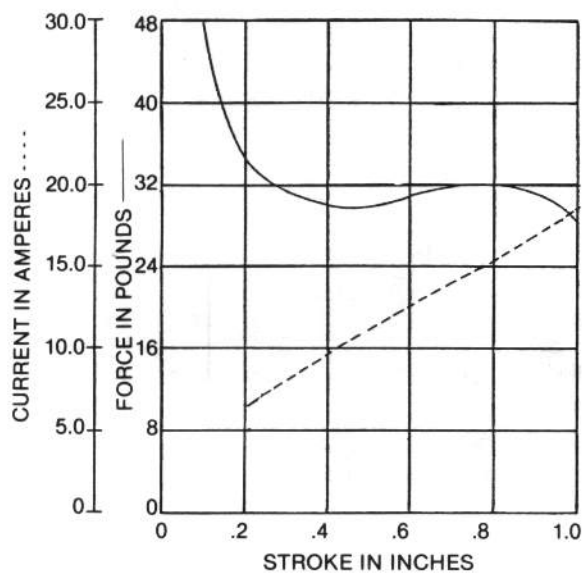
Typical Force and Current Curves

1.25 Stacking Size Curves Shown for 115V, 60 Hz



STROKE (inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.2	21.0	5.3
.4	20.0	8.4
.6	21.5	11.4
.8	22.0	14.0
1.0	19.0	17.3

2.00 Stacking Size Curves Shown for 115V, 60 Hz



STROKE (inches)	PULL TYPE	
	FORCE lbs.	CURRENT amps.
.2	34.5	8.7
.4	30.0	13.0
.6	31.0	17.0
.8	32.0	20.6
1.0	28.0	25.2

SPECIAL SOLENOIDS

Series
EB200
EB450
EB600
EB710

Listed in Alphanumeric order are Special Solenoids first, determine from the EB Standard Solenoid Catalog if a Standard Solenoid can be substituted for a Special Solenoid. If not, Consult Factory. Special Solenoids are priced higher than Standard Solenoids.

Consult Factory before ordering.

NAMCO

EB200 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB200-00005	Pull	Standard Base	115/50/60	.50	3.0	Same as EB200-00067 except voltage & cycle (Dual)
EB200-00157	Pull	Standard Side	110/DC	.50	1.0	Same as EB200-00140 except force
EB200-00238	Pull	Special Side	24/60	.62	1.5	Same as EB200-00653 except V & C
EB200-00266	Pull	Standard Side	220/240/60	.50	3.0	Same as EB200-00264 except voltage
EB200-00683	Pull	Standard Base	277/60	.50	3.0	Same as EB200-00067 except voltage
EB200-00193	Pull	Standard Side	220/240/60	.50	3.0	Same as EB200-00141 except voltage
EB200-00006	Pull	Standard Base	230/60	.50	3.0	Same as EB200-00067 except voltage
EB200-00033	Pull	Standard Base	110/50	.50	3.0	Same as EB200-00067 except V & C
EB200-00040	Pull	Standard Base	220/240/60	.50	3.0	Same as EB200-00067 except voltage
EB200-00041	Pull	Standard Base	440/480/60	.50	3.0	Same as EB200-00067 except voltage
EB200-00093	Pull	Standard Base	220/50/60	.50	3.0	Same as EB200-00067 except voltage dual cycle
EB200-00163	Pull	Standard Side	220/50	.50	3.0	Same as EB200-00141 except V & C
EB200-00158	Pull	Standard Side	115/50/60	.50	3.0	Same as EB200-00141 except voltage dual cycle
EB200-00523	Pull	Standard Side	110/50	.50	3.0	Same as EB200-00141 except V & C
EB200-00344	Pull	Standard Base	110/120/60	.25	2.0	Special coil with saddle stop special slot in saddle special plunger
EB200-00414	Pull	Standard Base	110/120/60	.75	2.0	Special retainer for 3/4" stroke
EB200-00606	Pull	—	110/120/60	.50	3.0	Same as EB200-00067 except no plate on core
EB200-00673	Pull	Special Side	110/120/60	.62	1.5	Same as EB200-00238 except voltage
EB200-00897	Pull	Special Side	24/50	.62	1.5	Same as EB200-00238 except cycle
EB200-09403	Push	Standard Side	24 VDC	.50	1.0	Same as EB200-09784 except D.C. coil and force
EB200-09853	Push	Standard Base	110/60	.50	3.0	Same as EB200-09857 except voltage
EB200-09673	Push	Special Base	110/60	.50	3.0	Special mounting plate
EB200-09474	Push	Special Base	110/120/60	.187	3.5	Same as EB200-09673 except attached pin and stroke and force
EB200-09784	Push	Standard Side	110/120/60	.50	3.0	Same as EB200-09784 except voltage
EB200-09773	Push	Standard Side	220/60	.50	3.0	Same as EB200-09784 except voltage and cycle
EB200-09453	Push	Standard Side	220/50	.50	3.0	Same as EB200-09784 except voltage and cycle
EB200-09763	Push	Standard Side	230 VDC	.50	1.0	D.C. with resistor
EB200-09513	Push	Special	230/60	.125	5.25	Same as EB200-09543 except voltage
EB200-10073	Pull	Standard Base	220/50	.50	5.5	Same as EB200-10034 except V & C
EB200-10454	Pull	Special Side	110/120/60	.125	6.5	End of retainer cut off, special coil, special plunger
EB200-10033	Pull	Standard Base	110/50	.50	5.5	Same as EB200-10034 except V & C
EB200-10037	Pull	Standard Base	440/480/60	.50	5.5	Same as EB200-10034 except voltage
EB200-10038	Pull	Standard Base	440/50	.50	5.5	Same as EB200-10034 except V & C
EB200-10043	Pull	Standard Base	110/60	.50	5.5	Same as EB200-10034 except voltage
EB200-10053	Pull	Standard Base	120/60	.50	5.5	Same as EB200-10034 except voltage
EB200-10063	Pull	Standard Base	208/60	.50	5.5	Same as EB200-10034 except voltage
EB200-10125	Pull	Standard Side	440/480/60	.50	5.5	Same as EB200-10215 except voltage
EB200-10193	Pull	Standard Side	110/60	.50	5.5	Same as EB200-10215 except voltage
EB200-10203	Pull	Standard Side	115/125/60	.50	5.5	Same as EB200-10215 except voltage
EB200-10533	Pull	Standard Side	115/50/60	.50	5.5	Same as EB200-10215 except voltage (dual cycle)
EB200-10234	Pull	Standard Side	230 VDC	.50	5.5	Same as EB200-10215 except D.C.
EB200-10293	Pull	Special Side	12/60	.50	5.5	Same as EB200-10343 except voltage
EB200-10353	Pull	Special Side	220/50	.50	5.5	Same as EB200-10343 except V & C
EB200-10385	Pull	Special Side	230/50	.50	5.5	Same as EB200-10343 except V & C
EB200-10386	Pull	Special Side	440/480/60	.50	5.5	Same as EB200-10343 except voltage
EB200-10387	Pull	Special Side	220/240/60	.50	5.5	Same as EB200-10343 except voltage
EB200-10393	Pull	Standard Base	110/60	.50	5.5	Special coil standard winding 36" leads
EB200-10395	Pull	Standard Base	450/60	.50	5.5	Same as EB200-10393 except voltage
EB200-10396	Pull	Standard Base	120/60	.50	5.5	Same as EB200-10393 except voltage
EB200-10403	Pull	Standard Base	125 VDC	.50	5.5	Same as EB200-10393 except D.C.
EB200-10413	Pull	Standard Base	110/60	.75	5.0	Special retainer, special coil, standard winding 48" leads
EB200-10453	Pull	Special Side	110/60	.125	6.5	Same as EB200-10454 except voltage
EB200-19505	Push	Standard Base	110/120/60	.50	5.5	Same as EB200-19505 except V & C
EB200-19443	Push	Standard Base	110/50	.50	5.5	Same as EB200-19505 except V & C
EB200-19754	Push	Standard Base	110/120/60	.25	6.5	Special saddle stop
EB200-19814	Push	Standard Base	110/120/60	.312	6.25	Special saddle stop
EB200-20100	Pull	Standard Base	230 VDC	.50	6.5	Same as EB200-20067 except D.C.
EB200-20164	Pull	Special Base	110/120/60	.50	9.0	Special core, special plunger, special coil
EB200-20103	Pull	Standard Side	110/50	.50	6.5	Same as EB200-20114 except V & C
EB200-20155	Special replacement solenoid for 5K100 (EB280)			.09	2.0	Solenoid for Bullard Co. 110/120/60
EB200-20003	Pull	Standard Base	110/50	.50	6.5	Same as EB200-20067 except V & C
EB200-20004	Pull	Standard Base	125 VDC	.50	3.2	Same as EB200-20067 except D.C. and force
EB200-20064	Pull	Standard Base	230/50	.50	6.5	Same as EB200-20067 except V & C
EB200-20065	Pull	Standard Base	220/240/60	.50	6.5	Same as EB200-20067 except voltage
EB200-20259	Pull	Standard Base	110/60	.50	7.5	Same as EB200-20067 except special coil
EB200-20403	Pull	Standard Base	220/50	.50	6.5	Same as EB200-20067 except V & C
EB200-20483	Pull	Standard Base	24/50	.50	6.5	Same as EB200-20067 except V & C
EB200-20157	Special replacement solenoid for 5K100 (EB280)			110/50		

EB200 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB200-20123	Pull	Standard Side	120/60	.50	6.5	Same as EB200-20114 except voltage
EB200-20173	Pull	Special Side	110/50	.50	6.5	Same as EB200-20464 except V & C
EB200-20213	Pull	Special Side	220/50	.50	6.5	Same as EB200-20464 except V & C
EB200-20465	Pull	Special Side	220/240/60	.50	6.5	Same as EB200-20464 except voltage
EB200-20466	Pull	Special Side	440/480/60	.50	6.5	Same as EB200-20464 except voltage
EB200-29805	Push	Standard Base	110/120/60	.312	6.75	Same as EB200-29865 except length of stroke
EB200-29735	Push	Standard Side	220/240/60	.50	6.5	Same as EB200-29734 except voltage
EB200-29513	Push	Special Throat	125 VDC	.50	10.0	Special core, special plunger, special retainer, special mounting feet, special coil
EB200-29523	Push	Special Throat	48 VDC	.50	10.0	Same as EB200-29513 except voltage
EB200-29464	Push	Special Base	110/60	.25	8.0	Special saddle stop
EB200-29533	Push	Special Throat	24 VDC	.50	10.0	Same as EB200-29513 except voltage
EB200-29734	Push	Standard Side	110/120/60	.50	6.5	
EB200-29614	Push	Standard Side	110/120/60	.312	7.0	Special core 9/32" push pin hole, special saddle stop
EB200-29863	Push	Standard Base	110/60	.50	6.5	Same as EB200-29865 except voltage
EB200-29593	Push	Special Base	110/60	.187	9.0	Special stroke, special saddle stop
EB200-30833	Pull	Standard Side	220/240/60	.50	9.0	Same as EB200-30195 except voltage
EB200-31117	Pull	Standard Base	115/50/60	.50	9.0	Same as EB200-30046 except special coil
EB200-30033	Pull	Standard Base	110/50	.50	9.0	Same as EB200-30046 except V & C
EB200-30043	Pull	Standard Base	110/60	.50	9.0	Same as EB200-30046 except voltage
EB200-30163	Pull	Standard Base	550/60	.50	9.0	Same as EB200-30046 except voltage
EB200-30783	Pull	Standard Base	220/50	.50	9.0	Same as EB200-30046 except V & C
EB200-30793	Pull	Standard Base	230/50	.50	9.0	Same as EB200-30046 except V & C
EB200-30183	Pull	Standard Side	110/50	.50	9.0	Same as EB200-30195 except V & C
EB200-30233	Pull	Standard Side	220/50	.50	9.0	Same as EB200-30195 except V & C
EB200-30883	Pull	Standard Side	440/480/60	.50	9.0	Same as EB200-30195 except voltage
EB200-30363	Pull	Standard Base	220/60	.75	7.25	Special retainer
EB200-30484	Pull	Standard Base	110/120/60	.50	9.0	1/4" diameter hole in plunger
EB200-30483	Pull	Standard Base	220/60	.50	9.0	Same as EB200-30484 except V & C
EB200-30584	Pull	Standard Base	110/120/60	.50	9.0	Same as EB200-31117 except V & C
EB200-30405	Pull	Standard Side	220/240/60	.50	9.0	Special coil, standard winding 48" leads
EB200-30434	Pull	Standard Side	110/120/60	.75	7.25	Special retainer
EB200-30524	Pull	Standard Side	220/240/60	.75	7.25	Special coil, standard winding 28" leads, special retainer, 1/4" diameter hole in plunger
EB200-39846	Push	Standard Base	220/240/60	.50	9.0	Same as EB200-39896 except voltage
EB200-39883	Push	Standard Base	110/60	.50	9.0	Same as EB200-39896 except voltage
EB200-39124	Push	Special Base	110/120/60	.50	9.0	Special coil, 48" leads, special diameter pin hole in plunger
EB200-39315	Push	Standard Base	110/120/60	.375	9.5	Special saddle stop
EB200-39323	Push	Standard Base	110/50	.375	9.5	Same as EB200-39315 except V & C
EB200-39664	Push	Standard Base	110/120/60	.312	10.5	Special coil winding special saddle stop
EB200-39118	Push	Special Base	115/50/60	.156	17.75	Special coil, 36" leads, special force
EB200-39373	Push	Special Side	110/50	.50	15.0	Same as EB200-39363 except cycle
EB200-39393	Push	Special Side	110/50	.50	15.0	Same as EB200-39383 except cycle
EB200-38713	Push	Standard Base	230 VDC	.50	9.0	Same as EB200-39896 except 230 VDC
EB200-39826	Push	Standard Base	440/480/60	.50	9.0	Same as EB200-39896 except voltage
EB200-39893	Push	Standard Base	110/50	.50	9.0	Same as EB200-39896 except V & C
EB200-39898	Push	Standard Base	135/60	.50	9.0	Special testing
EB200-39023	Push	Standard Base	110/60	.50	9.0	Same as EB200-39896 except class H coil
EB200-39035	Push	Standard Base	110/120/60	.375	9.25	Same as EB200-39896 except special saddle stop, 3/8" stroke
EB200-39203	Push	Standard Base	110/60	.50	15.0	Special coil, 3/8" diameter push pin hole
EB200-39403	Push	Standard Base	110/60	.50	15.0	Special coil, 15.0 at 1/2" stroke
EB200-39675	Push	Special Base	110/120/60	.375	8.0	Special coil, 1/4" diameter push pin hole
EB200-39786	Push	Standard Base	110/120/60	.312	9.0	Special saddle stop for 5/16" stroke
EB200-39343	Push	Standard Base	110/60	.375	11.0	Special coil
EB200-39564	Push	Special Base	110/120/60	.531	9.0	Special saddle stop for .531 stroke
EB200-39293	Push	Special Base	110/60	.531	9.0	Same as EB200-39564 except 110/60 and 3/8" hole in S.S.
EB200-39423	Push	Special Base	220/50	.50	9.0	Same as EB200-39444 except V & C
EB200-39493	Push	Special Base	110/60	.343	12.0	Special mounting
EB200-39553	Push	Special Base	230 VDC	.50	7.0	Special D.C.
EB200-39693	Push	Special Base	220/50	.375	7.0	Same as EB200-39683 except cycle
EB200-39444	Push	Special Base	110/120/60	.50	9.0	Special mounting
EB200-39543	Push	Special Base	250 VDC	.50	7.0	Same as EB200-39553 except voltage
EB200-39683	Push	Special Base	220/60	.375	7.0	Special coil

EB450 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB450-00026	Pull	Standard Thru Style 1 Mounting	110/120/60	1.0	4.0	
EB450-00054	Pull	Standard Thru Style 1 Mounting	220/240/60	1.0	4.0	Same as EB450-00026 except voltage
EB450-00064	Pull	Standard Thru Style 1 Mounting	440/480/60	1.0	4.0	Same as EB450-00026 except voltage
EB450-60043	Pull	Standard Thru Style 2 Mounting	110/60	1.0	16.0	
EB450-60073	Pull	Standard Thru Style 2 Mounting	220/240/60	1.0	16.0	Same as EB450-60043 except voltage
EB450-60083	Pull	Standard Thru Style 2 Mounting	440/60	1.0	16.0	Same as EB450-60043 except voltage
EB450-10063	Pull	Standard Thru Style 1 Mounting	220/240/60	1.0	6.5	Same as EB450-10006 except voltage
EB450-10011	Pull	Standard Thru Style 1 Mounting	240/50	1.0	6.5	Same as EB450-10006 except voltage
EB450-10014	Pull	Standard Thru Style 1 Mounting	24 VDC	1.0	6.5	Same as EB450-10006 except voltage (D.C.)
EB450-10175	Pull	Standard Thru Style 2 Mounting	110/120/60	1.0	6.5	
EB450-10433	Pull	Standard Thru Style 1 Mounting	440/60	1.0	5.0	Terminal blocks & special coil (insulated wire)
EB450-10434	Pull	Standard Thru Style 1 Mounting	440/480/60	1.0	5.0	Same as EB450-10433 except voltage
EB450-10234	Pull	Standard base	110/120/60	1.0	6.5	
EB450-10236	Pull	Standard base	220/240/60	1.0	6.5	Same as EB450-10234 except voltage
EB450-10323	Pull	Special Side	110/60	1.0	16.0	Same as EB450-10338 except voltage
EB450-10338	Pull	Special Side	110/120/60	1.0	16.0	Special coil
EB450-10169	Pull	Special Side	115 DC	1.0	16.0	Same as EB450-10338 except voltage, D.C. coil
EB450-10635	Pull	Standard side	440/480/60	1.0	6.5	With riveted retainers
EB450-10003	Pull	Standard Thru Style 1 Mounting	110/50	1.0	6.5	Same as EB450-10006 except voltage and cycle
EB450-10008	Pull	Standard Thru Style 1 Mounting	440/480/60	1.0	6.5	Same as EB450-10006 except voltage
EB450-10009	Pull	Standard Mounting Style 1 Mounting	440/50	1.0	6.5	Same as EB450-10006 except voltage and cycle
EB450-10043	Pull	Standard Mounting Style 1 Mounting	220/50	1.0	6.5	Same as EB450-10006 except voltage and cycle
EB450-10083	Pull	Standard Mounting Style 1 Mounting	380/50	1.0	6.5	Same as EB450-10006 except voltage and cycle
EB450-10543	Pull	Standard Mounting Style 1 Mounting	24/60	1.0	6.5	Same as EB450-10006 except voltage
EB450-10664	Pull	Standard Mounting Style 1 Mounting	12 VDC	1.0	3.2	Same as EB450-10006 except D.C. and force
EB450-10144	Pull	Standard side	110/120/60	1.0	6.5	
EB450-10168	Pull	Special side	125 VDC	1.0	16.0	Same as EB450-10169 except voltage
EB450-10176	Pull	Standard Thru Style 2 Mounting	220/240/60	1.0	6.5	Same as EB450-10175 except voltage
EB450-10237	Pull	Standard base	440/480/60	1.0	6.5	Same as EB450-10234 except voltage
EB450-10343	Pull	Standard side	220/50	1.0	6.5	Same as EB450-10603 except voltage and cycle
EB450-10363	Pull	Standard side	380/60	1.0	6.5	Same as EB450-10603 except voltage
EB450-10393	Pull	Standard side	550/60	1.0	6.5	Same as EB450-10603 except voltage
EB450-10603	Pull	Standard side	220/240/60	1.0	6.5	With riveted retainers
EB450-10514	Pull	Standard Thru Style 1 Mounting	110/120/60	1.0	6.5	With special coil Class H - Standard winding
EB450-19885	Push	Standard Thru Style 1 Mounting	110/120/60	1.0	6.5	
EB450-19887	Push	Standard Thru Style 1 Mounting	220/240/60	1.0	6.5	Same as EB450-19885 except voltage
EB450-19892	Pull/Push	Standard Thru Style 1 Mounting	220/60	1.0	6.5	Special pull/push double solenoid
EB450-19637	Push	Standard Thru Style 1 Mounting	110/60	1.0	5.0	Same as EB450-19885 except special coil 5.0 # at 1/2" stroke
EB450-19754	Push	Special Base	110/120/60	1.0	6.5	Special plunger with hardened steel tip with saddle stop
EB450-19883	Push	Standard Thru Style 1 Mounting	110/50	1.0	6.5	Same as EB450-19885 except voltage and cycle
EB450-19894	Pull/Push	Standard Thru Style 1 Mounting	220/50	1.0	6.5	Same as EB450-19892 except 50/cycle
EB450-19465	Push	Standard base (For round pin)	110/120/60	1.0	6.5	1/8" plunger ext. in open position special pin with saddle stop
EB450-19473	Push	Standard base	110/50	1.0	6.5	Same as EB450-19465 except voltage and cycle
EB450-22000	Pull/Pull	—	440/60	1.0	11.0	Special double solenoid, special Hi-temp coil Class H

EB450 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB450-20067	Pull	Standard Thru Style 1 Mounting	220/240/60	1.0	11.0	Same as EB450-20046 except voltage
EB450-20364	Pull	Standard Thru Style 2 Mounting	110/120/60	1.0	11.0	
EB450-20484	Pull	Special Side	110/120/60	1.0	11.0	Terminal block outside of core shield, slotted mounting holes
EB450-20023	Pull	Standard Thru Style 1 Mounting	110/50	1.0	11.0	Same as EB450-20046 except voltage and cycle
EB450-20053	Pull	Standard Thru Style 1 Mounting	208/60	1.0	11.0	Same as EB450-20046 except voltage
EB450-20080	Pull	Standard Mounting Style 1	110/50/60	1.0	11.0	Same as EB450-20046 except voltage and dual cycle
EB450-20083	Pull	Standard Thru Style 1 Mounting	380/60	1.0	11.0	Same as EB450-20046 except voltage
EB450-20105	Pull	Standard Thru Style 1 Mounting	440/480/60	1.0	11.0	Same as EB450-20046 except voltage
EB450-20174	Pull	Standard Base	110/120/60	1.0	11.0	
EB450-20175	Pull	Standard Base	100/50	1.0	11.0	Same as EB450-20174 except voltage and cycle
EB450-20214	Pull	Standard Base	220/240/60	1.0	11.0	Same as EB450-20174 except voltage
EB450-20215	Pull	Standard Base	440/480/60	1.0	11.0	Same as EB450-20174 except voltage
EB450-20403	Pull	Standard Thru Style 2 Mounting	250/50	1.0	11.0	Same as EB450-20364 except voltage and cycle
EB450-20274	Pull	Standard Side	220/240/60	1.0	11.0	Same as EB450-20254 except voltage
EB450-20504	Pull	Standard Thru Style 1 Mounting	110/120/60	1.0	2.5	Same as EB450-20046 except special coil and 26" leads
EB450-20513	Pull	Standard Thru Style 1 Mounting	115 D.C.	1.0	2.5	Same as EB450-20504 except DC and wound coil
EB450-20584	Pull	Standard Thru Style 1 Mounting	110/120/60	1.0	13.0	Same as EB450-20046 except special coil and cut-out switch
EB450-20625	Pull	Standard Thru Style 1 Mounting	110/120/60	1.0	7.0	Same as EB450-20046 except no retainers and special coil
EB450-29604	Push	Standard Thru Style 2 Mounting	110/120/60	1.0	11.0	With saddle stop
EB450-29623	Push	Standard Thru Style 2 Mounting	24 VDC	.875	19.0	1/2" ext. open position 17/64" dia. hole in end of bar. Special retainer
EB450-29825	Push	Standard Thru Style 1 Mounting	110/50	1.0	11.0	Same as EB450-29874 except voltage and cycle
EB450-29843	Push	Standard Thru Style 1 Mounting	220/50	1.0	11.0	Same as EB450-29874 except voltage and cycle
EB450-29834	Push	Standard Thru Style 1 Mounting	220/240/60	1.0	11.0	Same as EB450-29874 except voltage
EB450-29584	Push	Standard Thru Style 1 Mounting	110/120/60	1.0	11.0	Special plunger 9/16" ext. in open position with saddle stop
EB450-29611	Push	Standard Thru Style 1 Mounting	220/240/60	1.0	11.0	Same as EB450-29610 except voltage
EB450-29554	Push	Standard Throat	110/120/60	1.0	11.0	Special terminal block inside of core — 13/16" ext. closed

EB600 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB600-00155	Pull	Standard side	110/120/60	.50	2.5	
EB600-00157	Pull	Standard side	220/240/60	.50	2.5	Same as EB600-00155 except voltage
EB600-00503	Pull	Standard throat	110/120/60	.50	2.5	
EB600-00013	Pull	Standard base	110/50	.50	2.5	Same as EB600-00005 except V & C
EB600-00033	Pull	Standard base	208/60	.50	2.5	Same as EB600-00005 except voltage
EB600-00063	Pull	Standard base	220/50	.50	2.5	Same as EB600-00005 except V & C
EB600-00167	Pull	Standard side	440/480/60	.50	2.5	Same as EB600-00155 except voltage
EB600-00174	Pull	Standard side	200/60	.50	2.5	Same as EB600-00155 except voltage
EB600-09900	Push	Standard base	110/120/60	.50	2.5	
EB600-09883	Push	Standard base	220/60	.50	2.5	Same as EB600-09900 except voltage
EB600-09854	Push	Standard side	110/120/60	.50	2.5	
EB600-09663	Push	Standard base	110/50	.50	2.5	Same as EB600-09900 except V & C - Push bar
EB600-09883	Push	Standard side	220/60	.50	2.5	Same as EB600-09854 except V & C - Push bar
EB600-09633	Push	Special base	110/60	.25	1.5	Special mounting, special coil with stops - Push bar
EB600-09744	Push	Standard base	110/120/60	.375	3.5	Special coil, special cut-out in mounting - round pin
EB600-09733	Push	Standard base	220/60	.375	3.5	Same as EB600-09744 except voltage - round pin
EB600-09675	Push	Standard base	110/120/60	.375	3.5	Same as EB600-09744 except special coil, CL.H round pin
EB600-10035	Pull	Standard base	220/240/60	.50	4.0	Same as EB600-10120 except voltage
EB600-10075	Pull	Standard side	110/120/60	.50	4.0	
EB600-10003	Pull	Standard base	110/50	.50	4.0	Same as EB600-10120 except V & C
EB600-10063	Pull	Standard base	440/60	.50	4.0	Same as EB600-10120 except voltage
EB600-10263	Pull	Standard side	220/240/60	.50	4.0	Same as EB600-10075 except voltage
EB600-10164	Pull	Standard throat	110/120/60	.50	4.0	
EB600-20303	Pull	Standard base	110/60	.50	2.0	Special coil
EB600-20125	Pull	Standard side	110/120/60	.50	6.5	
EB600-20127	Pull	Standard side	220/240/60	.50	6.5	Same as EB600-20125 except voltage
EB600-20083	Pull	Standard base	220/50	.50	6.5	Same as EB600-20015 except V & C
EB600-20103	Pull	Standard base	220/240/60	.50	6.5	Same as EB600-20015 except voltage
EB600-20153	Pull	Standard side	220/60	.50	6.5	Same as EB600-20125 except voltage
EB600-20176	Pull	Standard throat	110/120/60	.50	6.5	
EB600-20205	Pull	Special throat	110/120/60	.50	6.5	Special throat mounting
EB600-29885	Push	Standard base	110/120/60	.50	6.5	
EB600-29673	Push	Standard side	110/60	.50	4.5	Special coil
EB600-29693	Push	Standard side	42 VDC	.50	6.5	Special coil, 38 # at 1/4" stroke
EB600-29835	Push	Standard side	110/120/60	.50	6.5	
EB600-29903	Push	Standard base	110/50	.50	6.5	Same as EB600-29885 except V & C

EB710 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB710-10100	Pull	Standard base	115/60	1.0	12.5	With round head plunger
EB710-10000	Pull	Standard thru	115/60	1.0	12.5	With round head plunger
EB710-10102	Pull	Standard base	460/60	1.0	12.5	Same as EB710-10100 except voltage
EB710-11100	Pull	Standard base	115/60	1.0	12.5	With round head plunger and guides
EB710-10200	Pull	Standard side	115/60	1.0	12.5	With round head plunger
EB710-12000	Pull	Standard thru	115/60	1.0	12.5	With flat head plunger
EB710-11201	Pull	Standard side	200/60	1.0	12.5	Same as EB710-11200 except voltage
EB710-12100	Pull	Standard base	115/60	1.0	12.5	With flat head plunger
EB710-12101	Pull	Standard base	230/60	1.0	12.5	Same as EB710-12100 except voltage
EB710-12200	Pull	Standard side	115/60	1.0	12.5	With flat head plunger
EB710-12201	Pull	Standard side	230/60	1.0	12.5	Same as EB710-12200 except voltage
EB710-12202	Pull	Standard side	460/60	1.0	12.5	Same as EB710-12200 except voltage
EB710-30100	Pull	Standard base	115/60	1.0	18.0	With round head plunger
EB710-30200	Pull	Standard side	115/60	1.0	18.0	With round head plunger
EB710-32200	Pull	Standard side	115/60	1.0	18.0	With flat head plunger
EB710-30007	Pull	Standard thru	115/50	1.0	18.0	Same as EB710-30000 except cycle
EB710-30101	Pull	Standard base	230/60	1.0	18.0	Same as EB710-30100 except voltage
EB710-30102	Pull	Standard base	460/60	1.0	18.0	Same as EB710-30100 except voltage
EB710-31000	Pull	Standard thru	115/60	1.0	18.0	With round head plunger and guides
EB710-31200	Pull	Standard side	115/60	1.0	18.0	With round head plunger and guides
EB710-32000	Pull	Standard thru	115/60	1.0	18.0	With flat head plunger
EB710-32001	Pull	Standard thru	230/60	1.0	18.0	Same as EB710-32000 except voltage
EB710-32100	Pull	Standard base	115/60	1.0	18.0	With flat head plunger
EB710-32202	Pull	Standard side	460/60	1.0	18.0	Same as EB710-32200 except voltage
EB710-32206	Pull	Standard side	240/60	1.0	18.0	Same as EB710-32200 except voltage
EB710-22000	Push	Standard thru	115/60	1.0	13.5	
EB710-22100	Push	Standard base	115/60	1.0	13.5	
EB710-22106	Push	Standard base	24/60	1.0	13.5	Same as EB710-22100 except voltage
EB710-22200	Push	Standard side	115/60	1.0	13.5	
EB710-22202	Push	Standard side	460/60	1.0	13.5	Same as EB710-22200 except voltage
EB710-23200	Push	Standard side	115/60	1.0	13.5	With guides
EB710-24000	Push	Standard thru	115/60	1.0	13.5	With saddle stop
EB710-24100	Push	Standard base	115/60	1.0	13.5	With saddle stop
EB710-24200	Push	Standard side	115/60	1.0	13.5	With saddle stop
EB710-24202	Push	Standard side	460/60	1.0	13.5	Same as EB710-24200 except voltage
EB710-25102	Push	Standard base	460/60	.50	15.5	
EB710-50100	Pull	Standard base	115/60	1.0	19.5	With round head plunger
EB710-50101	Pull	Standard base	230/60	1.0	19.5	Same as EB710-50100 except voltage
EB710-50102	Pull	Standard base	460/60	1.0	19.5	Same as EB710-50100 except voltage
EB710-50200	Pull	Standard side	115/60	1.0	19.5	With round head plunger
EB710-50201	Pull	Standard side	230/60	1.0	19.5	Same as EB710-50200 except voltage
EB710-50300	Pull	Standard throat	115/60	1.0	19.5	With round head plunger
EB710-51101	Pull	Standard base	230/60	1.0	19.5	With round head plunger and guides
EB710-51200	Pull	Standard side	115/60	1.0	19.5	With round head plunger and guides
EB710-52100	Pull	Standard base	115/60	1.0	19.5	With flat head plunger
EB710-52200	Pull	Standard side	115/60	1.0	19.5	With flat head plunger
EB710-53201	Pull	Standard side	230/60	1.0	19.5	With flat head plunger and guides
EB710-42000	Push	Standard thru	115/60	1.0	17.0	
EB710-42001	Push	Standard thru	230/60	1.0	17.0	Same as EB710-42000 except voltage
EB710-42200	Push	Standard side	115/60	1.0	17.0	
EB710-42201	Push	Standard side	230/60	1.0	17.0	Same as EB710-42200 except voltage
EB710-44100	Push	Standard base	115/60	1.0	17.0	With saddle stop
EB710-44200	Push	Standard side	115/60	1.0	17.0	With saddle stop
EB710-73300	Pull	Standard throat	115/60	1.0	25.0	With guides
EB710-73321	Pull	Standard throat	220/50	1.0	24.5	Same as EB710-73300 except V & C
EB710-70000	Pull	Standard thru	115/60	1.0	24.5	With round head plunger
EB710-70100	Pull	Standard base	115/60	1.0	24.5	With round head plunger
EB710-70200	Pull	Standard side	115/60	1.0	24.5	With round head plunger
EB710-70201	Pull	Standard side	230/60	1.0	24.5	Same as EB710-70200 except voltage
EB710-72100	Pull	Standard base	115/60	1.0	24.5	With flat head plunger
EB710-72102	Pull	Standard base	230/60	1.0	24.5	Same as EB710-72100 except voltage
EB710-72200	Pull	Standard side	115/60	1.0	24.5	With flat head plunger
EB710-62000	Push	Standard thru	115/60	1.0	21.5	
EB710-62001	Push	Standard thru	230/60	1.0	21.5	Same as EB710-62000 except voltage
EB710-62101	Push	Standard base	230/60	1.0	21.5	
EB710-62200	Push	Standard side	115/60	1.0	21.5	
EB710-62201	Push	Standard side	230/60	1.0	21.5	Same as EB710-62200 except voltage
EB710-62301	Push	Standard throat	230/60	1.0	21.5	
EB710-63200	Push	Standard side	115/60	1.0	21.5	With guides
EB710-63301	Push	Standard throat	230/60	1.0	21.5	With guides
EB710-64100	Push	Standard base	115/60	1.0	21.5	With saddle stop
EB710-64200	Push	Standard side	115/60	1.0	21.5	With saddle stop
EB710-64201	Push	Standard side	230/60	1.0	21.5	With saddle stop

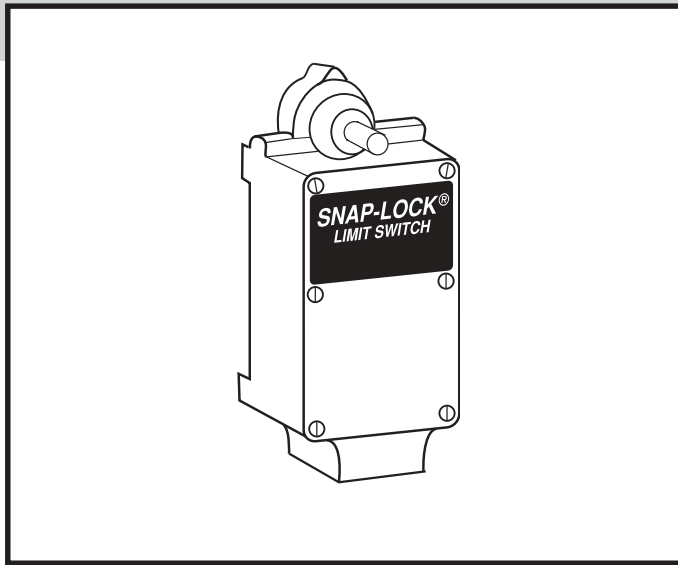
EB710 Series SOLENOIDS

PART NO.	TYPE	MOUNTING	V & C	(INCHES) STROKE	(LBS.) FORCE	DESCRIPTION OR SPECIAL FEATURES
EB710-66100	Push/Pin	Standard base	115/60	1.0	21.5	With flat head plunger
EB710-66101	Push/Pin	Standard base	230/60	1.0	21.5	Same as EB710-66100 except voltage
EB710-90000	Pull	Standard thru	115/60	1.0	30.5	With round head plunger
EB710-90100	Pull	Standard base	115/60	1.0	30.5	With round head plunger
EB710-90101	Pull	Standard base	230/60	1.0	30.5	Same as EB710-90100 except voltage
EB710-90102	Pull	Standard base	460/60	1.0	30.5	Same as EB710-90100 except voltage
EB710-90103	Pull	Standard base	575/60	1.0	30.5	Same as EB710-90100 except voltage
EB710-91200	Pull	Standard side	115/60	1.0	30.5	With round head plunger and guides
EB710-91203	Pull	Standard side	575/60	1.0	30.5	Same as EB710-91200 except voltage
EB710-92002	Pull	Standard thru	460/60	1.0	30.5	With flat head plunger
EB710-92004	Pull	Standard thru	380/50	1.0	30.5	With flat head plunger
EB710-92100	Pull	Standard base	115/60	1.0	30.5	With flat head plunger
EB710-92101	Pull	Standard base	230/60	1.0	30.5	Same as EB710-92100 except voltage
EB710-92102	Pull	Standard base	460/60	1.0	30.5	Same as EB710-92100 except voltage
EB710-92200	Pull	Standard side	115/60	1.0	30.5	With flat head plunger
EB710-92300	Pull	Standard throat	115/60	1.0	30.5	With flat head plunger
EB710-92380	Pull	Standard throat	115/60	1.0	30.5	Same as EB710-92300 except class H coil
EB710-93100	Pull	Standard base	115/60	1.0	30.5	With flat head plunger and guides
EB710-93200	Pull	Standard side	115/60	1.0	30.5	With flat head plunger with guides
EB710-93300	Pull	Standard throat	115/60	1.0	30.5	With flat head plunger and guides
EB710-93302	Pull	Standard throat	460/60	1.0	30.5	Same as EB710-93300 except voltage
EB710-82000	Push	Standard thru	115/60	1.0	30.0	
EB710-82100	Push	Standard base	115/60	1.0	30.0	
EB710-82101	Push	Standard base	230/60	1.0	30.0	Same as EB710-82100 except voltage
EB710-82102	Push	Standard base	460/60	1.0	30.0	Same as EB710-82100 except voltage
EB710-82200	Push	Standard side	115/60	1.0	30.0	
EB710-84000	Push	Standard thru	115/60	1.0	30.0	With saddle stop
EB710-84200	Push	Standard side	115/60	1.0	30.0	With saddle stop
EB710-87201	Push/Pin	Standard side	230/60	1.0	30.0	With guides
EB710-88201	Push/Pin	Standard side	230/60	1.0	30.0	With saddle stop



Namco Customer Service
2013 West Meeting Street
Lancaster, SC 29720

Nuclear Qualified Products



Limit Switches/ Receptacle Assembly... For Nuclear Environments

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50, Appendix B, and ANSI N45.2, as applicable.
- Die-cast zinc housing.
- Stainless steel top cover and fasteners.
- Gold-plated contacts.
- High temperature components throughout.
- High temperature lubricants.
- Seismic and vibration resistant.
- Resists chemical spray.
- Three mounting styles.
- EA 180 has a positive lever latching mechanism.

Technical Data:

- Two normally open and two normally closed, NEMA form Z contact arrangement.
- Enclosure meets NEMA 1, 4 and 13 requirements for dust-tight, water-tight and oil-tight applications.
- Operating lever is adjustable in 7°30' increments through 173°.
- Adequate wiring space for nine conductors.
- Operating temperature 0° to 90°C.
- Short term exposure to 175°C.
- EA 180-302/402 has 10° or 6½ ° pre-travel, maximum travel 37°.
- Weight EA 180-302: 4.5 lbs.; EA 180-402: 5.5 lbs.
- DBE maximum test parameters — temperature 340°F, pressure 70 PSIG, radiation 204 megarads gamma.

Continuous Current Rating 75-100% Power Factor*

125 VAC	20 AMPS*
250 VAC	15 AMPS*
480 VAC	10 AMPS*
600 VAC	5 AMPS*
125 VDC	5 AMPS
250 VDC	1.5 AMPS

Receptacle Data

- Qualified receptacle sealed in place.
- Qualified ring tongue terminal applied to leads.
- Every assembly tested before shipment.
- Qualified lead wires.
- Receptacle keyed for proper alignment of connector.
- All circuits wired.
- Circuits of receptacle identified the same as limit switch A, B, C, D, etc.



FOR INSIDE CONTAINMENT AREAS SWITCHES SHOULD BE SPECIFIED AS FOLLOWS:

EA180 Series*

Series	Operation	Standard	Wide	Long
		EA180-		
EA180 Standard		11302	21302	31302
		12302	22302	32302
	Maint.	13302	23302	33302
EA180 Short Travel		14302	24302	34302
		15302	25302	35302
	Maint.	16302	26302	36302

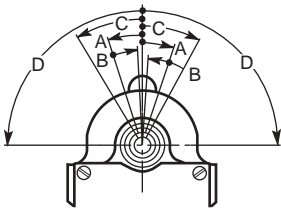
For inside containment see catalog EA170-302.

EA180 Series with Receptacle**

Series	Operation	Standard	Wide	Long
		EA180-		
EA180 Standard	CW	11402	21402	31402
	CCW	12402	22402	32402
	Maint.	13402	23402	33402
EA180 Short Travel	CW	14402	24402	34402
	CCW	15402	25402	35402
	Maint.	16402	26402	36402

** For outside containment — see catalog EA170-XX402.
Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-19001.

Operational Data



RETURN SPRING MOUNTED ON THIS SIDE OF SWITCH FOR "CCW" OPERATION.

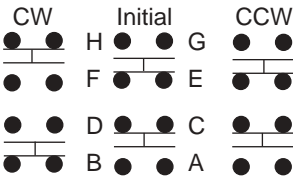
RETURN SPRING MOUNTED ON THIS SIDE OF SWITCH FOR "CW" OPERATION.

Series EA180 - Standard	
Direction of Rotation	
A. Trip Travel	10°
B. Reset Travel	8°
C. Recommended Travel	13°
D. Total Travel	37°
E. Torque to Trip (Inch Lbs.)	21

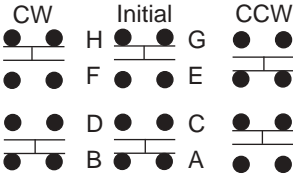
Series EA180 - Short Travel	
A. Trip Travel	6°30'
B. Reset Travel	4°
C. Recommended Travel	7°
D. Total Travel	36°
E. Torque to Trip (Inch Lbs.)	32

Contact Configuration:

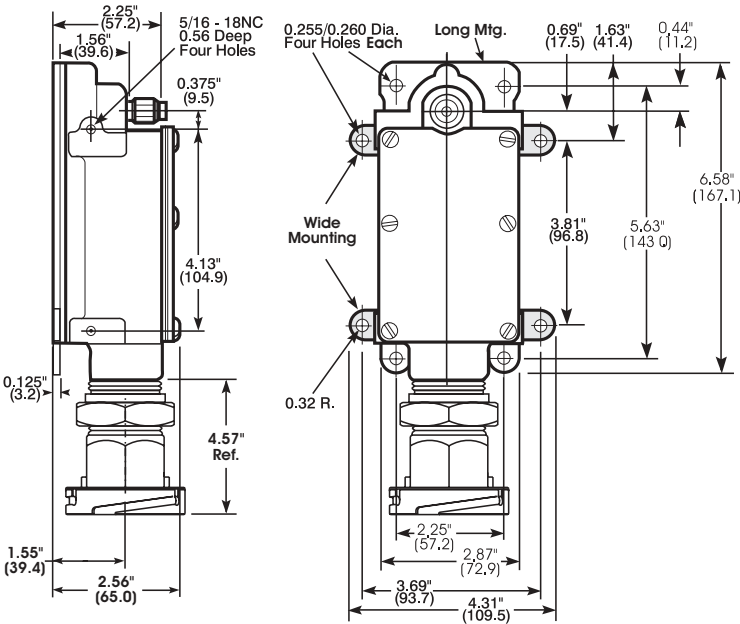
For CW Switch



For CCW Switch



Dimensions



PLUG-IN CABLES: Cable lengths for the above Switch/ Receptacle Assemblies should be ordered with specific cable lengths as follows . . .

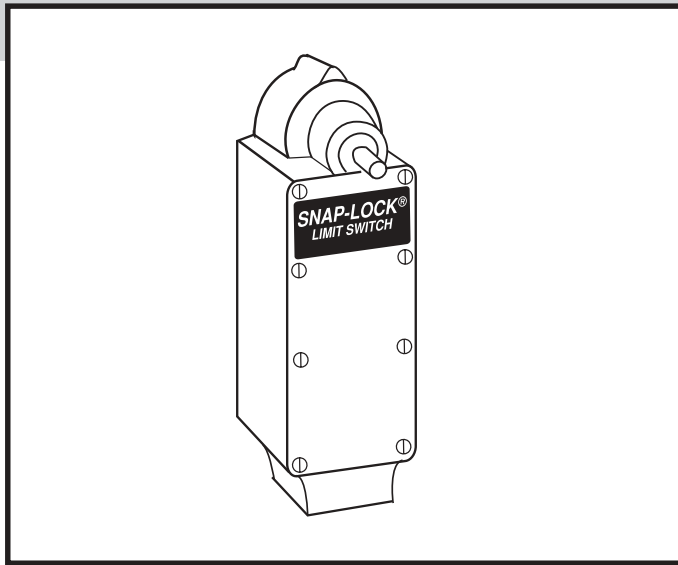
Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100

LEVERS: For use inside containment area, levers with bronze arms and beryllium copper rollers are recommended.

Note: Levers must be ordered as separate item. For information request Lever Bulletin EL.

ADAPTORS: Straight and elbow adapters are available for direct mounting into limit switches. See CD/EH700 Series Bulletin.

Nuclear Qualified Products



Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50, Appendix B, and ANSI N45.2, as applicable.
- Die-cast bronze housing.
- Stainless steel top cover and fasteners.
- Gold-plated contacts.
- High temperature components throughout.
- High temperature lubricants.
- Pressure and radiation resistant
- Seismic and vibration resistant.
- Resists chemical spray.
- Three mounting styles.
- EA 740 has a cam action latching mechanism.

Continuous Current Rating 75-100% Power Factor*

125 VAC	20 AMPS*
250 VAC	15 AMPS*
480 VAC	10 AMPS*
600 VAC	5 AMPS*
125 VDC	5 AMPS
250 VDC	1.5 AMPS

Technical Data:

- Two normally open and two normally closed, NEMA form Z contact arrangement.
- Enclosure meets NEMA 1, 4 and 13 requirements for dust-tight, water-tight and oil-tight applications.
- Operating lever is adjustable in 7°30' increments through 360°.
- Adequate wiring space for nine conductors.
- Rated at 21°C to 90°C.
- Short term exposure to 175°C.
- EA 740 has 18° pre-travel, maximum travel 90°.
- Weight EA 740: 4.3 lbs.; EA 740 with Receptacle: 5.3 lbs.
- DBE maximum test parameters — temperature 340°F, pressure 70 PSIG, radiation 204 megarads gamma.

Receptacle Data

- Qualified receptacle sealed in place.
- Qualified ring tongue terminal applied to leads.
- Every assembly tested before shipment.
- Qualified lead wires.
- Receptacle keyed for proper alignment of connector.
- All circuits wired.
- Circuits of receptacle identified the same as limit switch A, B, C, D, etc.

FOR INSIDE CONTAINMENT AREAS SWITCHES SHOULD BE SPECIFIED AS FOLLOWS:

EA740 Series

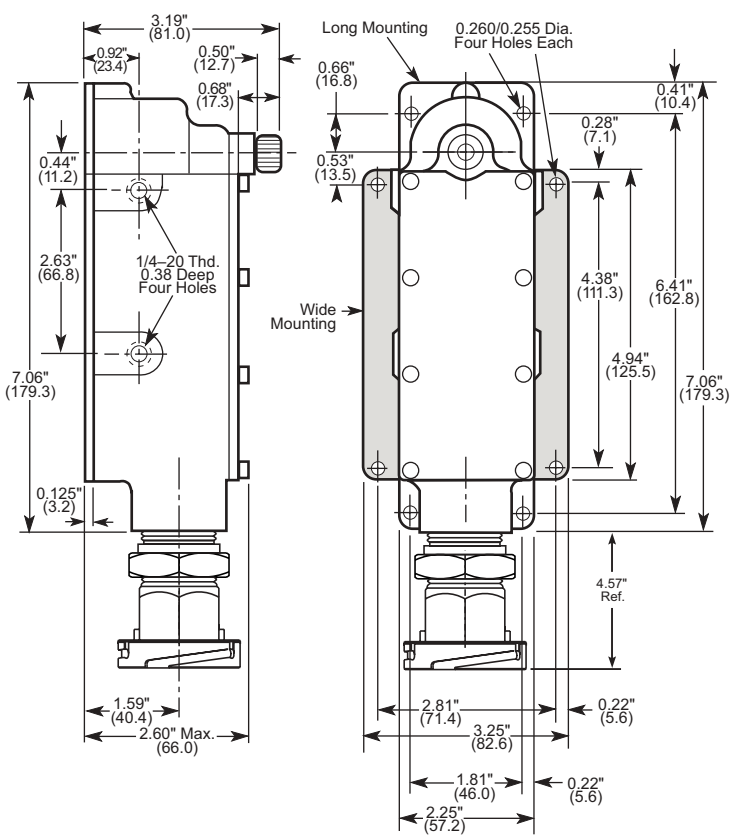
Series	Operation	Standard	Wide	Long
		EA740-		
EA740 Standard		20000	50000	80000
		20001	50001	80001
	(2 am)	20100	50100	80100
EA740 Maint.	Maint. "M" am	26000	56000	86000
	Maint. "M7" am	26700	56700	86700

EA740 Series with Receptacle

Series	Operation	Standard	Wide	Long
		EA740-		
EA740 Standard	CW	20040	50040	80040
	CCW	20041	50041	80041
	CW & CCW (B2 cam)	20140	50140	80140
EA740 Maint.	Maint. "M" Cam	26040	56040	86040
	Maint. "M7" Cam	26740	56740	86740

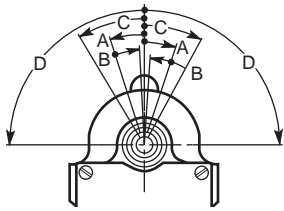
Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-19001.

Dimensions



Operational Data

Standard Contacts



- A. Trip Travel 18°
 B. Reset Travel 14°
 C. Recommended Travel 30°
 D. Total Travel Available 90°
 Torque to Trip (inch Lbs.) 27
 2 N.O. — 2 N.C.

For CW Switch

CW	Initial	CCW

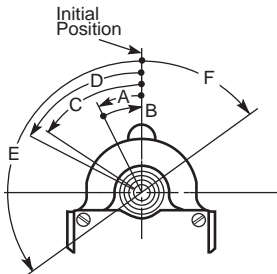
For CCW Switch

CW	Initial	CCW

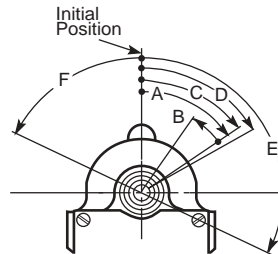
For CW & CCW Switch

CW	Initial	CCW

Maintained Contacts & Lever Position



CCW Operating



CW Operating

- | | CCW | CW |
|-------------------------------------|------|------|
| A. Trip Travel | 25° | 55° |
| B. Reset Travel | 25° | 22° |
| C. Min. Travel to Maintain | 54° | 55° |
| D. Recommended Travel | 60° | 60° |
| E. Total Travel | 124° | 116° |
| F. Overall Travel | 56° | 64° |
| G. Torque to Trip (inch Lbs.) | 12 | 6 |

To change switch orientation from cam (left view) position to cam (right view) position, operate switch thru angle C. Remove lever and reset at initial position.

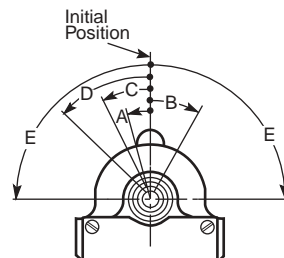
For CW Switch

CW	Initial	CCW

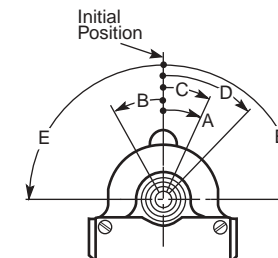
For CCW Switch

CW	Initial	CCW

Maintained Contacts — Lever Returned



CCW Operating



CW Operating

- | | CCW | CW |
|-------------------------------------|------|-----|
| A. Trip Travel | 16° | 30° |
| B. Reset Travel | 30° | 26° |
| C. Min. Travel to Maintain | 26° | 30° |
| D. Recommended Travel | 45° | 45° |
| E. Total Travel | 90° | 90° |
| F. Torque to Trip (inch Lbs.) | 16.5 | 15 |

To change switch orientation from cam (left view) position to cam (right view) position, operate switch thru angle B. Remove lever and reset at initial position.

For CW Switch

CW	Initial	CCW

For CCW Switch

CW	Initial	CCW

Accessories

PLUG-IN CABLES: Cable lengths for the above Switch/ Receptacle Assemblies should be ordered with specific cable lengths as follows . . .

Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100

LEVERS: For use inside containment area, levers with bronze arms and beryllium copper rollers are recommended.

Note: Levers must be ordered as separate item. For information request Lever Bulletin EL.

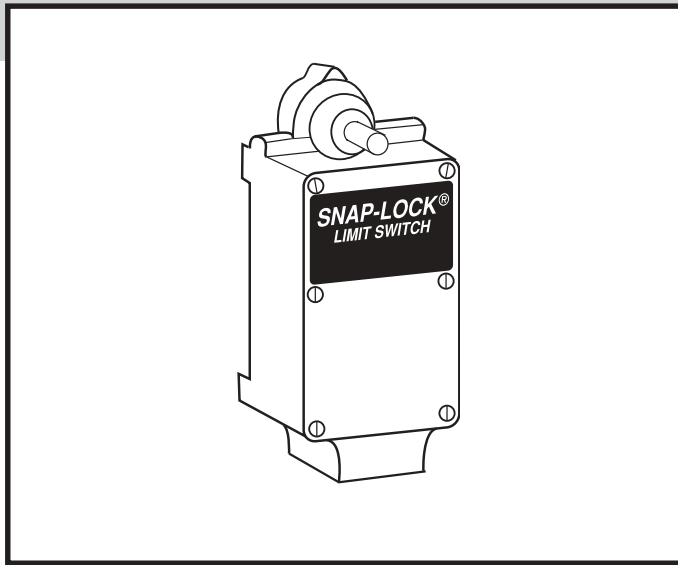
ADAPTORS: Straight and elbow adapters are available for direct mounting into limit switches. See CD/ EH700 Series Bulletin.



EA170-302/402 Series

Outside Containment Areas

Nuclear Qualified Products



Limit Switches/ Receptacle Assembly... For Nuclear Environments

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972. For outside containment use only (mild environment).
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50, Appendix B, and ANSI N45.2, as applicable.
- Die-cast zinc housing.
- Stainless steel top cover and fasteners.
- Gold-plated contacts.
- High temperature components throughout.
- High temperature lubricants.
- Radiation resistant.
- Seismic and vibration resistant.
- Hose down, water resistant.
- Available with reverse shaft extension.
- Three mounting styles.
- EA 170 has a positive lever latching mechanism.

Continuous Current Rating 75-100% Power Factor*

125 VAC	20 AMPS*
250 VAC	15 AMPS*
480 VAC	10 AMPS*
600 VAC	5 AMPS*
125 VDC	5 AMPS
250 VDC	1.5 AMPS

Technical Data:

- Two normally open and two normally closed, NEMA form Z contact arrangement.
- Enclosure meets NEMA 1, 4 and 13 requirements for dust-tight, water-tight and oil-tight applications.
- Operating lever is adjustable in 7°30' increments through 173°.
- Adequate wiring space for nine conductors.
- Operating temperature 0° to 90°C.
- EA 170-302/402 has 10° or 6½° pre-travel, maximum travel 37°.
- Weight EA 170-302: 3.5 lbs.; EA 170-402: 4.5 lbs.
- Maximum radiation-204 megarads gamma.
- 8-32 SEMS terminal screws.

Receptacle Data

- Qualified receptacle sealed in place.
- Qualified ring tongue terminal applied to leads.
- Every assembly tested before shipment.
- Qualified lead wires.
- Receptacle keyed for proper alignment of connector.
- All circuits wired.
- Circuits of receptacle identified the same as limit switch A, B, C, D, etc.

NAMCO

FOR OUTSIDE CONTAINMENT AREAS SWITCHES SHOULD BE SPECIFIED AS FOLLOWS:

EA170 Series*

Series	Operation	Standard	Wide	Long
		EA170-		
EA170 Standard	CW	11302	21302	31302
	CCW	12302	22302	32302
	Maint.	13302	23302	33302
EA170 Short Travel	CW	14302	24302	34302
	CCW	15302	25302	35302
	Maint.	16302	26302	36302
EA170 Standard Reverse Shaft	CW	41302	51302	61302
	CCW	42302	53302	62302
	Maint.	43302	53302	63302
EA170 Short Travel Reverse Shaft	CW	44302	54302	64302
	CCW	45302	55302	65302
	Maint.	46302	56302	66302

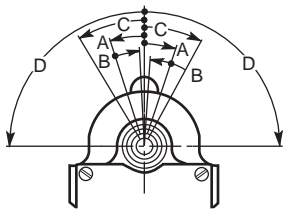
* For inside containment — see catalog EA180-XX302.

EA170 Series with Receptacle**

Series	Operation	Standard	Wide	Long
		EA170-		
EA170 Standard	CW	11402	21402	31402
	CCW	12402	22402	32402
	Maint.	13402	23402	33402
EA170 Short Travel	CW	14402	24402	34402
	CCW	15402	25402	35402
	Maint.	16402	26402	36402
EA170 Standard Reverse Shaft	CW	41402	51402	61402
	CCW	42402	53402	62402
	Maint.	43402	53402	63402
EA170 Short Travel Reverse Shaft	CW	44402	54402	64402
	CCW	45402	55402	65402
	Maint.	46402	56402	66402

** For inside containment — see catalog EA180-XX402.
Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-19001.

Operational Data

Series EA170NUC - Standard
Direction of Rotation

- A. Trip Travel 10°
 B. Reset Travel 8°
 C. Recommended Travel 13°
 D. Total Travel 37°
 E. Torque to Trip (Inch Lbs.) 23
 F. Weight Approx. 3.5 Lbs.

Series EA170NUC - Short Travel

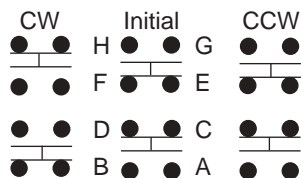
- A. Trip Travel 6°30'
 B. Reset Travel 4°
 C. Recommended Travel 7°
 D. Total Travel 36°
 E. Torque to Trip (Inch Lbs.) 32
 F. Weight Approx. 3.5 Lbs.

Series EA170NUC - Reverse Shaft
(CW OPERATION SHOWN)
VIEWED FROM TOP COVER
Direction of Rotation

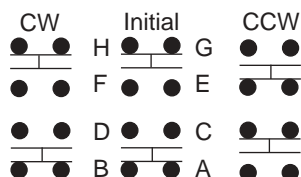
- A. Trip Travel 10°
 B. Reset Travel 8°
 C. Recommended Travel 13°
 D. Total Travel 38°
 E. Torque to Trip (Inch Lbs.) 23
 F. Weight Approx. 3.5 Lbs.

Contact
Configuration:

For CW Switch



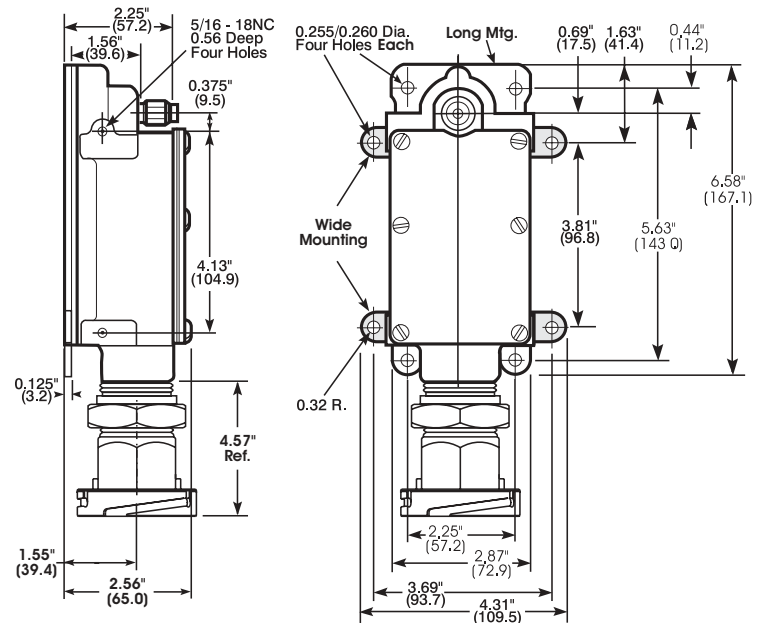
For CCW Switch



PLUG-IN CABLES: Cable lengths for the above Switch/ Receptacle Assemblies should be ordered with specific cable lengths as follows . . .

Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100

Dimensions



LEVERS: For use inside containment area, levers with bronze arms and beryllium copper rollers are recommended.

Note: Levers must be ordered as separate item. For information request Lever Bulletin EL.

ADAPTORS: Straight and elbow adapters are available for direct mounting into limit switches. See CD/EH700 Series Bulletin.



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EC290 (4-Pin)



Nuclear Qualified Products

4 Pin Receptacle/Plug-In Quick Connector Systems

Tested and Qualified for Containment Areas
and Other Harsh Environments

Description:

NAMCO nuclear connectors, designed for fast easy disconnect connect operation, dramatically reduce the exposure of personnel to radiation. They maintain the sealed integrity of limit switches and other devices such as solenoid valves, transmitters, etc. by eliminating the need to disassemble and rewire the devices during required maintenance.

All units have a minimum life of 10 years under intense radiation and combine the following product features.

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50 Appendix B, and ANSI N45.2, as applicable.
- Connector keyed for quick positive one way connection.
- Bayonet style connection, positive visual locking indicator
- Radiation resistant elastometer materials.
- Flexible wire to eliminate kinking and fatigue failure.
- Leakproof to DBE environments including LOCA and HELB conditions — e.g., steam, vapors, pressures up to 80 PSIG and chemical sprays.
- Four wired pins.
- Cable lengths available from 20 feet.
- Seismic and vibration resistant.

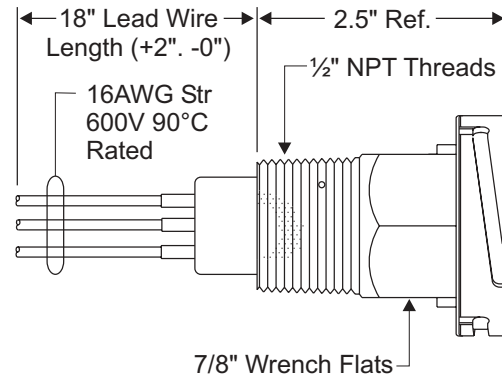
NAMCO

EC290 (4-Pin)

Nuclear Qualified Products

EC290-34001 Receptacle Features

Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-34001.



EC290-44xxx Cable Features

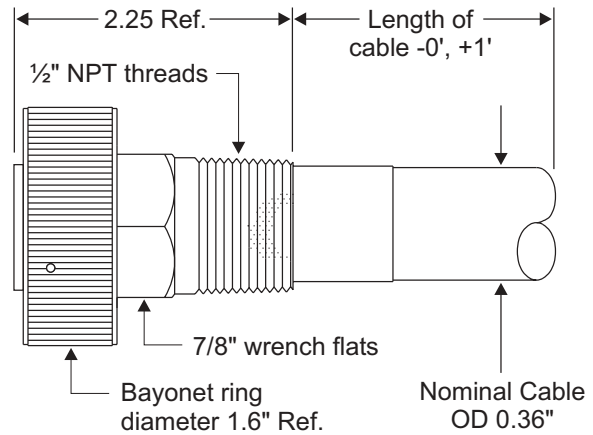
600V/90°C rated 4 conductor 16 AWG stranded nuclear grade cable has excellent resistance to radiation, heat, mechanical abuse, flame, weathering, most oils, acids and alkalis.

Cable meet requirements of IEEE Std. 383" type test of Class IE electronic cables.

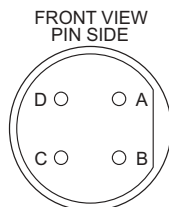
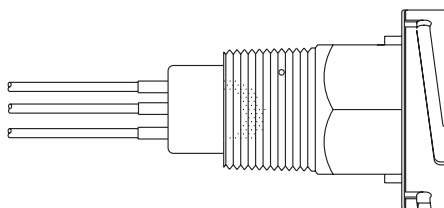
Plug-In Cable

Cable lengths for the above Receptacle Assemblies should be ordered with specific cable lengths between 20 and 100 feet lengths as follows:

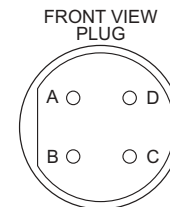
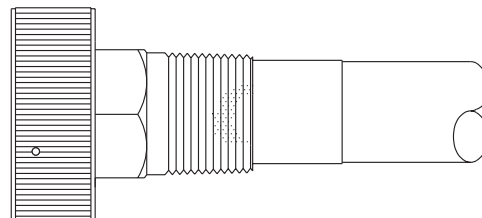
Plug-In Cables	
Length	EC290-
20 Ft.	44020
25 Ft.	44025
30 Ft.	44030
35 Ft.	44035
50 Ft.	44050
100 Ft.	44100



Receptacle Side



Plug Side



Qualification test report QTR-500 documenting Namco's testing of receptacle connector and cable is available.



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EC290 (9-Pin)



Nuclear Qualified Products

9 Pin Receptacle/Plug-In Quick Connector Systems

Tested and Qualified for Containment Areas
and Other Harsh Environments

Description:

NAMCO nuclear connectors, designed for fast easy disconnect-connect operation, dramatically reduce the exposure of personnel to radiation. They maintain the sealed integrity of limit switches and other devices such as solenoid valves, transmitters, etc. by eliminating the need to disassemble and rewire the switches during required maintenance.

All units have a minimum life of 10 years under intense radiation and combine the following product features.

Features:

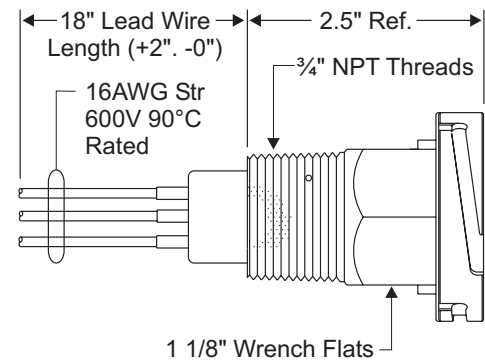
- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50 Appendix B, and ANSI N45.2, as applicable.
- Connector keyed for quick positive one-way connection.
- Bayonet style connection, positive visual locking indicator.
- Radiation-resistant elastomer materials.
- Flexible wire to eliminate kinking and fatigue failure.
- Leakproof to DBE environments including LOCA and HELB conditions — e.g., steam, vapors, pressures up to 80 PSIG and chemical sprays.
- Nine wired pins: Eight leads plus ground wire for EA740/EA180/EA170 Series.
- Cable lengths available from 20 feet.
- Seismic and vibration resistant.

NAMCO

EC290-19001 Receptacle

Dimensional Data

Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-19001.



EC290-29xxx Cable Features

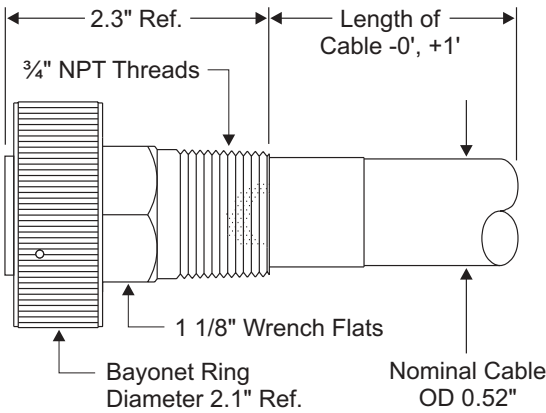
600V/90°C rated 9 conductor 16 AWG stranded nuclear grade cable has excellent resistance to radiation, heat, mechanical abuse, flame, weathering, most oils, acids and alkalies.

Cable meet requirements of IEEE Std. 383" type test of Class IE electrical cables.

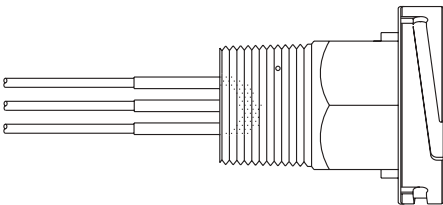
Plug-In Cable

Cable lengths for the Plug-In Cable Assemblies should be ordered with specific cable lengths between 20 and 100 feet lengths as follows:

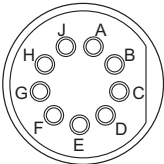
Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100



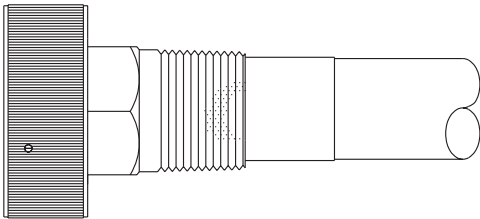
Receptacle Side



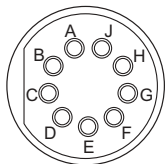
FRONT VIEW
PIN SIDE



Plug Side



FRONT VIEW
PLUG



Qualification test report QTR-500 documenting Namco's testing of receptacle connector and cable is available.

EH700 Series Adapters

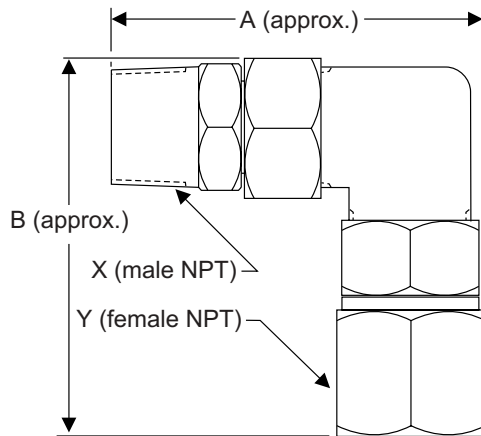


Nuclear Qualified Products

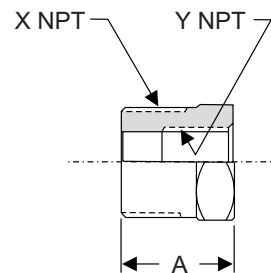
For use with EC290 Series 4 and 9 Pin Receptacle/Plug-In Quick Connector Systems

Adapters

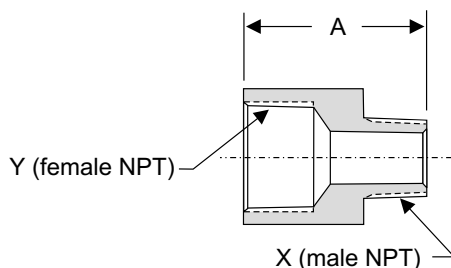
Namco's EC290 Series 4 pin and 9 pin connectors fit into 3/4" NPT and 1" NPT conduit entrances respectively. Namco has made available this line of adapters and elbow assemblies to allow adaptation to various size conduit openings and to help eliminate costly rework in limited access areas.



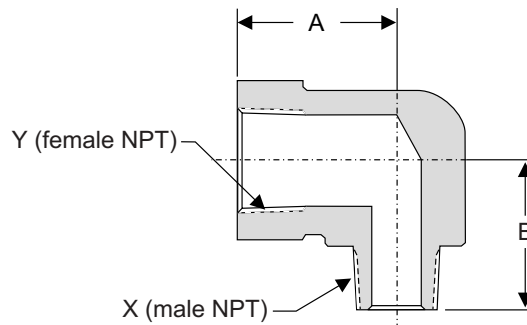
**Union Elbow Assembly
Detail #1**



**Reduced Bushing
Detail #2**



**Reducing Adapter
Detail #3**



**Reducing Street Elbow
Detail #4**

EH700 Series Adapters

Assembly #	Description		Detail	A	B	X	Y
EH700-21600	Union Elbow Assembly	3/4" MPT x 1/2" FPT	1	3-1/4"	3-1/4"	3/4"	1/2"
EH700-21601	Union Elbow Assembly	1/2" MPT x 1/2" FPT	1	3-1/4"	3-1/4"	1/2"	1/2"
EH700-30100	Reducing Bushing	3/4" MPT x 1/2" FPT	2	1-5/8"	-	3/4"	1/2"
EH700-31601	Union Elbow Assembly	3/4" MPT x 1" FPT	1	3-1/2"	3-1/2"	3/4"	1"
EH700-31602	Union Elbow Assembly	3/4" MPT x 1" FPT	1	3-3/4"	4"	3/4"	1"
EH700-40100	Reducing Adapter	1" MPT x 1/2" FPT	3	1-3/8"	-	1"	1/2"
EH700-40200	Reducing Adapter	1" FPT x 3/4" MPT	3	2-3/16"	-	3/4"	1"
EH700-40400	Reducing Street Elbow	1" FPT x 3/4" MPT	4	1-15/16"	1-3/4"	3/4"	1"
EH700-41600	Union Elbow Assembly	1" MPT x 1/2" FPT	1	3-1/2"	3-3/8"	1"	1/2"
EH700-41602	Union Elbow Assembly	1" MPT x 1" FPT	1	4-1/8"	4"	1"	1"
EH700-40101	Reducing Bushing	1" MPT x 3/4" FPT	2	1-7/8"	-	1"	3/4"



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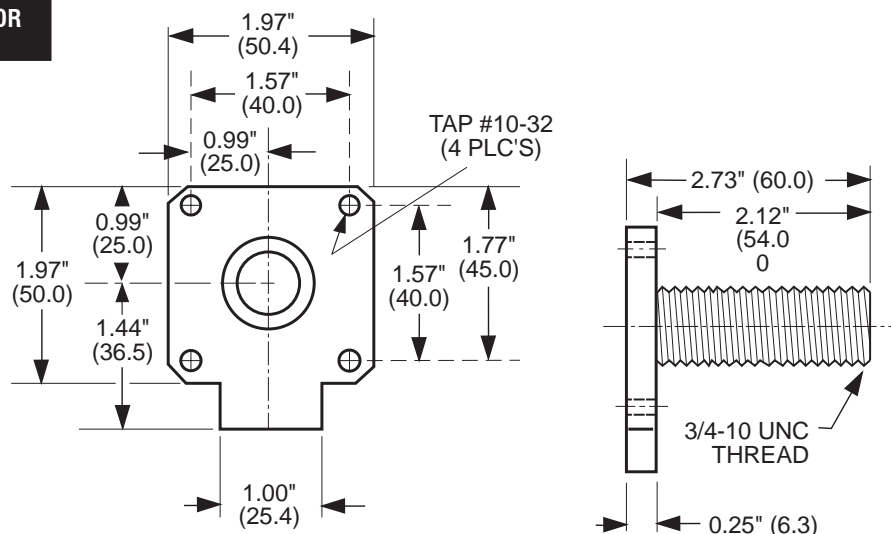
25mm ADJUSTABLE EXTENDED RANGE SENSOR MOUNTING BRACKET KIT

Part No. EE972-01860

Allows 25mm Proximity Sensors to be adjusted similarly to a standard tubular sensor. Kit includes (4) #10-32 socket head cap screws and (2) hex jam nuts.

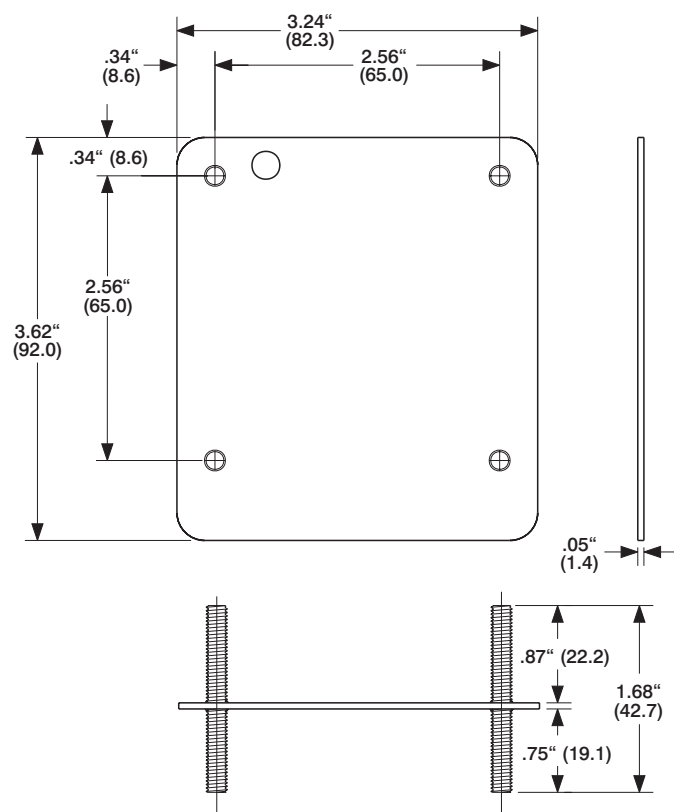
Part No. EE972-01861

Bracket only.



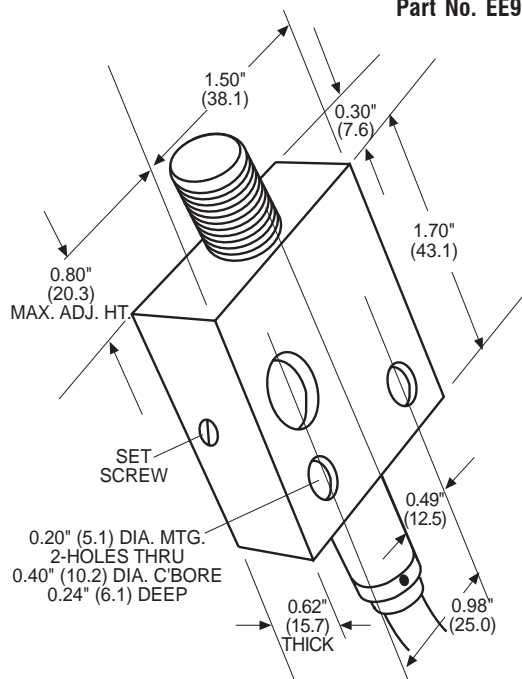
40mm FLATPAK BRACKET

Part No. EE972-01859



12mm TUBULAR BRACKET

Part No. EE972-01834



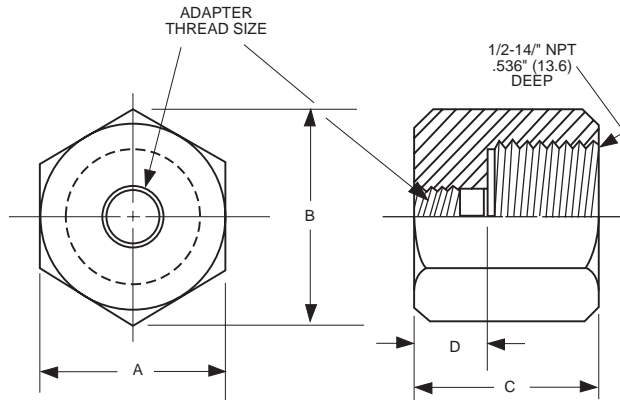
Continued on
next page. ➡

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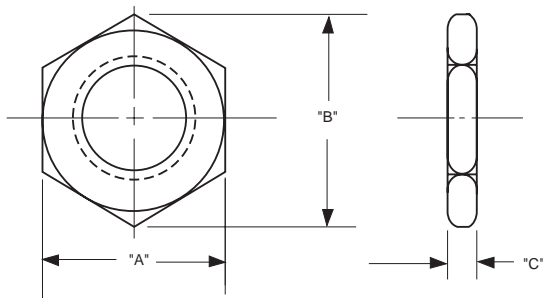
CONDUIT ADAPTERS



Material: Aluminum 2024
Stainless Steel version available on special order.
Consult factory.

Adapter Thread Size (mm)	HEX SIZE				Model No.
	Flats	Corners	Length	Depth	
	A	B	C	D	
8	1.00" (25.4)	1.15" (29.2)	1.00" (25.4)	0.25" (6.3)	EE014-20009
12	1.00" (25.4)	1.15" (29.2)	1.50" (38.1)	0.25" (6.3)	EE014-20010
18	1.00" (25.4)	1.15" (29.2)	2.00" (50.8)	0.25" (6.3)	EE014-20011
30	1.50" (38.1)	1.73" (43.9)	2.25" (57.1)	0.38" (9.6)	EE014-20012
47	2.00" (50.8)	2.31" (58.7)	2.50" (63.5)	0.38" (9.6)	EE014-20013

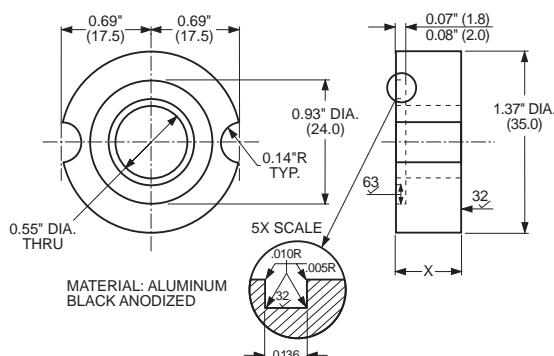
MOUNTING NUTS



I.D.	Mounting Nuts				Lock Washer	
	Dimensions			Model No.		Black, Serrated
	A	B	C	Metal	Plastic	
3/4-20	1.06" (26.9)	1.22" (30.9)	0.16" (4.1)	EE154-80001*	—	—
8mm	0.51" (13.0)	0.58" (14.7)	0.16" (4.1)	EE013-80011	EE013-80000	—
12mm	0.67" (17.0)	0.77" (19.5)	0.22" (5.6)	EE013-80003	EE013-81003	EE100-00139
18mm	0.94" (23.8)	1.06" (26.9)	0.16" (4.1)	EE013-80002*	EE013-81002	EE100-00137
30mm	1.44" (36.6)	1.66" (42.2)	0.19" (4.8)	EE013-80001*	EE013-81001	EE100-00138
47mm	2.00" (50.8)	2.20" (55.9)	0.20" (5.1)	EE013-80004	—	—

*Quantity one (1) per package; all others are shipped two (2) per package.

CYLINDRICATOR® SENSOR SPACER KITS



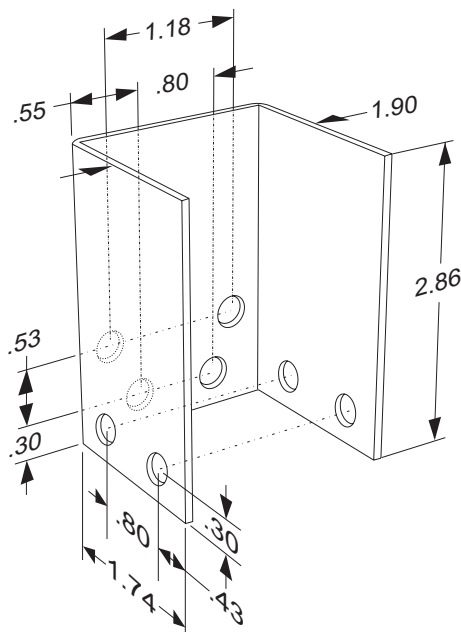
Kits include two mounting bolts and O-Ring. Replacement O-Ring is EE972-19306 (Equivalent to Parker # 2-116V709-90). Specify spacer height.

NOTE: Please consult factory before using spacer kits with LPR Cylindricator® sensors.

Dimension "X"	Model No.
0.19"	EE972-01827
0.25"	EE972-01822
0.31"	EE972-01829
0.38"	EE972-01831
0.50"	EE972-01820

Stainless Steel Protective Brackets

- Protects sensor from impact damage
- 14 gauge 304 Stainless superior to painted steel — resists weld slag buildup, minimally effects sensor performance
- Ideal for load/unload stations or locations where typical part tolerances make impact with sensors unavoidable



Part No. EE972-01910

HammerHead Sensors 9-Way Configurable Proximity Sensors

Model Number	Shielded Range	Unshielded Range	Effective Range (Sensor Mounted in SS Bracket)
EE5X0-90XX0	15mm	—	12mm
EE5X0-91XX0	20mm	—	16mm
EE5X0-92XX0	—	25mm	Not Recommended
EE5X0-93XX0	25mm	—	20mm
EE5X0-94XX0	—	35mm	Not Recommended

DuraProx Sensors 9-Way Configurable Proximity Sensors

Model Number	Shielded Range	Unshielded Range	Effective Range (Sensor Mounted in SS Bracket)
EE5X0-90XX1	15mm	—	12mm
EE5X0-91XX1	20mm	—	16mm
EE5X0-92XX1	—	25mm	Not Recommended
EE5X0-93XX1	25mm	—	20mm
EE5X0-94XX1	—	25mm	Not Recommended

TEFLON® CAPS

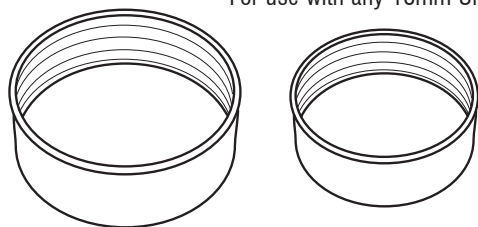
Repel weld slag;
increase sensor life.

Part No. EE505-60002

For use with any 18mm Shielded Sensor

Part No. EE505-60004

For use with any 18mm Unshielded Sensor



Part No. EE505-60003

For use with any 30mm Shielded Sensor

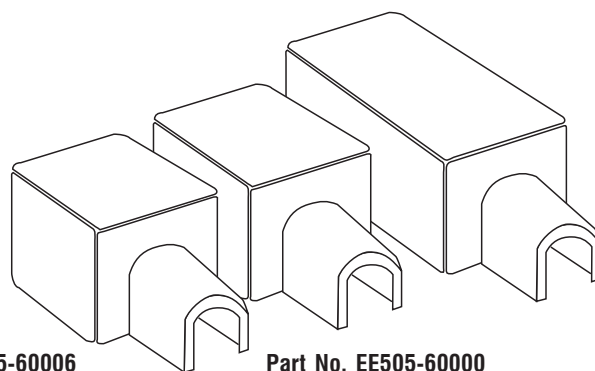
Part No. EE505-60005

For use with any 30mm Unshielded Sensor

WELD-SPLATTER RESISTANT COVERS

Part No. EE505-60001

For use with EE500-1 Rotatable Rectangular Sensors



Part No. EE505-60006

For use with EE500-9 HammerHead Sensors

Part No. EE505-60000

For use with EE500-8 25mm Extended Range Sensors

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Principles of Operation

Inductive

Proximity sensors are generally constructed with four main elements: (1) a coil and ferrite core assembly; (2) an oscillator; (3) a convertor/trigger circuit (detector) and; (4) an output device.

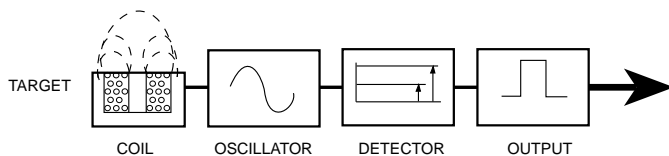


Figure 1

The oscillator creates a radio frequency field that is shaped and defined by the coil and core. As a target is placed in this field, eddy currents are set up in the surface of the target. The oscillator, being a limited power device, will lower its amplitude as the eddy currents are produced. The convertor/trigger circuit rectifies the AC sine wave signal to DC, compares the level against a preset reference, and actuates the sensor output if a target is present. Switching is clean, with none of the bounce of mechanical switches.

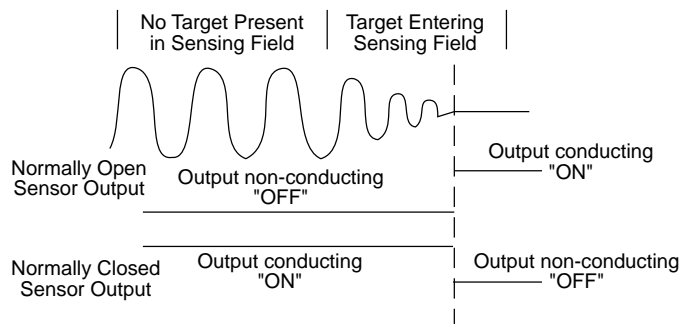


Figure 2

Capacitive

Essentially similar except that the coil is replaced by a sensing plate, and the oscillator is not running until the object to be detected is within range.

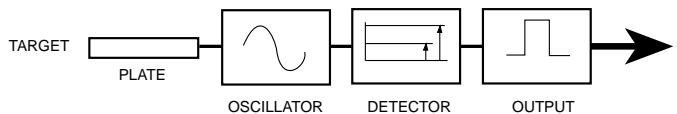


Figure 3

Capacitive sensors depend on the coupling between the sensing plate and earth ground. If a target is placed within range, the capacitance level will vary depending on target density, conductivity, and relative humidity. If the adjustment potentiometer is correctly set, the oscillator will be turned on when a target is within range.

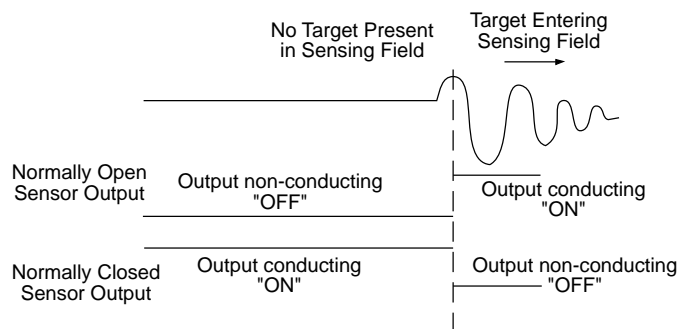


Figure 4

Important Note: Never use a metal body capacitive sensor in wet environments. Moisture between the sensing plate and the metal body will cause the sensor to "lock on." For wet environments, always use a plastic bodied sensor.

Inductive Sensor Selection

1. Target Identification

This is the most critical step in proper application of inductive and capacitive sensors. Most application problems stem from improper selection of a sensor for a particular target. This usually comes from a desire to "standardize" a design. Generally the following rules apply to all inductive sensors:

The sensor face should equal or be smaller than the target surface area. All manufacturers calibrate the range of a particular sensor with a "standard target." This standard target is always larger than the diameter of the sensor face. Although it is possible to sense targets smaller than the sensor face diameter, rated range cannot be achieved using a target that is smaller than the sensor face. The following changes in the sensing range will occur if the dimensions of the target are larger or smaller than the standard target specified.

Target size in %	150	125	100 (Standard Target)	75	50	25	12.5
Deviation from Sn in %	+10	+7	0	-7	-14	-27	-45

Figure 5

2. Air Gap Determination

When examining your application, remember that most shielded inductive sensors (Fig. 6) will have a maximum range that is approximately one third of the diameter of the sensing face.

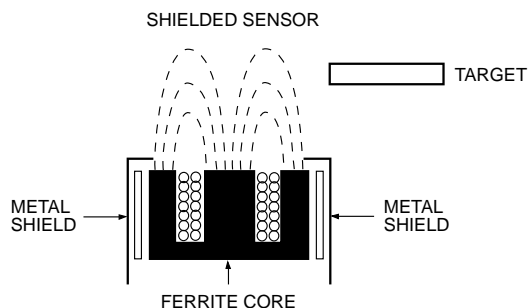


Figure 6

It is often necessary to allow a rather large air gap between the target and the sensor. When this is required, an unshielded sensor (Fig. 7) will be required. The unshielded sensor will generally have the plastic "nose" of the sensor projecting out of the metal barrel, or (plastic bodied types) it will not have a shielding ring around the core. These unshielded sensors will typically sense at ranges 3 to 50 percent greater than shielded types. A penalty is paid, however, as it is necessary to provide a metal-free area around the sensor that is much larger than the shielded types.

NONSHIELDED SENSOR

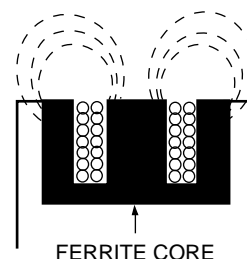


Figure 7

(See 3. Mounting Clearances)

Positioning of the sensor should allow the target to penetrate approximately 30% into the field to allow for manufacturing tolerances, resistance to vibration, and inaccuracies that are common to all initial start-ups.

When determining the air gap (sensing distance) required, it should be noted that an inductive sensor will produce its rated range only against a standard target of mild steel. Other materials will reduce the sensing range (SN) as follows:

- Mild Steel SN x 1.0
- Aluminum Foil SN x 1.0
- Stainless Steel SN x 0.85
- Brass SN x 0.5
- Copper SN x 0.46
- Aluminum SN x 0.4

*Continued on
next page.* ➡

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Example: If a sensor with a 5mm sensing range is used to sense a standard target made of copper, the sensing range of the sensor is reduced as indicated below:

$$5\text{mm} (0.46) = 2.3\text{mm} (\text{maximum})$$

When mounting a sensor it is always preferred to position the target so that it "slides by" the sensor face. This type of mounting will ensure that the sensor face is not damaged by contact with the target. If your application dictates a "head on" approach, it is essential that the target does not use the sensor face as a physical stop. Failure to provide clearance in either the slide-by or head-on modes will result in damage to the sensor and possible failure of the device.

Hysteresis (Fig. 8) must be allowed for as the target must move far enough away from the sensing field so that the sensor cannot detect it. If a target is placed within the hysteresis band, vibration of the target can cause the switch to turn on and off rapidly ("chatter"). All sensor manufacturers build in a certain amount of hysteresis to minimize chatter.

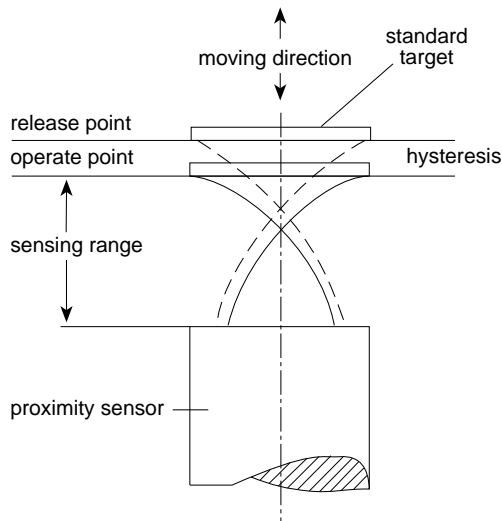
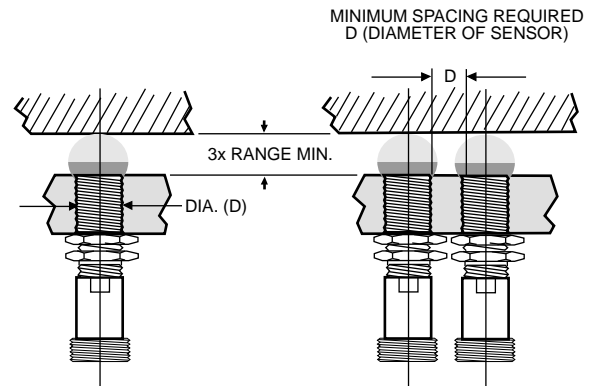


Figure 8

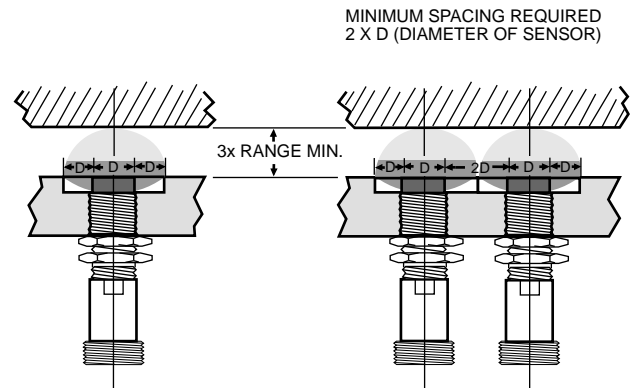
3. Mounting Clearances

Mounting of sensors should follow industry accepted practices as shown. Failure to properly position the sensor is the single largest cause of field problems.

SHIELDED SENSORS (FLUSH MOUNTABLE)



UNSHIELDED SENSORS REQUIRE METAL-FREE AREA



SENSORS MUST BE MOUNTED SUCH THAT SURROUNDING METAL IS NOT IN THE SENSING AREA.

OPPOSING SENSORS

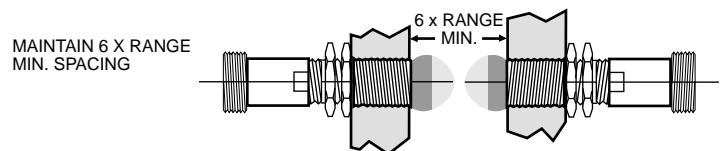


Figure 9

4. Housing Selection

After you have determined the target and air gap, it is then possible to select the style of housing for the application. Sensors are typically grouped according to range against a standard target. The most often used types are the metal barrel styles. These are great for general purpose uses but should not be used in areas where liquids are present. For wet environments, the all-plastic types are preferred. To determine your best specific type, consult the Enclosure Types below.

Various accessories are available for sealing, conduit, and mounting. Also, many sensors are available with quick disconnects. This is more expensive initially but can be justified if the sensor is placed on moving equipment where the cable is flexed often. The weak link then becomes the entry point of the cable to the housing. When failure occurs, it is necessary to replace the complete assembly because the cable failed. It's also easier to position the sensor mechanically, then complete the electrical wiring.

Industrial Control Equipment - UL 508
Table 6.1 – Enclosure Designations

Designation	Intended Use and Description	Designation	Intended Use and Description
1	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.	4X	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.
2	Indoor use to provide a degree of protection against limited amounts of falling water and dirt.	6	Indoor or outdoor use to provide against the entry of water during temporary, limited submersion; undamaged by the formation of ice on the enclosure.
3	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	6P	Indoor and outdoor use to provide a degree of protection against the entry of water during prolonged submersion at limited depths.
3R	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	11	Indoor use to provide by oil immersion a degree of protection of the enclosed equipment against the corrosion effects of corrosive liquids and gases.
3S	Outdoor use to provide a degree of protection against windblown dust, windblown rain, and sleet; external mechanisms remain operable while ice laden.	12, 12K	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids.
4	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	13	Indoor use to provide a degree of protection against lint, dust seepage, external condensation, and spraying of water, oil, and noncorrosive liquids.

Table 6.1 revised December 5, 1986
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*Continued on
next page.* ➡

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Cylindicator Sensor Installation

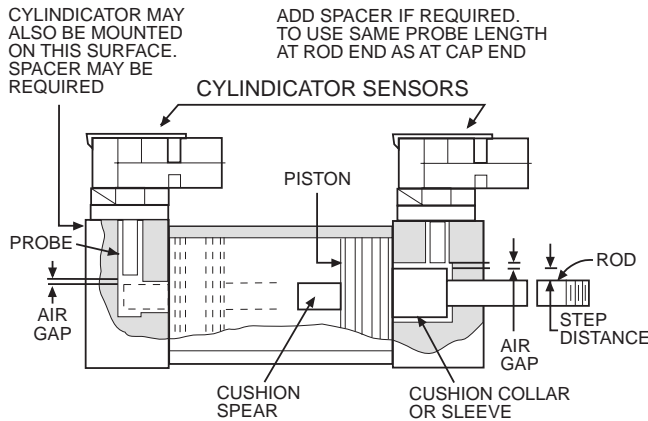


Figure 1

Proper operation of your Namco Cylindicator depends in large part on these factors:

Establishment of a proper air gap between the probe face and the target.

The air gap is the actual distance between the tip of the probe and the part of the piston which is the "target." The target can be the collar or cushion sleeve, cushion spear, or the end of the rod inside the cylinder. **This target must be close enough to actuate the Cylindicator Sensor but not so close as to actually contact the probe.**

Experience has shown an air gap of 0.025 inches to be optimum in most applications. The air gap should always be greater than 0.015 inches and less than 0.045 inches, including worst case tolerances. Gaps in excess of 0.045 inches are not recommended and could result in inconsistent operation.

Assuring a minimum "step distance" between the cushion collar and the piston rod.

Standard Namco Cylindicator Sensors have a nominal sensing range of 0.080 inches beyond the stated probe length. The minimum step distance (cushion to rod) must be greater than 0.095 inches to guarantee that the sensor will "drop out" when the target is no longer present. This minimum step distance accounts for mechanical tolerances, temperature effects, and hysteresis effects.

Sensing a known metallic target.

In all applications referred to in this publication, the target is assumed to be of a ferrous metal. Consult Namco if a different metal such as aluminum, brass, or stainless steel must be used as the sensing range is reduced.

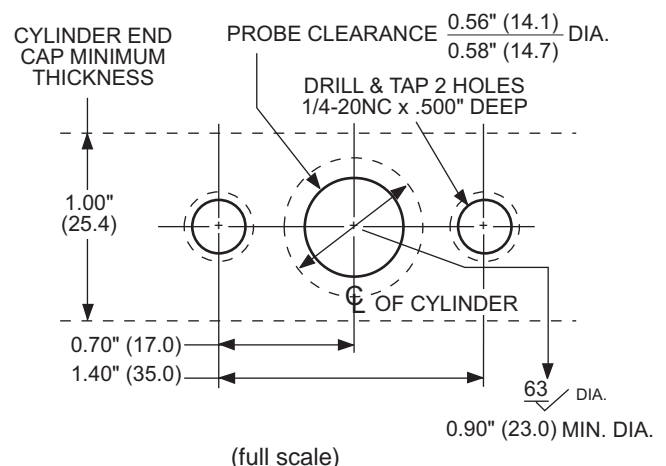
Mounting to a proper cylinder endcap.

The clearance hole for the sensing probe must be 0.560" diameter minimum/0.580" diameter maximum. The end block must be designed so that the probe tip is flush to 0.04" extended beyond surrounding metal within 0.5" of the probe side walls.

Other Tips:

- Never operate the cylinder at pressures which exceed the Cylindicator sensor's ratings.
- Do not exceed ambient temperature range.
- The Cylindicator Sensor must be positioned so that the target area (cushion spear, cushion collar, etc.) will completely cover the probe sensing face when the sensor is operated.
- Do not mount the Cylindicator Sensor on the bottom of the cylinder. Debris could accumulate around the probe which might cause damage or inconsistent operation.
- All Cylindicator Sensors are completely epoxy potted and as such contain no serviceable parts inside. Do not remove the cover or tamper with the cable or connector.
- Cylindicator Sensors must have the O-Ring probe seal that is supplied with each unit installed around the probe before mounting.
- Do not attempt to modify the probe by cutting, grinding, filing, etc.

Mounting Dimensions and Template



“Stroke To Go” vs. “Air Gap”

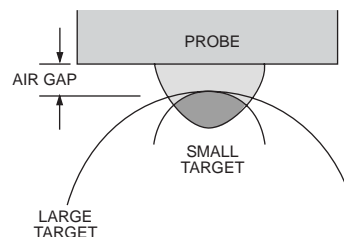
“Stroke To Go”

The amount of stroke remaining in the cylinder after the Cylindicator Sensor activates.

NOTE: If a cylinder is mechanically restrained from going full stroke — no target will be present for the switch to detect (no switch output).

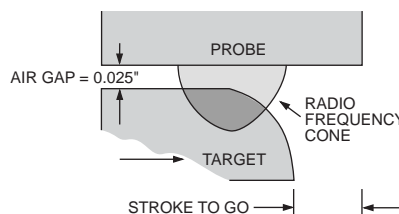
Target End View

Smaller diameter targets have less metal in the sensing field at a constant air gap. Loss of stroke-to-go is more pronounced on smaller bore cylinders as air gap increases.



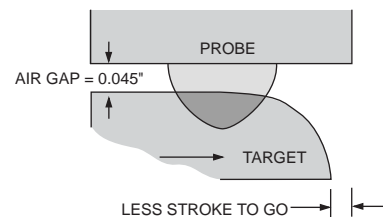
Switch Actuated

Recommended nominal air gap distance provides the stated maximum stroke to go.



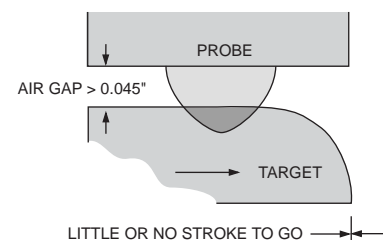
Switch Actuated

Variations from the recommended nominal air gap distance results in loss of stroke to go.



Switch Probably Not Actuated

Increased variations from the recommended nominal air gap distance results in little or no stroke to go and possible erratic operation.



**Loss of stated maximum stroke to go can prevent the proximity sensor from activating in plant equipment and tools with positive stops.*

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1/4" Grid

Sensing Solutions Worksheet



Conditions of Sale

NOTE: The following Conditions of Sale are subject to change. All Sales Transactions are subject to the latest published Conditions of Sale of Namco Controls Corporation and to any Special Conditions of Sale which may be contained in applicable Namco Controls Corporation quotations and acknowledgments.

- 1. ACCEPTANCE, GOVERNING PROVISIONS, AND CANCELLATIONS.** No order for Seller's products or services shall be binding upon Seller until accepted in writing by an authorized official of Seller or by shipment or other performance of such order. Any such order shall be subject to these Conditions of Sale, and acceptance shall be expressly conditioned on assent to such Conditions, which assent shall be deemed given unless Purchaser shall expressly notify Seller to the contrary prior to any shipment or other performance of an order by Seller and, in any event, within five (5) days after receipt of any acknowledgment or confirmation of such order.

No order accepted by Seller may be altered or modified by Purchaser unless agreed to in writing signed by an authorized official of Seller, and no such order may be cancelled or terminated except upon payment of Seller's loss, damage and expense arising from such cancellation or termination.

No modified or other conditions will be recognized by Seller unless specifically agreed to in writing, and failure of Seller to object to provisions contained in any purchase order or other communication from a Purchaser (including, without limitation, penalty clauses of any kind) shall not be construed as a waiver of these Conditions nor an acceptance of any such provisions.

Any contract for sale and these Conditions shall be governed by and construed according to the Laws of the State of Ohio.

- 2. QUOTATIONS AND PRICES.** Written quotations are conditioned upon acceptance by Purchaser within thirty (30) days from date issued and shall be considered as offers by Seller to sell during such thirty (30) day period unless sooner terminated by notice. Other Seller publications are maintained as sources of general information and are not quotations or offers to sell.

All prices are subject to change without notice. In the event of a net price change, the price of products on order but unshipped will be adjusted to the price in effect at the time of shipment. Downward adjustment of prices shall apply only to unshipped portions of outstanding orders.

Orders amounting to less than \$250.00 net will be billed at \$250.00 plus transportation charges.

All clerical errors are subject to correction.

- 3. PAYMENT TERMS.** Except as may otherwise be stated in quotations, discount schedules, catalogs, or other Seller publications, terms of payment to Purchaser of satisfactory credit are 30 days net.

Seller reserves the right at any time to demand full or portion payment before proceeding with a contract of sale if, in its judgment, the financial condition of Purchaser shall not justify the terms of payment specified. If delivery is delayed or deferred by Purchaser beyond the scheduled date, payment shall be due in full when Seller is prepared to ship and the products may be stored at the risk and expense of Purchaser. If Purchaser defaults when any payment is due, then the whole contract price shall become due and payable upon demand, or Seller, at its option, without prejudice to other lawful remedies, may defer delivery or cancel the contract for sale.

- 4. TAXES AND OTHER CHARGES.** Any manufacturer's tax, retailer's occupation tax, use tax, sales tax, excise tax (except the Federal excise tax on vehicles), duty, custom, inspection or testing fee, or other tax, fee or charge of any nature whatsoever, imposed by any governmental authority, on or measured by any transaction between Seller and Purchaser, shall be paid by Purchaser in addition to the prices quoted or invoiced. In the event Seller shall be required to pay any such tax, fee or charge, Purchaser shall reimburse Seller therefore; or, in lieu of such payment, Purchaser shall provide Seller at the time the order is submitted with an exemption certificate or other document acceptable to the authority imposing the same. Purchase orders must state the existence and amount of any such tax, fee or charge which it shall be Seller's responsibility to collect from Purchaser and pay.

- 5. DELIVERY.** Delivery of product to a carrier at any of Seller's plants or other shipping point shall constitute delivery to Purchaser; and, regardless of freight payment, title and all risk of loss or damage in transit shall pass to Purchaser at that time.

Great care is taken in packing Seller's product. Seller cannot be held responsible for breakage after having received "in good order" receipts from the transportation company. All claims for loss and damage must be made by Purchaser to the carrier.

Claims for shortages or other errors must be made in writing to Seller within 30 days after receipt of shipment, and failure to give such notice shall constitute unqualified acceptance and a waiver of all such claims by Purchaser.

Except as may otherwise be stated in quotations, discount schedules, catalogs, or other Seller publications, freight will be allowed to the common carrier free delivery point nearest the destination on shipments within THE UNITED STATES EXCLUDING ALASKA AND HAWAII.

For shipment to ANY OTHER DESTINATION, INCLUDING ALASKA AND HAWAII, consult Seller's home office for terms that apply.

No allowance will be made in lieu of transportation if Purchaser accepts shipment at factory, warehouse, freight station, or otherwise supplies its own transportation.

Method and route of shipment will be at the discretion of Seller unless Purchaser shall specify otherwise, and any additional expense of the method or route of shipment specified by Purchaser shall be borne by Purchaser.

Seller reserves the right to make delivery in installments, unless otherwise expressly stipulated in the contract for sale; and all such installments when separately invoiced

shall be paid for when due per invoice, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Purchaser of its obligations to accept remaining deliveries. Seller shall not be liable for any damage as a result of any delay due to any cause beyond Seller's reasonable control, including, without limitation, an act of God, an act of Purchaser or Seller's supplier, embargo or other governmental act, regulation or request; fire, accident, strike, slowdown, war, riot, delay in transportation, and inability to obtain necessary labor, materials or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time lost by reason of the delay.

- 6. SUBSTITUTES.** Seller may furnish suitable substitutes for materials unobtainable because of priorities or regulations established by governmental authority or nonavailability of materials from suppliers, and assumes no liability for deviation from published dimensions and descriptive information not essential to proper performance of the product.

- 7. WARRANTY.** Seller warrants products manufactured by it to be free from defects in materials and workmanship for a period of one (1) year from date of shipment to Purchaser. If within this period any such products shall be proven to Seller's reasonable satisfaction to be so defective, they shall be repaired or replaced at Seller's option. This warranty shall not apply to (a) products not manufactured by Seller, (b) products which shall have been repaired or altered by others than Seller so as, in its judgment, to affect same adversely, (c) products which shall have been subjected to negligence, accident or damage by circumstances beyond seller's control, or to improper operation, maintenance or storage, or to other than normal use or service. With respect to products not manufactured by Seller, the warranty obligations of Seller shall conform to the warranty actually extended to Seller by its supplier, subject to the limitations and exclusions hereafter stated. The foregoing warranties do not cover reimbursement for transportation, removal, installation, or other expenses which may be incurred in connection with repair or replacement.

Except as may be expressly provided in the authorized writing by Seller, Seller shall not be subject to any other obligations or liabilities whatsoever with respect to products manufactured by Seller or services rendered by Seller.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES EXCEPT WARRANTIES OF TITLE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

- 8. LIMITATIONS OF LIABILITY AND REMEDIES.** SELLER SHALL NOT BE LIABLE, AND PURCHASER WAIVES ALL CLAIMS AGAINST SELLER, FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER OR NOT BASED UPON SELLER'S NEGLIGENCE OR BREACH OF WARRANTY OR STRICT LIABILITY IN TORT OR ANY OTHER CAUSE OF ACTION. Buyer's exclusive remedy for any cause of action under this contract is a claim for damages and in no event will damages or any other recovery of any kind against Seller exceed the price of the specific products as to which the claim is made. Seller will not be liable to Purchaser for any loss, damage or injury to persons or property resulting from the handling, storage, transportation, resale or use of the products in manufacturing processes, or otherwise.

- 9. RETURN OF PRODUCTS.** No products may be returned without first obtaining Seller's written permission and a returned material identification tag.

Products accepted for credit, not involving an error on Seller's part, shall be subject to a minimum service charge of 10% of the invoice price and all transportation charges shall be prepaid by Purchaser.

Returned products must be securely packed to reach Seller without damage; any cost incurred by Seller to put equipment in first class condition will be charged to Purchaser.

- 10. PATENTS.** As to products proposed and furnished by Seller, Seller shall defend any suit or proceeding brought against Purchaser so far as based on a claim that said equipment constitutes an infringement of any patent of the United States, if notified promptly in writing and given authority, information and assistance at Seller's expense for the defense of the same. In event of a final award of costs and damages, Seller shall pay such award. In event the use of said product by Purchaser is enjoined in such a suit, Seller shall, at its own expense, either (a) procure for Purchaser the right to continue using said equipment, (b) modify said equipment to render it noninfringing, (c) replace said equipment with noninfringing equipment, or (d) refund the purchase price (less depreciation) and the transportation and installation costs of said equipment. Seller will not be responsible for any compromise or settlement made without its written consent.

The foregoing states the entire liability of Seller for patent infringement, and in no event shall Seller be liable if the infringement charge is based on the use of Seller's products for a purpose other than that for which sold by Seller. As to any products furnished by Seller to Purchaser and manufactured in accordance with designs proposed by Purchaser, Purchaser shall indemnify Seller against any award made against Seller for patent, trademark, or copyright infringements.

- 11. NUCLEAR INDEMNITY BY PURCHASER.** If the products furnished by Seller are to be used in any nuclear installation or activity, then Purchaser shall, or cause the ultimate user to (a) secure and maintain the maximum nuclear property damage and liability insurance protection available, (b) enter into and maintain a Government Indemnity Agreement and (c) waive and require its insurers to waive all rights of recovery or subrogation against Seller and its suppliers and subcontractors or every tier for, and indemnify and hold Seller harmless from and against, any claims, losses or damages whatsoever (including contractual or special damages of any kind) arising out of a Nuclear Incident as that term is defined in the Atomic Energy Act of 1954, as amended.



Reliable Solutions for Presence & Position Sensing

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- **LPR™ Cylindicator®**
- **DuraProx™**
- **Hammerhead™**
- **Hardcoat™ Tubulars**
- **FlatPak®**
- **C2000™**



NAMCO

WFI Sensors for Automotive Manufacturing

How Tough Does A Sensor Have To Be?

No Matter How Tough Your Electronic Sensor Has to Be, If It's a Namco, It's Covered by a Lifetime Replacement Program

A Lifetime Product Replacement Program That Makes Sense

All Namco self-contained, fully solid state proximity sensors and photoelectric switches are covered by a "lifetime" replacement program. Both our standard as well as our Weld Field Immune products are included.

Namco had the very first lifetime warranty for sensor users back in 1987. This program was originally offered to very large users of our Weld Field Immune sensors.

We have such confidence in our products, that this same protection has now been extended to all users of our non-contact, fully electronic sensors.

And, all that's required is the registration of your facility every three (3) years, not individual registration of each sensor you purchase.

The Namco Pledge

All Namco self-contained, fully encapsulated, solid state proximity and photoelectric sensors, and device network products that have been specified by a Registered User and that have been applied and used within those products' specifications and ratings will have the warranty of specified products supplied on the Program equipment extended from one (1) year to The Life of the Equipment. "Life" is as long as that equipment remains at the original installation site and continues to produce the product for which it was originally installed.

See Conditions of Sale paragraph 7, "Warranty Limitations and Exclusions," for limitations of warranty.

Electronic sensors require no periodic maintenance, other than maintaining mounting and interconnections. Sensors must be used within their stated ratings. See I&O sheet packaged with each sensor.



Official Lifetime Replacement Program Registration

- 1) Read carefully the Lifetime Replacement Program details on the following page.
- 2) Fill-in this Registration Form completely. All questions must be answered to qualify.
- 3) Fax this page to Namco.
- 4) That's all that is required for your facility to become registered for a 3-year period. Renewal forms will be mailed automatically after 3 years.

Please Print or Type

Date _____

End User
Company/Corporation _____

Division/Subsidiary _____

Plant/Department _____

Your Name _____

Title _____

Phone _____

Mailing Address:

Address _____

City _____ State _____ Zip _____

Shipping Address:

Address _____

City _____ State _____ Zip _____

List the individual responsible for the following functions at your Plant/Department.

Engineering _____

Maintenance _____

Procurement _____

Manufacturing _____

What is the product and/or service produced at your facility? _____

Does your facility have a plant specification for sensors?

☐ Yes

☐ No

Is Namco ☐ preferred ☐ approved ☐ used

Method used to approve new sensors: _____

Who at your facility decides what sensors will be used? _____

Namco Sensors in use at this plant/facility:

☐ ET Series Proximity Sensors

☐ EE Series WFI Proximity Sensors

☐ PB Series ProxBlox Sensor Wiring Systems

☐ ER Series HMD's, Flow Sensors, Long Range Prox

☐ EP Series Photoelectric Sensors

☐ Other _____

Signed _____

Lifetime Replacement Program Conditions

I. Conditions of Sale

For Conditions of Sale see back page of this catalog.

II. General Conditions for Warrantee

WARRANTIES; LIMITATIONS AND EXCLUSIONS. Seller warrants products manufactured by it to be free from defects in materials and workmanship for a period of one (1) year from date of shipment to purchaser. If within this period any such products shall be proved to Seller's reasonable satisfaction to be so defective, they shall be repaired or replaced at Seller's option. This warranty shall not apply to, (a) products not manufactured by Seller, (b) products which shall have been repaired or altered by others than Seller so as, in its judgment, to affect same adversely, (c) products which shall have been subjected to negligence, accident or damage by circumstances beyond Seller's control, or to improper operation, maintenance or storage, or to other than normal use or service with respect to products not manufactured by Seller, the warranty obligations of Seller shall conform to the warranty actually extended to Seller by its suppliers subject to the limitations and exclusions hereafter stated. The foregoing warranties do not cover reimbursement for transportation, removal, installation, or other expenses which may be incurred in connection with repair or replacement.

Except as may be expressly provided in the authorized writing by Seller, Seller shall not be subject to any other obligations or liabilities whatsoever with respect to products manufactured by Seller or services rendered by Seller.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES EXCEPT WARRANTIES OF TITLE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Anything to the contrary herein contained notwithstanding, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, CONTINGENT OR INCIDENTAL DAMAGES WHATSOEVER.

III. Lifetime Replacement Program

- A. All Namco self-contained fully encapsulated solid state proximity sensors, photoelectric sensors and sensor network products that have been specified by a Registered End User and that have been applied and used within the product's stated specifications and ratings, will have the warranty of specified products, installed in the End User's facility, extended from one (1) year to the Life of the Equipment on which specified products are originally installed.
- B. **Life** - "Life" is as long as the equipment on which specified products are originally installed remains at the original installation site and continues to produce the End User product for which that equipment was originally installed.
- C. **Covered Products** - All inductive and capacitive proximity sensors, photoelectric sensors, and sensor network products that are totally solid state, and that have been applied and used within the products' stated specifications and ratings and that have a production date code of 1987 or later (1995 or later for sensor network products) are included. Specifications and ratings are listed on I/O sheet, packaged with each sensor.
- D. **Excluded Products** - All products not specifically covered in paragraph III, C, including but not limited to mechanical switches, control modules, and sensors that include mechanical relays are not covered by this program. Also excluded are products that have been applied and/or used outside their specifications and ratings, and products that have been damaged in use. This Program also excludes coverage of the functional content and performance of embedded software ("firmware"), or its compatibility with software-based products from other manufacturers.
- E. **Damaged Products Excluded** - Products damaged due to physical impact, exposed to environmental conditions outside stated ratings, subjected to loads and power sources outside

stated ratings, subjected to continuous or excessive vibration and movement of the sensor or connecting cable, and any other damage caused in the application and use, are specifically excluded from coverage.

- F. **Determination of Cause** - Any product(s) returned to Namco for repair or replacement under this program will be subjected to inspection and test at Namco's facility. Determination of cause for any loss of function of returned products will be at Namco's sole discretion.
- G. **Method of Registration** - Complete and return to Namco the postage paid Lifetime Replacement Program Registration form, publication SD/HT. All information requested must be provided. Registration is on a facility by facility basis. Large, multi-plant facilities must have each plant registered separately. Registration will last for three (3) years. A renewal registration form will be mailed automatically in January or July prior to third year anniversary and if returned within 30 days coverage will be renewed for the next three (3) years without interruption.
- H. **Return of Products** - To return products covered under this program contact Namco Controls Customer Service Department 1-800-626-8324 FAX 1-800-678-6263 and request an RGA (Return Goods Authorization) or contact your local Namco Representative. Package products securely to prevent damage in shipment including the RGA packing slip and follow instructions on RGA form.

Returned products will be processed generally within two (2) weeks following receipt by Namco. Returned products will be repaired or replaced if covered under this program. Products that are found to meet stated specifications and/or damaged and Excluded Products will be returned to the End User.
- I. **Method of Replacement** - Any returned product covered under this program will be replaced free of charge with an equal or equivalent sensor. Namco reserves the right to make replacement with the latest design for the returned product or to substitute any equivalent function sensor in case of non-availability or obsolescence of the exact model and type being returned.

IV. Application Assistance

Namco Sales Representatives are available to assist with the application and selection of Namco products. Additional assistance is available by calling the Namco Application Hotline: 1-800-NAMTECH

Refer to Installation and Operation Sheet(s) packaged with each unit for specifications and ratings. Follow all recommended procedures for installation.

WARNING

A SWITCH IN A PROTECTIVE INTERLOCKING CIRCUIT SHOULD BE USED WITH AT LEAST ONE OTHER DEVICE THAT WILL PROVIDE A REDUNDANT PROTECTIVE FUNCTION, AND THE CIRCUIT SHOULD BE SO ARRANGED THAT EITHER DEVICE WILL INTERRUPT THE INTENDED OPERATION OF THE CONTROLLED EQUIPMENT.

SERVICING ENERGIZED INDUSTRIAL CONTROL EQUIPMENT CAN BE HAZARDOUS, SEVERE INJURY OR DEATH CAN RESULT FROM ELECTRICAL SHOCK, BURN OR UNINTENDED ACTUATION OF CONTROLLED EQUIPMENT.

RECOMMENDED PRACTICE IS TO DISCONNECT AND LOCK OUT CONTROL EQUIPMENT FROM POWER SOURCES, AND DISCHARGE STORED ENERGY TO CAPACITORS, IF PRESENT. IF IT IS NECESSARY TO WORK IN THE VICINITY OF ENERGIZED EQUIPMENT, ONLY QUALIFIED PERSONNEL SHOULD BE PERMITTED TO PERFORM SUCH WORK, USING ALL APPLICABLE SAFETY PRACTICES AND PROTECTIVE EQUIPMENT.

Refer to NFPA 70B, RECOMMENDED PRACTICE FOR ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association, for additional information.

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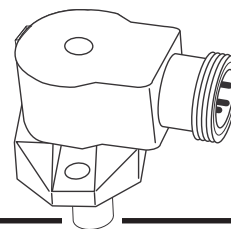
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**Weld
Field
Immune**

LPR Cyllindicator® Sensors

**DC
AC/DC**



Proxim ty Sensors

- **Both 3,000 and 5,000 PSI Pressure Ratings**
- **Weld Field and Electrical Noise Immunity**
- **Standard Latching Short Circuit Protection (SCP) — Non-latching Available in DC Models**
- **Predictable, Consistent Electrical Performance**
- **100% Tested and Burned-in**
- **Purpose-Designed Housings and Materials**

For over 25 years, the Cyllindicator sensor has been the standard for industrial applications that require end-of-stroke indication on Hydraulic and Pneumatic Cylinders. Available in both 3,000 and 5,000 PSI pressure ratings, they are the standard for many OEM cylinder manufacturers. All Cyllindicators are completely PLC compatible with many output configurations, including a UL Listed Intrinsically Safe version (see EE931 series for details).

LPR 3000 (3,000 PSI)

Probe Length	3-pin Micro, N.O.	3-pin Mini, N.O.		4-pin Mini, N.O.		4-pin Euro, N.O.	
	2-wire, 20-230V, AC/DC Latching SCP	2-wire, 20-230V, AC/DC Latching SCP		3-wire, 10-30V DC, Sourcing (PNP) 10µA leakage current		3-wire, 10-30V DC Sourcing (PNP) 10µA leakage current	
	1.7mA leakage current	1.7mA leakage current	4.5mA leakage current	Latching SCP	Non-Latching SCP	Latching SCP	Non-Latching SCP
1.025	EE230-10423	EE230-10420	EE260-10420	EE210-10440	EE210-10400	EE210-10444	EE210-10404
1.250	EE230-11323	EE230-11320	EE260-11320	EE210-11340	EE210-11300	EE210-11344	EE210-11304
1.500	EE230-12323	EE230-12320	EE260-12320	EE210-12340	EE210-12300	EE210-12344	EE210-12304
1.750	EE230-13323	EE230-13320	EE260-13320	EE210-13340	EE210-13300	EE210-13344	EE210-13304
2.062	EE230-18723	EE230-18720	EE260-18720	EE210-18740	EE210-18700	EE210-18744	EE210-18704
2.875	EE230-17823	EE230-17820	EE260-17820	EE210-17840	EE210-17800	EE210-17844	EE210-17804
3.775	EE230-19023	EE230-19020	EE260-19020	EE210-19040	EE210-19000	EE210-19044	EE210-19004
4.560	EE230-18623	EE230-18620	EE260-18620	EE210-18640	EE210-18600	EE210-18644	EE210-18604

LPR 5000 (5,000 PSI)

Probe Length	3-pin Micro, N.O.	3-pin Mini, N.O.		4-pin Mini, N.O.		4-pin Euro, N.O.	
	2-wire, 20-230V, AC/DC Latching SCP	2-wire, 20-230V, AC/DC Latching SCP		3-wire, 10-30V DC, Sourcing (PNP) 10µA leakage current		3-wire, 10-30V DC Sourcing (PNP) 10µA leakage current	
	1.7mA leakage current	1.7mA leakage current	4.5mA leakage current	Latching SCP	Non-Latching SCP	Latching SCP	Non-Latching SCP
1.025	EE230-10427	EE230-10425	EE260-10425	EE210-10445	EE210-10405	EE210-10446	EE210-10406
1.250	EE230-11327	EE230-11325	EE260-11325	EE210-11345	EE210-11305	EE210-11346	EE210-11306
1.500	EE230-12327	EE230-12325	EE260-12325	EE210-12345	EE210-12305	EE210-12346	EE210-12306
1.750	EE230-13327	EE230-13325	EE260-13325	EE210-13345	EE210-13305	EE210-13346	EE210-13306
2.062	EE230-18727	EE230-18725	EE260-18725	EE210-18745	EE210-18705	EE210-18746	EE210-18706
2.875	EE230-17827	EE230-17825	EE260-17825	EE210-17845	EE210-17805	EE210-17846	EE210-17806
3.775	EE230-19027	EE230-19025	EE260-19025	EE210-19045	EE210-19005	EE210-19046	EE210-19006
4.560	EE230-18627	EE230-18625	EE260-18625	EE210-18645	EE210-18605	EE210-18646	EE210-18606

► Consult factory for Normally Closed and DC Sinking model availability.



Common Sensor Characteristics

CYLINDRATOR® SENSORS		
	AC/DC	DC
Nominal Sensing Range ($\pm 10\%$)	0.080"	
Current Consumption	1.7 or 4.5mA	10mA
Voltage Drop	³ 10 VAC	2.0V@100mA
Temperature Drift (Max.)	$\pm 10\%$	
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Ambient Temperature Range	-4°F to +158°F	
Maximum Switching Frequency	16Hz	
Hysteresis	3-10%	
Repeatability	$< \pm 1.25\%$	
Designed to meet NEMA Enclosure Type	4, 6, 12 & 13	
Load Current	5mA to 500mA	200mA max.
LED Indicator	red = power green = target	green = power amber = target
Shipping Weight	12 oz.	

See Cylindicator® Sensor Design Guide Section for details.

LED Functions

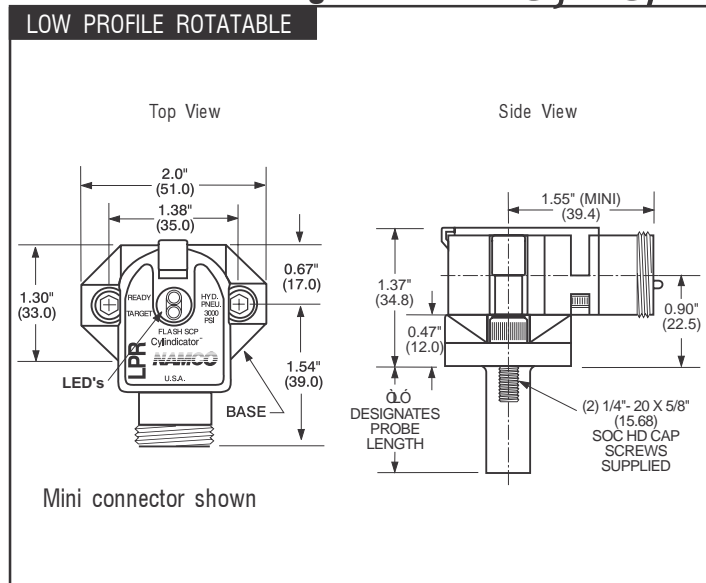
	10-30V DC		20-230V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

***Short Circuit Protection:** If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Probe Length	Color Dot
1.025	Blue
1.250	White
1.500	White
1.750	White
2.062	Red
2.875	Orange
3.775	Silver
4.560	Gold

Dimensional Drawings

DC, AC/DC

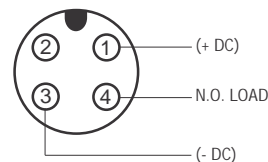


Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

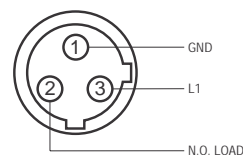
3 Wire DC N.O.



MICRO CONNECTOR MODELS

Male view shown

2 Wire AC/DC N.O.

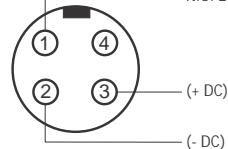


MINI CONNECTOR MODELS

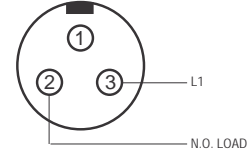
Male views shown

3 Wire DC N.O.

N.O. LOAD



2 Wire AC/DC N.O.



NAMCO

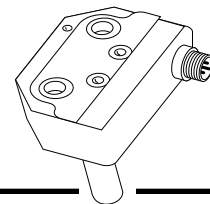
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**Weld
Field
Immune**

Low-Profile Cylindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- 1500 PSI Continuous Pressure Rating
- Standard Latching Short Circuit Protection (SCP), Non-Latching Available in DC Models
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Purpose-Designed Housings and Materials

For over 25 years, the Cylindicator sensor has been the standard for industrial applications that require end-of-stroke indication on Hydraulic and Pneumatic Cylinders. Available in several styles, they are the standard for many OEM cylinder manufacturers. All Cylindicators are completely PLC compatible with many output configurations, including a UL Listed Intrinsically Safe version (see EE931 series for details).

	3-Pin Micro Connector 2-W, 20-230V, AC/DC, N.O.		4-Pin Euro Connector 3-W, 10-30V, DC Sourcing (PNP), N.O.	
	Latching Short-Circuit Protection (SCP)			Non-Latching SCP
	1.7mA Leakage Current	4.5mA Leakage Current	10µA Leakage Current	
Probe Length	EE230-	EE260-	EE210-	EE210-
0.915"	EE230-28820	EE260-28820	EE210-28844	EE210-28804
0.950"	EE230-20120	EE260-20120	EE210-20144	EE210-20104
1.025"	EE230-20420	EE260-20420	EE210-20444	EE210-20404
1.130"	EE230-20320	EE260-20320	EE210-20344	EE210-20304
1.250"	EE230-21320	EE260-21320	EE210-21344	EE210-21304
1.350"	EE230-21720	EE260-21720	EE210-21744	EE210-21704
2.062"	EE230-28720	EE260-28720	EE210-28744	EE210-28704
2.775"	EE230-27420	EE260-27420	EE210-27444	EE210-27404
2.875"	EE230-27820	EE260-27820	EE210-27844	EE210-27804
3.775"	EE230-29020	EE260-29020	EE210-29044	EE210-29004
4.560"	EE230-28620	EE260-28620	EE210-28644	EE210-28604



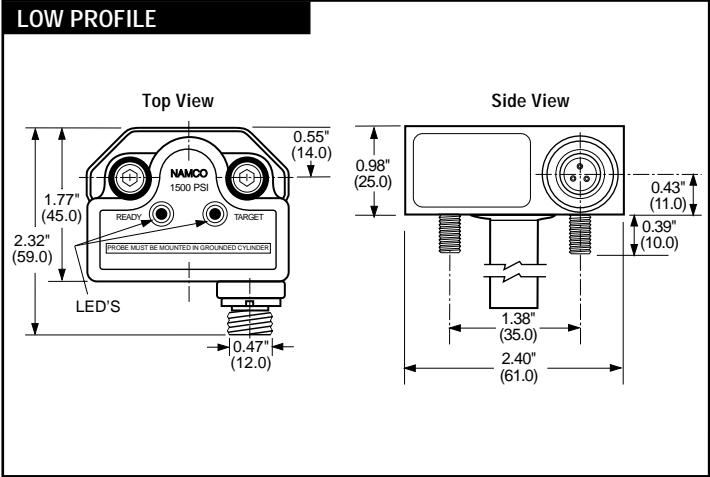
► Consult factory for Normally Closed, DC Sinking, and Cable model availability.

Common Sensor Characteristics

CYLINDRICATOR® SENSORS		
	AC/DC	DC
Nominal Sensing Range (±10%)	0.080"	
Current Consumption	1.7 or 4.5mA	10µA
Voltage Drop	≈10 VAC	2.0V@100mA
Temperature Drift (Max.)	±10%	
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Ambient Temperature Range	-4°F to +158°F	
Maximum Switching Frequency	16Hz	
Hysteresis	3-10%	
Repeatability	<±1.25%	
Designed to meet NEMA Enclosure Type	4, 6, 12 & 13	
Load Current	5mA to 500mA	200mA max.
LED Indicator	red = power green = target	green = power amber = target
Shipping Weight	12 oz.	

See Cylindicator® Sensor Design Guide Section for details.

Dimensional Drawings

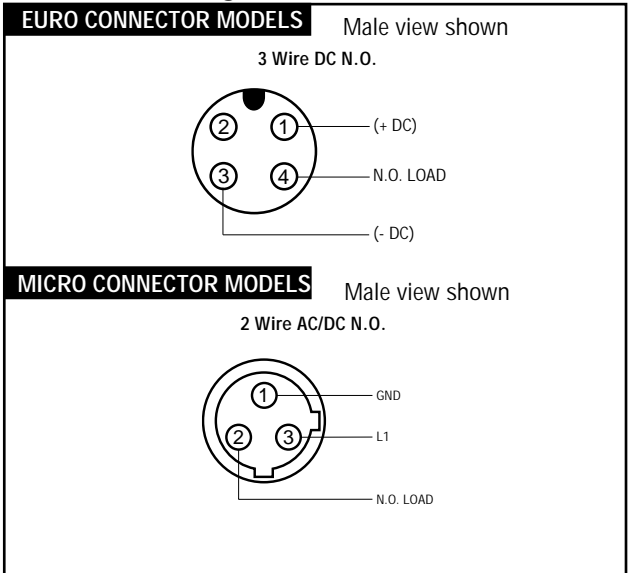


LED Functions

	10-30V DC		20-230V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Circuit Drawings



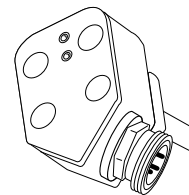
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**Weld
Field
Immune**

90° Rotatable Cylindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- 3000 PSI Pressure Rating
- Standard Latching Short Circuit Protection (SCP), Non-Latching Available in DC Models
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Purpose-Designed Housings and Materials

For over 25 years, the Cylindicator sensor has been the standard for industrial applications that require end-of-stroke indication on Hydraulic and Pneumatic Cylinders. Available in several styles, they are the standard for many OEM cylinder manufacturers. All Cylindicators are completely PLC compatible with many output configurations, including a UL Listed Intrinsically Safe version (see EE931 series for details).



	3-Pin Mini 2-W, 20-230V AC/DC, N.O.		4-Pin Mini* 3-Wire, 10-30V DC, N.O., 10µA Leakage Current				
	Latching SCP		Non-Latching SCP		Latching SCP		
	1.7mA Leakage Current	4.5mA Leakage Current	SI (NPN)	SO (PNP)	SI (NPN)	SO (PNP)	SI/SO*
Probe Length	EE230	EE260	EE210-	EE210-	EE210-	EE210-	EE210-
0.915	—	—	EE210-38820	EE210-38800	EE210-38860	EE210-38840	EE210-38880
0.950	EE230-30120	EE260-30120	EE210-30120	EE210-30100	EE210-30160	EE210-30140	EE210-30180
1.025	EE230-30420	EE260-30420	EE210-30420	EE210-30400	EE210-30460	EE210-30440	EE210-30480
1.050	EE230-30520	EE260-30520	EE210-30520	EE210-30500	—	EE210-30540	—
1.125	EE230-30820	EE260-30820	EE210-30820	EE210-30800	EE210-30860	EE210-30840	EE210-30880
1.150	EE230-30920	EE260-30920	—	—	—	—	—
1.225	EE230-31220	—	—	EE210-31200	—	EE210-31240	—
1.250	EE230-31320	EE260-31320	EE210-31320	EE210-31300	EE210-31360	EE210-31340	EE210-31380
1.275	EE230-31420	EE260-31420	—	—	—	—	—
1.295	EE230-31520	EE260-31520	EE210-31520	EE210-31500	EE210-31560	EE210-31540	EE210-31580
1.350	EE230-31720	EE260-31720	—	—	—	EE210-31740	—
1.400	EE230-31920	—	EE210-31920	—	EE210-31960	EE210-31940	EE210-31980
1.475	EE230-32220	EE260-32220	—	—	—	—	—
1.500	EE230-32320	EE260-32320	EE210-32320	EE210-32300	—	EE210-32340	EE210-32380
1.525	EE230-32420	—	—	—	—	—	—
1.625	EE230-32820	—	—	—	—	—	—
1.725	EE230-33220	EE260-33220	EE210-33220	EE210-33200	EE210-33260	EE210-33240	EE210-33280
1.750	EE230-33320	EE260-33320	—	EE210-33300	—	EE210-33340	EE210-33380
1.875	EE230-33820	EE260-33820	EE210-33820	EE210-33800	EE210-33860	EE210-33840	EE210-33880
2.062	EE230-38720	EE260-38720	EE210-38720	EE210-38700	EE210-38760	EE210-38740	EE210-38780
2.125	EE230-34820	EE260-34820	EE210-34820	EE210-34800	EE210-34860	EE210-34840	EE210-34880
2.275	EE230-35420	EE260-35420	EE210-35420	EE210-35400	EE210-35460	EE210-35440	EE210-35480
2.375	EE230-35820	—	—	—	—	—	—
2.775	EE230-37420	EE260-37420	—	—	—	—	—
2.875	EE230-37820	EE260-37820	EE210-037820	EE210-37800	EE210-37860	EE210-37840	EE210-37880
3.750	EE230-39120	—	—	—	—	—	—
3.775	EE230-39020	EE260-39020	—	EE210-39000	—	EE210-39040	—
4.560	EE230-38620	EE260-38620	EE210-38620	—	EE210-38660	EE210-38640	EE210-38680
4.850	EE230-38920	EE260-38920	EE210-38920	EE210-38900	EE210-38960	—	EE210-38980
4.990	EE230-38520	—	EE210-38520	EE210-38500	EE210-38560	—	EE210-38580

* Sink/Source Combination Devices Use a 5-Pin, 4-Wire Connector!

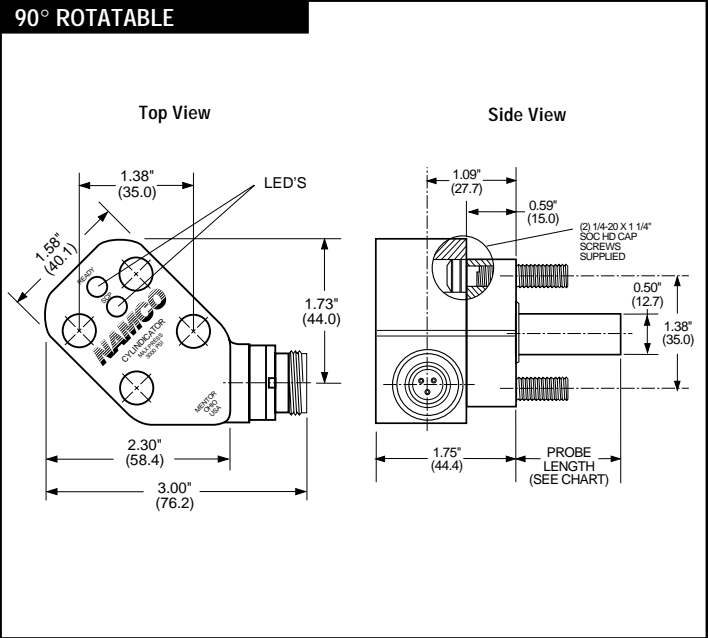
► Consult factory for Normally Closed, DC Sinking, and Cable model availability.

Common Sensor Characteristics

CYLINDRICATOR® SENSORS		
	AC/DC	DC
Nominal Sensing Range (±10%)	0.080"	
Current Consumption	1.7 or 4.5mA	10µA
Voltage Drop	≈10 VAC	2.0V@100mA
Temperature Drift (Max.)	±10%	
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Ambient Temperature Range	-4°F to +158°F	
Maximum Switching Frequency	16Hz	
Hysteresis	3-10%	
Repeatability	<±1.25%	
Designed to meet NEMA Enclosure Type	4, 6, 12 & 13	
Load Current	5mA to 500mA	200mA max.
LED Indicator	red = power green = target	green = power amber = target
Shipping Weight	12 oz.	

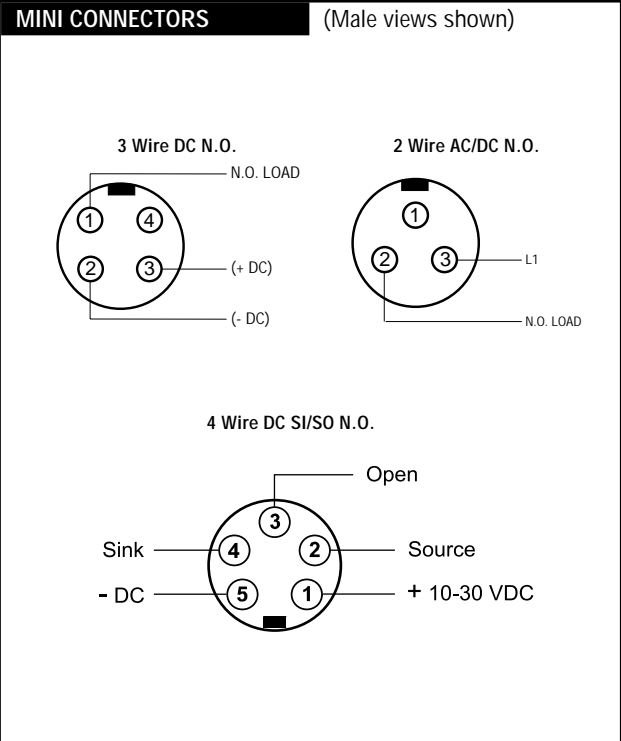
See Cylindricator® Sensor Design Guide Section for details.

Dimensional Drawings



Proximity Sensors

Circuit Drawings



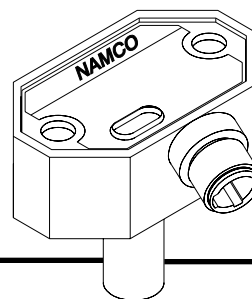
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**Weld
Field
Immune**

C2™ Cylindicator® Sensors

**DC
AC/DC**



Proximity Sensors

- Low Mass - Less Susceptible to Damage from Shock and Vibration
- Lowest Profile Cylinder Sensor on the Market
- Weld Field and Electrical Noise Immunity
- 300 PSI Continuous Pressure Rating
- Single Piece Rugged Die-Cast Housing
- Tested to over 20 Million Switching Cycles
- Purpose-Designed Housings and Materials
- Standard Latching Short Circuit Protection (SCP), Non-Latching Available in DC Models

As the leader in end-of-stroke cylinder position sensing for over 18 years, Namco is proud to introduce the newest member of the Namco Cylindicator series: the C2™ Cylindicator® sensor.

Many developments in cylinder position sensing have resulted in sophisticated, overly-complicated sensors. The C2 sensor, on the other hand, is a "back to basics" design. This new design capitalizes on the real needs of the pneumatic power clamp cylinder user.

	3-Pin Micro	4-Pin Euro	
	2-W, 20-150V AC/DC, N.O. 1.7mA Leakage Current Latching SCP	3-W, 10-30V DC, N.O., Sourcing (PNP) 10µA Leakage Current Latching SCP	Non-Latching SCP
Probe Length	EE230-	EE210-	EE210-
1.025"	EE230-60420	EE210-60444	EE210-60404
1.250"	EE230-61320	EE210-61344	EE210-61304
1.500"	EE230-62320	EE210-62344	EE210-62304
1.750"	EE230-63320	EE210-63344	EE210-63304
2.062"	EE230-68720	EE210-68744	EE210-68704
2.875"	EE230-67820	EE210-67844	EE210-67804
3.775"	EE230-69020	EE210-69044	EE210-69004
4.560"	EE230-68620	EE210-68644	EE210-68604



Common Sensor Characteristics

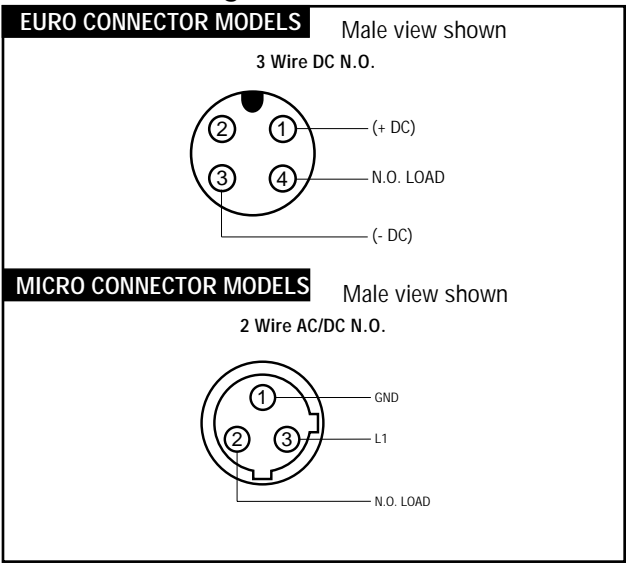
C2 CYLINDRATOR® SENSORS		
Nominal Sensing Range (±10%)		0.080"
Supply Voltage	10-30V DC	20-150V AC/DC
Voltage Drop	≤ 2.5V @ 200mA	≤ 10V
	≤ 2.0V @ ≤ 100mA	
Max. Load Current @ 25°C	200mA	
Inrush Current (rms 1Hz)	-	1.5A
Leakage Current	10μA	1.7mA
Max. Continuous Pressure	300 psi	
Response Time	30ms	
Power-up Time	35ms to 45ms	
Max. Switching Frequency	15Hz	
Ambient Temp. Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

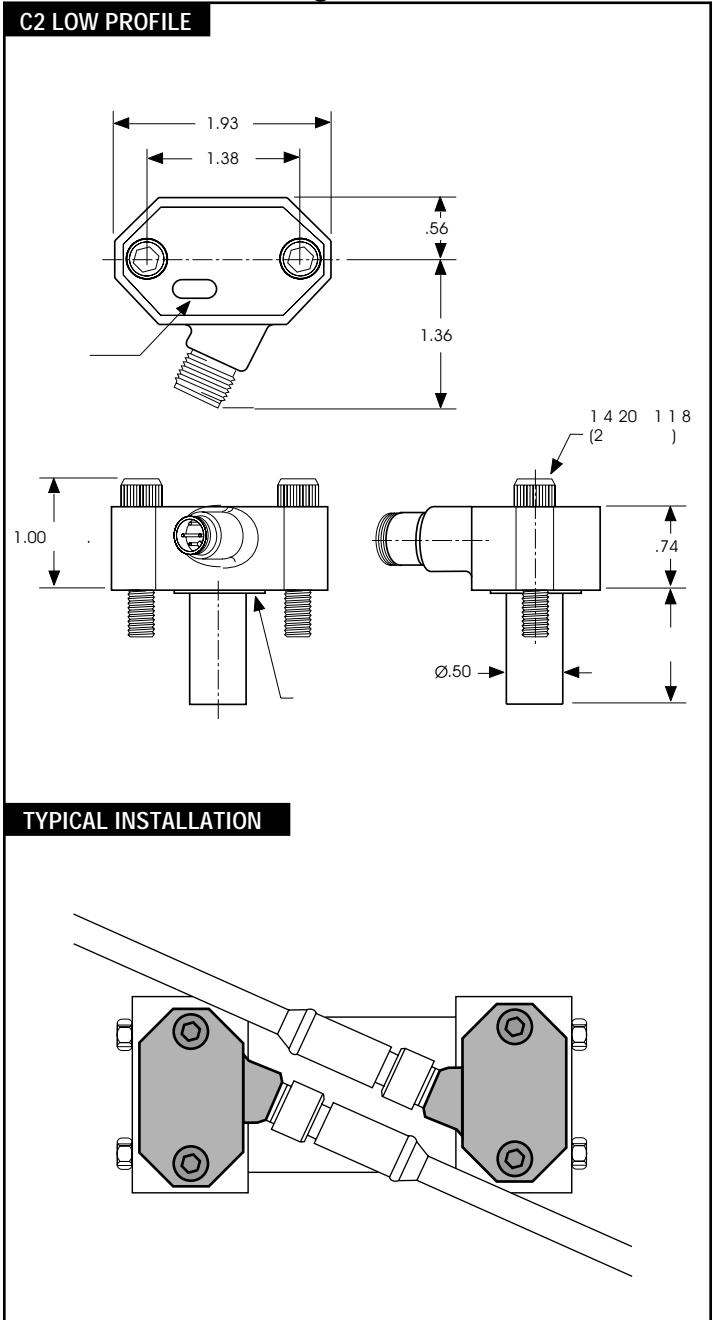
	10-30V DC		20-150V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Circuit Drawings



Dimensional Drawings

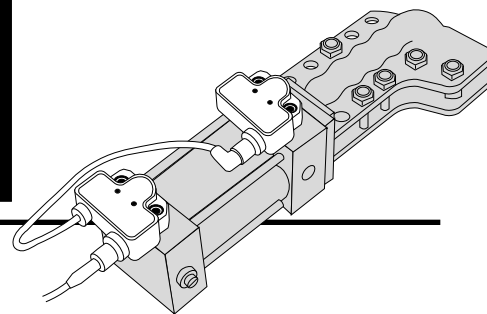


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Tandem Low Profile - Power Clamp Sensor Kit



- Cabling is Reduced 50%
- Cabling is Industry-Standard Micro Style
- Outputs Remain Independent - Power and Ground Connectors are Factory Interconnected
- Cable Terminations Reduced for Installer
- Cable Bundle Density Reduced
- Reduces Junction Box Size
- Reduces Fitting Size
- Reduces Panel Size

The new Namco LP2™ Tandem Low Profile Power Clamp Sensor Kit is an adaptation of our successful Low Profile Cylindicator® sensor.

This new version reduces the cabling necessary by 50% when two sensors are required on an air or hydraulic cylinder.

The system consists of a new Low Profile Cylindicator sensor specially constructed as a common wiring point. Cabling is brought to the Master unit, then the built-in cable from the Master unit is connected to a standard Low Profile Cylindicator sensor. This eliminates 50% of the wiring density and labor required as compared to "conventional" practices.

The LP2™ sensor kit is the most cost effective, highest reliability solution for reducing sensor wiring complexity and cost in power clamp applications.

Applications:

Patented Weld Field Immune circuitry permits application within one inch of resistance welder tips carrying 20,000 Amperes. This system is ideal for end-of-stroke detection on hydraulic or pneumatic clamping cylinders in automotive assembly, metal fabricating, and general automated welding applications.

Cylindicator is a registered trademark of Namco Controls Corporation.

LP2 is a trademark of Namco Controls Corporation.

Ordering Information

Description	Part No.	Part No.
	2-wire AC/DC	3-wire DC
Standard LP2 Kit, 1.025" Probe	EE270-20420	EE280-20446
Kit includes: 1 Master Low Profile Cylindicator® Sensor with "pigtail" interconnect 1 Standard Low Profile Cylindicator® Sensor	EE270-20421 EE230-20420	EE280-20447 EE210-20444



Specifications

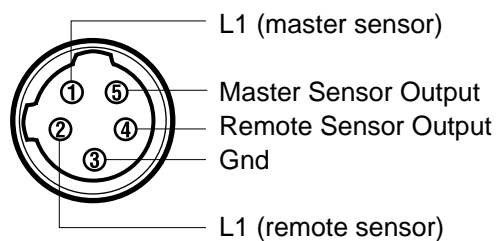
LP2 POWER CLAMP SENSOR KIT		
Supply Voltage	10-30V DC	20-230V AC/DC
Voltage drop	$\leq 2.5V @ 200mA$ $\leq 2.0V @ \leq 100mA$	$\leq 10V$
Max. Load Current @ 25°C	200mA	500mA
Inrush Current (rms 1Hz)	—	3A
Leakage Current	10 μ A	1.7mA
Response Time	30ms	
Power-up Time	35ms to 45ms	
Max. Switching Frequency	15 Hz	
Ambient Temp. Range	-20°C to 70°C	
Max. Continuous Pressure	1500 PSI	

LED Functions				
	10-30V DC		20-230V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Both Flashing		Both Flashing	

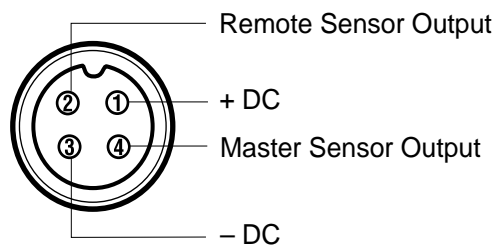
* Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LED's will flash and the sensor will limit current flow to about 2.0mA.

Wiring Diagram

2WAC/DC

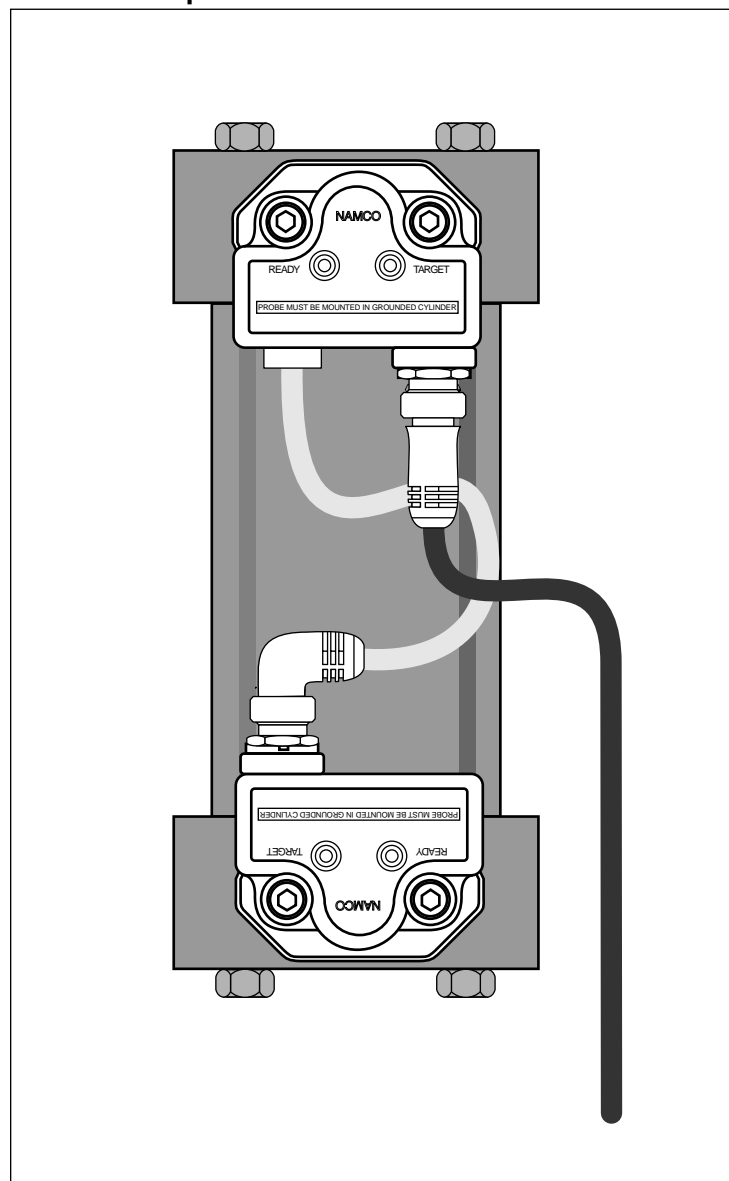


3WDC



Tandem Low Profile - Power Clamp Sensor Kit

EE270-2



Proximity Sensors

NAMCO

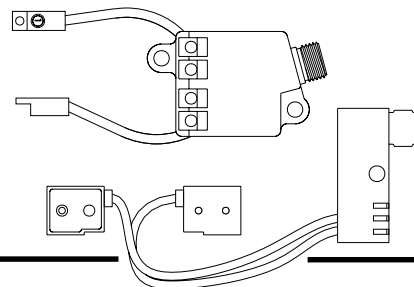
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**For
Power
Clamps**

C2000™ Cylindicator® Sensor Kits

**Types
91, 92 & 93**



Proximity Sensors

- **Single cordset reduces wiring time and material costs as compared to two discrete sensors**
- **Two 10-30V, 3-wire DC WFI sensors, with non-latching Short Circuit Protection**
- **100mm, 160mm or 200mm cable lengths available**
- **Cross-drilled hole pattern for mounting flexibility**
- **Rugged, fully encapsulated housings**
- **Status LED's indicate clamp position, viewable nearly 180° for mounting flexibility, easy troubleshooting**
- **Standard 4-pin euro connector**

The C200 Cylindicator sensors kits are designed to fit new enclosed style power clamps from major suppliers utilizing integral sensors. Kit senses both open and closed clamp positions

All Namco WFI sensors pass the NEMA noise tests and exhibit no false turn-ons from walkie-talkies or other in-plant sources of RF Noise.

C2000 Cylindicator Sensors - Types 91, 92 & 93

Description	Part Number
C2000 Type 91	
10-30VDC, PNP, 4-pin, Euro Connector, 100mm Leads	EE280-91100
10-30VDC, PNP, 4-pin, Euro Connector, 160mm Leads	EE280-91160
10-30VDC, PNP, 4-pin, Euro Copnector, 200mm Leads	EE280-91200
C2000 Type 92	
10-30VDC, PNP, 4-pin, Euro Connector, 140mm Leads	EE280-92140
C2000 Type 93	
10-30VDC, PNP, 4-pin, Euro Connector, 110mm Leads	EE280-93110

► Consult factory for normally closed model availability.



Common Sensor Characteristics

	Type 91/93	Type 92
Supply Voltage	10-30VDC	
Ripple	<10%	N/A
Sensing Range	(Embeddable) 2.0mm (.08")±10%	2.0mm (.08")±10%
Current Consumption	10mA	
Voltage Drop	2.0V @ 100 mA	
Load Current	200mA max. (100mA ea.)	200 mA max.
No Load Current	<10mA	N/A
Leakage Current	<10µA	10µA
Weld Field Immune/RF Immune	Yes	
Over Current Protection	Yes	N/A
Protection Class	IP67	N/A
Short Circuit Protection (SCP)	Yes	
Reverse Polarity Protection	Yes	
Response Time (On)	30ms	
Response Time (Off)	1 ms	
Switching Frequency	50Hz	16Hz
Temperature Drift	±15%	±10% (max.)
Hysteresis	3-8% typical, 15% max.	3-10%
Connector	4-pin single-key Euro	
Operating Temperature Range	-25° C to +70° C	

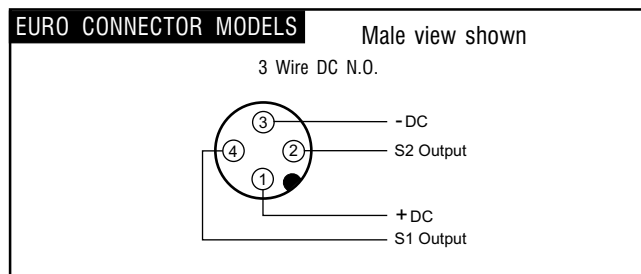
Type 91/93

LED Functions	S1	Ready	S2
Power/Ready	Off	Green	Off
Sensor # 1 - Targeted	Yellow	Green	Off
Sensor # 2 - Targeted	Off	Green	Red
Sensor # 1 SCP Tripped	Off	Flashing	Off
Sensor # 2 SCP Tripped	Off	Flashing	Off

Type 92

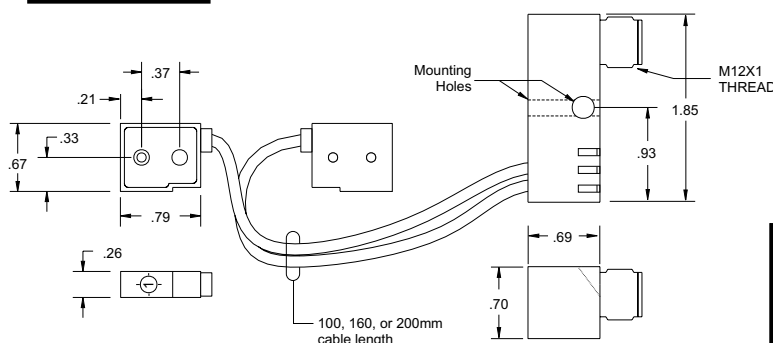
LED Functions	3-wire DC version			
	Sensor 1		Sensor 2	
	Ready	S1	Ready	S2
Power/Ready	Green	Off	Green	Off
Sensor 1 Targeted	Green	Yellow	Green	Off
Sensor 2 Targeted	Green	Off	Green	Yellow
Sensor 1 SCP Tripped	Flash	Off	Flash	Off
Sensor 2 SCP Tripped	Flash	Off	Flash	Off

Circuit Drawing

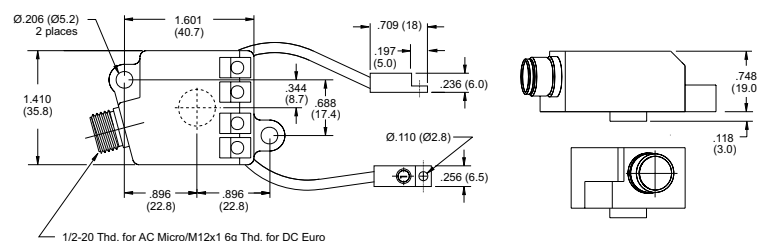


Dimensional Drawings Type 91/92/93

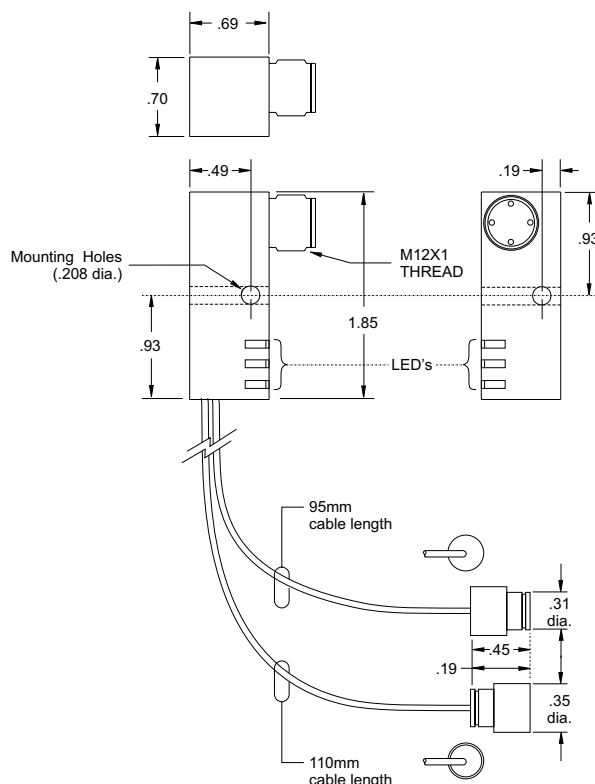
C2000 - TYPE 91



C2000 - TYPE 92



C2000 - TYPE 93



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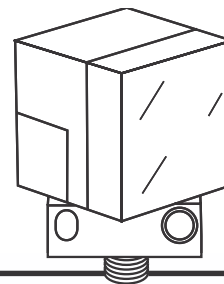
Proximity Sensors

**Weld
Field
Immune**

DuraProx™

9-Way Configurable Proximity Sensors

**DC
AC/DC**



Proximity Sensors

Introducing the Namco DuraProx™ Proximity Sensor: Evolution Means Survival of the Fittest.

All Metal Body Stands up to Abuse

To evolve means to adapt to your surroundings. The DuraProx sensor is completely enclosed in a rugged die-cast body. All metal means more strength in the face of abuse.

9-Way Position Flexibility

Eight-point indexed side-sense, plus top sense configuration make the DuraProx sensor "9-sensors-in-one."

Positive Grip Compression Clamp Bracket

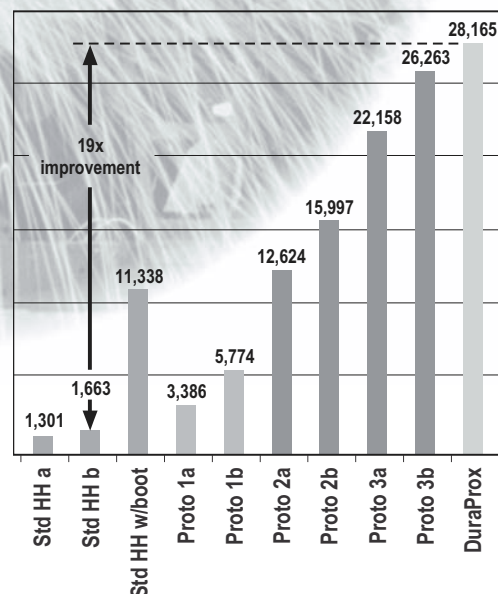
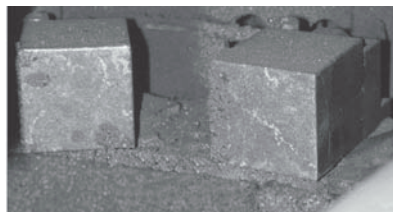
Provides superior mounting strength.



Standard Sensor Failed due to weld slag adhesion after 1,663 Weld Cycles



Namco DURAPROX™ Sensor after 28,000 Weld Cycles: Superior Resistance to Slag Build-Up and Adhesion



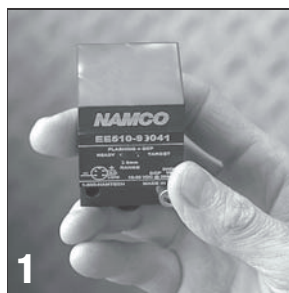
A wide range of materials were tested to determine optimal surface hardness and thermal characteristics necessary to survive the rigors of the automotive welding environment.

Proven in independent laboratory testing, Namco DURAPROX™ survives weld-slag buildup UPTO 19 TIMES LONGER than standard proxes.

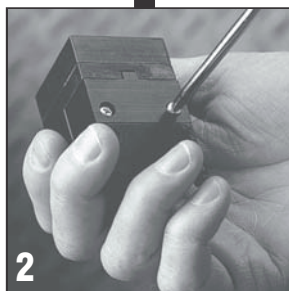
DURAPROX

Streamlined Design Shakes off Weld Slag . . . Without Protective "Boots"

The DuraProx sensor's face incorporates a proprietary high-temperature abrasion-resistant coating that is weld slag resistant, so even heavy deposits roll right off. Plus, because it has no nooks or crevices for slag to accumulate, you'll never have to worry about "false triggering" from slag build-up.

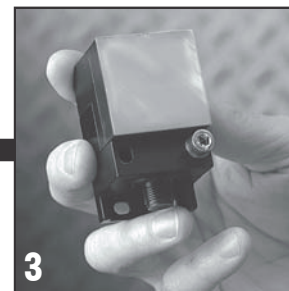


1



2

Adjustment screws go straight in . . . no difficult angles to slow things down.



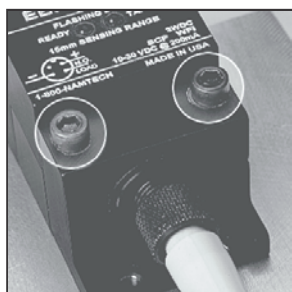
3

Configuring is as easy as "1-2-3"

The DuraProx sensor is field-adaptable to positions for top, front, left or right sensing. This means you can site-adapt sensors to changing application conditions.

An Easy Upgrade. Directly Replaces Other Configurable Sensors

Two sets of mounting holes on bracket allow easy retrofit of traditional rectangular sensors (using lower pair of holes), or retrofit of limit switch-style sensors (using the upper pair).



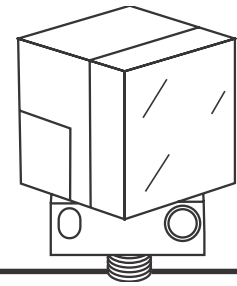
Simplifies Ordering

Because it is "9-sensors-in-one," the DuraProx sensor makes things easy for your Purchasing Department. A single part number replaces as many as five conventional rectangular proximity sensors.



360° Connector Swivel

Allows for convenient cordset routing, especially with 90° cordsets.



- **Designed to Survive the Toughest Automotive Welding Environments**
- **New Extended Range Versions — 25mm Shielded / 35mm Unshielded — Keeps the Sensor Out of Harm's Way**
- **Proprietary High-Temperature Abrasion-Resistant Coating on Sensing Face**
- **Patented Short Circuit Protection**

- **Covered by Namco Lifetime Replacement Program**
- **Rugged metal body and clamp bracket**

The DuraProx sensor is field-configurable to sense in nine different positions: top, front, back, left, right, and four 45° side sense positions.

The DuraProx sensor features Namco's famous weld field immune circuit proven reliable the world over in the harshest conditions. Totally epoxy encapsulated, the electronics are truly "automotive grade."

Connector Type	Circuit Description	Housing Dimensions	Non-latching SCP Model No.	Latching SCP Model No.	Maximum Load Current	Leakage Current	Voltage Drop	Short Circuit Protected
15mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-90001	EE510-90401	200mA	< 10µA	1.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-90041	EE510-90441	200mA	< 10µA	1.5V	Yes
20mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-91001	EE510-91401	200mA	< 10µA	1.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-91041	EE510-91441	200mA	< 10µA	1.5V	Yes
25mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-93001	EE510-93401	200mA	< 10µA	1.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-93041	EE510-93441	200mA	< 10µA	1.5V	Yes
25mm SENSING RANGE DC 10-30V (UNSHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-92001	EE510-92401	200mA	< 10µA	1.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-92041	EE510-92441	200mA	< 10µA	1.5V	Yes
35mm SENSING RANGE DC 10-30V (UNSHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-94001	EE510-94401	200mA	< 10µA	1.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-94041	EE510-94441	200mA	< 10µA	1.5V	Yes
15mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-90401	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-90421	200mA	1.7mA	10V	Yes
20mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-91401	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-91421	200mA	1.7mA	10V	Yes
25mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-93401	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-93421	200mA	1.7mA	10V	Yes
25mm SENSING RANGE AC/DC 20-150V (UNSHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-92401	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-92421	200mA	1.7mA	10V	Yes
35mm SENSING RANGE AC/DC 20-150V (UNSHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-94401	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-94421	200mA	1.7mA	10V	Yes



Common Sensor Characteristics

DURAPROX SENSORS		
	2-Wire AC/DC	3-Wire DC
Operating Voltage	20-150 VAC/DC	10-30 VDC
Output Circuit	2-Wire	PNP (Sourcing)
Load Current	200mA	200mA
Leakage Current		< 10µA
No Load Current	<1.7 ma @ 110VAC	< 6mA @ 24 VDC
LED Indicators	RED = POWER GREEN = TARGET	GREEN = POWER AMBER = TARGET
Voltage Drop	<10V @ 200ma	<1.5V @ 200mA
Switching Speed	10 Hz	150 Hz
Range Accuracy	±10%	
Temperature Range	-25°C to +70°C	
Temperature Drift	±15% max.	
Hysteresis	3% - 8% typical, 15% max.	
Enclosure Type	IP67	
Mis-Wire Protected	YES	
Short-Circuit Protected	YES	
Weld Field Immune	YES	

LED Functions

	2 Wire AC/DC		3 Wire DC	
	Red	Green	Green	Amber
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	Off	On	On	On
*SCP Mode Activated	Both Flashing		Both Flashing	

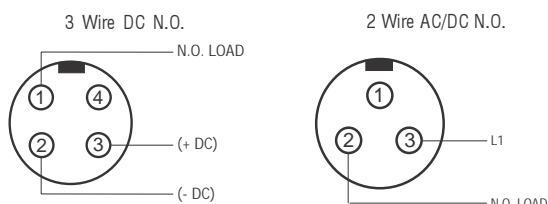
*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

- Namco 2-wire AC/DC sensors are bipolar by design - they cannot be mis-wired.
- Namco 3-wire DC sensors incorporate reverse polarity protection.

Wiring Diagrams

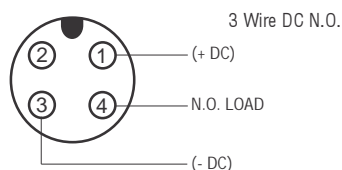
MINI CONNECTOR MODELS

Male views shown



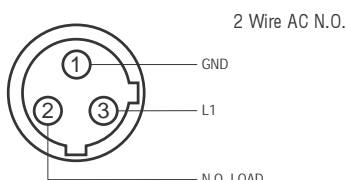
EURO CONNECTOR MODELS

Male view shown



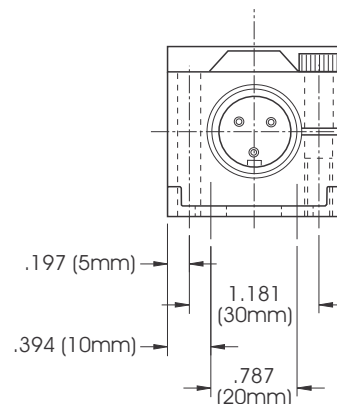
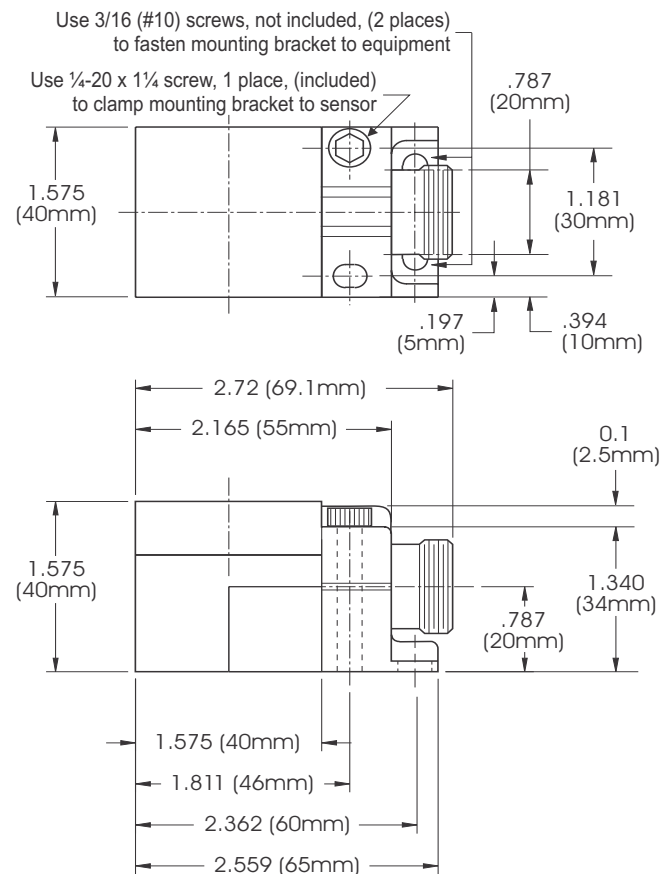
MICRO CONNECTOR MODELS

Male view shown



Dimensional Drawings

DURAPROX SENSORS - MINI CONNECTORS



NAMCO

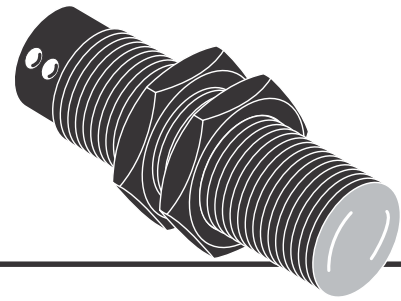
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**Weld
Field
Immune**

DuraProx™ Hardcoat 18mm Tubular

**DC
AC/DC**



Proximity Sensors

- **Weld Field and Electrical Noise Immunity**
- **Standard Latching Short Circuit Protection (SCP), Non-Latching SCP available for DC models only**
- **Proprietary High-Temperature Abrasion-Resistant Coating on Sensing Face**
- **New Hardcoat housings are resistant to weld expulsion**

These sensors are specifically designed for extreme duty use in harsh applications (i.e., automotive fabrication, assembly plants, etc.). The tubular series is popular as part present and machine location sensors for demanding applications such as resistance welding of body assemblies. Namco's proprietary Hardcoat housings and high-temperature abrasion-resistant coating on sensing face resists weld slag build-up more than 10 TIMES LONGER than standard proxes.

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
18mm WFI DC 10-30V DuraProx Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73443	EE510-72443	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73043	EE510-72043	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
90° 4-pin Euro	3W, PNP, NO	Metal-HC**	67mm	EE510-73453	EE510-72453	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
90° 4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73053	EE510-72053	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73403	EE510-72403	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73003	EE510-72003	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
90° 4-pin Mini	3W, PNP, NO	Metal-HC**	67mm	EE510-73423	EE510-72423	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
90° 4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73023	EE510-72023	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
18mm WFI AC/DC 20-230V DuraProx Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
3-pin Mini	2W, NO	Metal-HC**	76mm	EE530-73403	EE530-72403	500mA	1.7mA	< 10V	16Hz	16Hz	Latching
3-pin Mini	2W, NO	Metal-HC**	76mm	EE560-73403	EE560-72403	500mA	4.5mA	< 10V	16Hz	16Hz	Latching
3-pin Micro	2W, NO	Metal-HC**	76mm	EE530-73433	EE530-72433	500mA	1.7mA	< 10V	16Hz	16Hz	Latching
90° 3-pin Mini	2W, NO	Metal-HC**	67mm	EE530-73423	EE530-72423	500mA	1.7mA	< 10V	16Hz	16Hz	Latching
90° 3-pin Mini	2W, NO	Metal-HC**	67mm	EE560-73423	EE560-72423	500mA	4.5mA	< 10V	16Hz	16Hz	Latching
* Across conducting sensor											
** Hard Coat: Weld spatter resistant											
*** Non-hardcoat versions											

* Across conducting sensor

** Hard Coat: Weld spatter resistant

*** Non-hardcoat versions

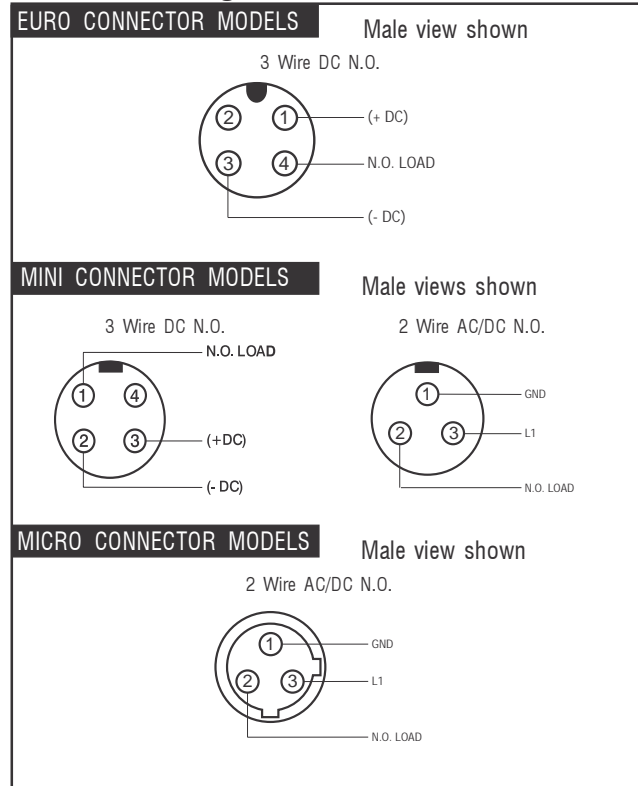
► Consult factory for normally closed model availability.



Common Sensor Characteristics

18mm DIAMETER WFI SENSORS		
	18mm	12mm
Shielded Sensing Range ($\pm 10\%$)	5mm	2mm
Unshielded Sensing Range ($\pm 10\%$)	8mm	4mm
Short Circuit Protection	yes	yes
Repeatability	$< \pm 1\%$	
Hysteresis	3-10%	
Temperature Drift (max.)	$\pm 10\%$	
Ambient Temperature Range	-4°F to $+158^{\circ}\text{F}$	
Reverse Polarity Protected	yes	
Current Consumption (3-wire DC only)	10mA	
NEMA Enclosure Type	1, 3, 4, 6, 13	
LED Indicator (AC/DC)	red = power, grn = target	
LED Indicator (DC)	grn = pwr, Amber = target	
Metal Housings	Weld Flash Proof	
Shipping Weight	4 oz.	

Circuit Drawings

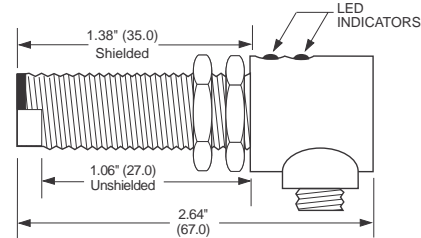
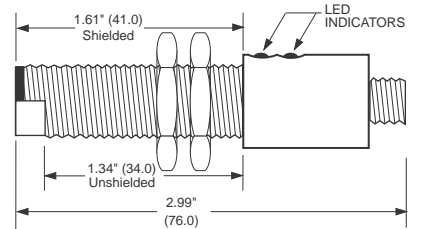


Dimensional Drawings

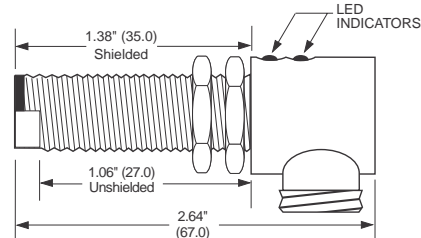
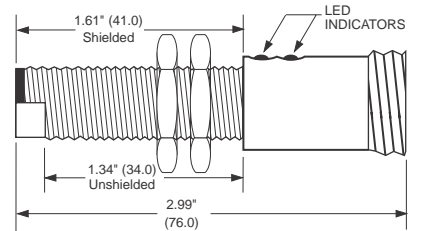
18mm-WFI

18mm EURO CONNECTOR

Body threads = M18x1



18mm MINI CONNECTOR



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**Weld
Field
Immune**

DuraProx™ Hardcoat 30mm Tubular

**DC
AC/DC**



Proximity Sensors

- **Weld Field and Electrical Noise Immunity**
- **Standard Latching Short Circuit Protection (SCP), Non-Latching SCP available for DC models only.**
- **Dual LED indicators**
- **Predictable, consistent electrical performance**
- **Proprietary High-Temperature Abrasion-Resistant Coating on Sensing Face**
- **100% tested & burned-in**
- **New Hardcoat housings are resistant to weld expulsion**

These sensors are specifically designed for extreme duty use in harsh applications (i.e., automotive fabrication, assembly plants, etc.). The tubular series is popular as part present and machine location sensors for demanding applications such as resistance welding of body assemblies. Namco's proprietary Hardcoat housings will not allow the hot weld expulsion to adhere to the housing.

10mm (Shielded) and 15mm (Unshielded) Sensing Range

Connector Type		Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
										Shielded	Unshielded	
WFI	DC	10-30V										
4-pin Euro	3W, PNP, NO	Metal-HC	76mm	EE510-77443	EE510-76443	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching	
4-pin Mini	3W, PNP, NO	Metal-HC	76mm	EE510-77403	EE510-76403	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching	
4-pin Euro	3W, PNP, NO	Metal-HC	76mm	EE510-77043	EE510-76043	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching	
4-pin Mini	3W, PNP, NO	Metal-HC	76mm	EE510-77003	EE510-76003	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching	
WFI	AC/DC	20-230V										
3-pin Mini	2W, AC/DC, NO,LL	Metal-HC	76mm	EE530-77403	EE530-76403	500mA	1.7mA	<10V	16Hz	16Hz	Latching	
3-pin Mini	2W, AC/DC, NO, HL	Metal-HC	76mm	EE560-77403	EE560-76403	500mA	4.5mA	<10V	16Hz	16Hz	Latching	
3-pin Micro	2W, AC/DC, NO	Metal-HC	76mm	EE530-77433	EE530-76433	500mA	1.7mA	<10V	16Hz	16Hz	Latching	

* Across conducting sensor

► Consult factory for normally closed model availability.



Common Sensor Characteristics

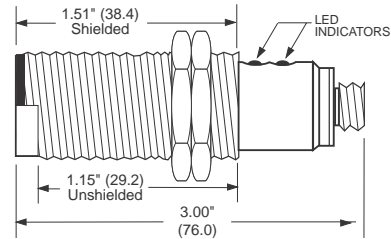
Shielded Sensing Range ($\pm 10\%$)	10mm
Unshielded Sensing Range ($\pm 10\%$)	15mm
Short Circuit Protection	yes
Repeatability	$< \pm 1\%$
Hysteresis	3-10%
Range Drift over Temperature	$\pm 10\%$
Operating Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
NEMA Enclosure Type	1, 3, 4, 6, 13
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Metal Housings	Weld Flash Proof
Shipping Weight	5 oz.

Dimensional Drawings

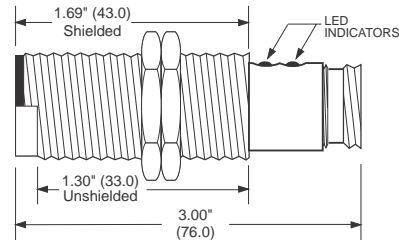
30mm-WFI

EURO/MICRO CONNECTOR MODELS

Body threads = M30x1.5



MINI CONNECTOR MODELS

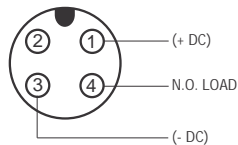


Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

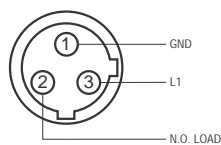
3 Wire DC N.O.



MICRO CONNECTOR MODELS

Male view shown

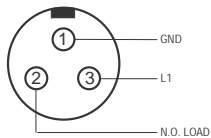
2 Wire AC/DC N.O.



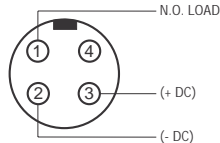
MINI CONNECTOR MODELS

Male views shown

2 Wire AC/DC N.O.



3 Wire DC N.O.



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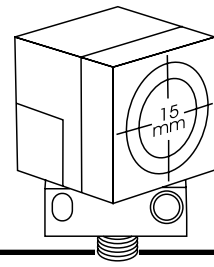
For technical assistance, call 1-800-NAMTECH

**Weld
Field
Immune**

HammerHead™

9-Way Configurable Proximity Sensors

**DC
AC/DC**



Proximity Sensors

- Nine-way position flexibility
- Weld Field Immune circuitry is designed to operate within 1" of a resistance welding electrode carrying 20,000 Amperes RMS (45,000 Amp. peak) without changing state
- Will not exhibit false turn-ons from walkie-talkies or other in-plant sources of RF noise
- Patented Short Circuit Protection

- Covered by Namco Lifetime Replacement Program
- Rugged metal body and clamp bracket

The HammerHead sensor is field-configurable to sense in nine different positions: top, front, back, left, right, and four 45° side sense positions.

The HammerHead sensor features Namco's famous weld field immune circuit proven reliable the world over in the harshest conditions. Totally epoxy encapsulated, the electronics are truly "automotive grade."

Connector Type	Circuit Description	Housing Dimensions	Non-latching SCP Model No.	Latching SCP Model No.	Maximum Load Current	Leakage Current	Voltage Drop	Short Circuit Protected
15mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-90000	EE510-90400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-90040	EE510-90440	200mA	< 10µA	2.5V	Yes
20mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-91000	EE510-91400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-91040	EE510-91440	200mA	< 10µA	2.5V	Yes
25mm SENSING RANGE DC 10-30V (SHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-93000	EE510-93400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-93040	EE510-93440	200mA	< 10µA	2.5V	Yes
25mm SENSING RANGE DC 10-30V (UNSHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-92000	EE510-92400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-92040	EE510-92440	200mA	< 10µA	2.5V	Yes
35mm SENSING RANGE DC 10-30V (UNSHIELDED)								
4-pin Mini	3W, PNP, NO	40x40x68.5mm	EE510-94000	EE510-94400	200mA	< 10µA	2.5V	Yes
4-pin Euro	3W, PNP, NO	40x40x68.5mm	EE510-94040	EE510-94440	200mA	< 10µA	2.5V	Yes
15mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-90400	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-90420	200mA	1.7mA	10V	Yes
20mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-91400	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-91420	200mA	1.7mA	10V	Yes
25mm SENSING RANGE AC/DC 20-150V (SHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-93400	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-93420	200mA	1.7mA	10V	Yes
25mm SENSING RANGE AC/DC 20-150V (UNSHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-92400	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-92420	200mA	1.7mA	10V	Yes
35mm SENSING RANGE AC/DC 20-150V (UNSHIELDED)								
3-pin Mini	2W, NO	40x40x68.5mm		EE530-94400	200mA	1.7mA	10V	Yes
3-pin Micro	2W, NO	40x40x68.5mm		EE530-94420	200mA	1.7mA	10V	Yes



Common Sensor Characteristics

HAMMERHEAD SENSORS		
	2 Wire AC/DC	3 Wire DC
Supply Voltage	20-150V	10-30V
Voltage Drop	10V	2.5V
Max. Load Current	200mA	200mA
Current Consumption	N/A	11mA
Leakage Current	1.7mA	< 10µA
Mis-wiring Protected	Yes ¹	Yes ²
Response Time	30ms	30ms
Output Circuit	2 Wire	Sourcing
Ambient Temperature Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

	2 Wire AC/DC		3 Wire DC	
	Red	Green	Green	Amber
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	Off	On	On	On
*SCP Mode Activated	Both Flashing		Both Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

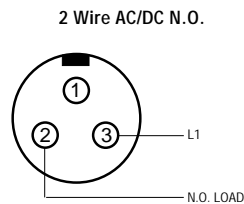
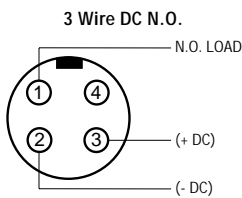
¹ Namco 2-wire AC/DC sensors are bipolar by design - they cannot be mis-wired.

² Namco 3-wire DC sensors incorporate reverse polarity protection.

Wiring Diagrams

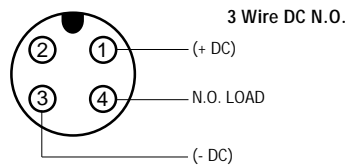
MINI CONNECTOR MODELS

Male views shown



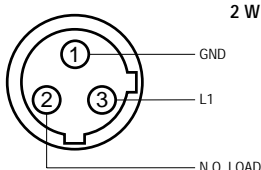
EURO CONNECTOR MODELS

Male view shown



MICRO CONNECTOR MODELS

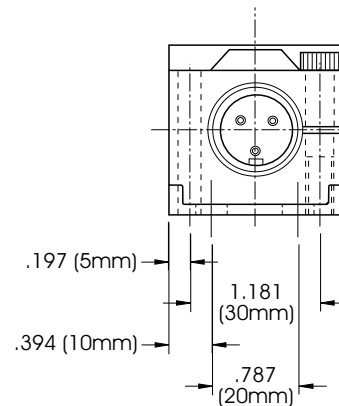
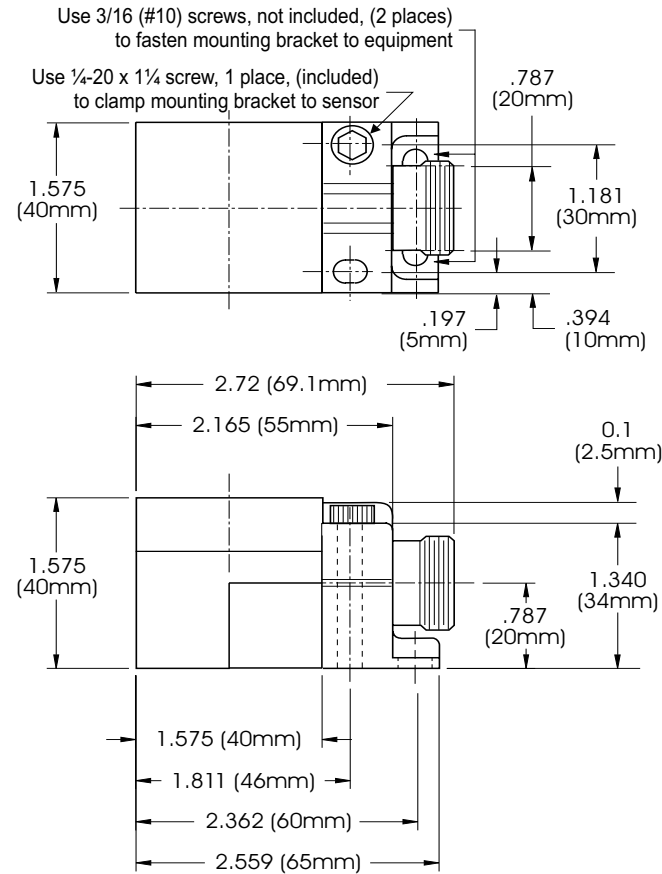
Male view shown



Dimensional Drawings

DC, AC/DC

HAMMERHEAD SENSORS - MINI CONNECTORS



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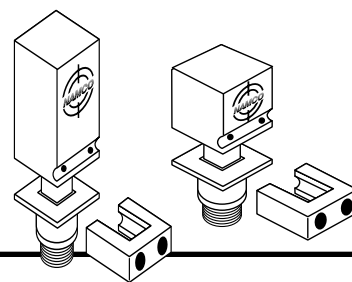
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**Weld
Field
Immune**

Inductive Rotatable Rectangular

**DC
AC/DC**



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Predictable, Consistent Performance
- 100% Tested and Burned-in
- New Ultra Long Range models in latching and non-latching

These sensors are specifically designed for extreme duty use in harsh applications such as automotive fabrication and assembly plants. The rectangular series has been the standard of the automotive industry for over 25 years. In that time several different versions, all with a common mounting, have been developed for use as part present and machine location sensors. In addition, specific accessories have been developed to make these sensors even more reliable in your application.

0.5"/1.0" Range (Unshielded) Rotatable Sensors

Connector Type	Circuit Description	Front Sense**	Top Sense	Maximum Load Current	Leakage Current	Voltage Drop*	Short Circuit Protected	Inrush Current
SHORT HOUSING DC 10-30V 0.5" Range								
4-pin Euro	3W, PNP, NO	EE510-15440	EE510-19440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-15040	EE510-19040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-15400	EE510-19400	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-15000	EE510-19000	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
SHORT HOUSING AC/DC 20-230V 0.5" Range								
3-pin Mini	2W, NO, LL	EE530-15400	EE530-19400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Micro	2W, NO, LL	EE530-15420	EE530-19420	500mA	1.7mA	<10V	Latching	3A (20ms)
LONG HOUSING DC 10-30V 0.5" Range								
4-pin Euro	3W, PNP, NO	EE510-10440	EE510-14440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-10040	EE510-14040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-10400	EE510-14400	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-10000	EE510-14000	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
8' Cable	3W, PNP, NO	EE510-10415	EE510-14415	200mA	10µA	2.0V @ 100mA	Latching	N/A
8' Cable	3W, PNP, NO	EE510-10015	EE510-14015	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
LONG HOUSING AC/DC 20-230V 0.5" Range								
3-pin Mini	2W, NO, LL	EE530-10400	EE530-14400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Micro	2W, NO, LL	EE530-10420	EE530-14420	500mA	1.7mA	<10V	Latching	3A (20ms)
LONG HOUSING DC 10-30V 1.0" Range								
4-pin Euro	3W, PNP, NO	EE510-30440	EE510-34440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-30040	EE510-34040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
LONG HOUSING AC/DC 20-150V 1.0" Range								
3-pin Mini	2W, NO, LL	EE530-30400	EE530-34400	200mA	1.7mA	<10V	Latching	1.5A

* Across conducting sensor

** Rotate for left or right sense.

- "LL" indicates *Low Leakage*
- Consult factory for normally closed and *High Leakage* model availability.



Common Sensor Characteristics

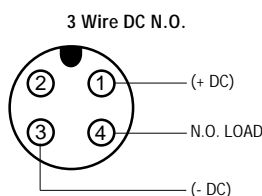
ROTATABLE INDUCTIVE RECTANGULAR SENSORS	
Nominal Sensing Range (±10%)	0.5"/1.0"
Short Circuit Protection	yes
Repeatability	<±1%
Hysteresis	3-10%
Temperature Drift (max.)	±10%
Ambient Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Housing	Weld Flash Resistant
Cable Type	PVC
Shipping Weight	Connector model: 6 oz. Cable model: 11 oz.
Maximum Switching Frequency	16Hz

* 1" range is for the Ultra Long Range models only

Circuit Drawings

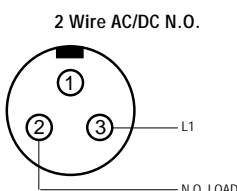
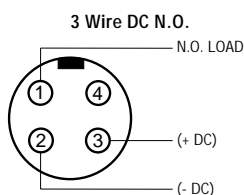
EURO CONNECTOR MODELS

Male view shown

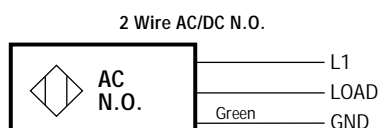
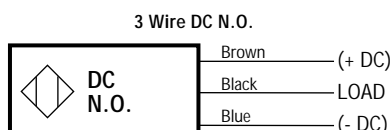


MINI CONNECTOR MODELS

Male views shown



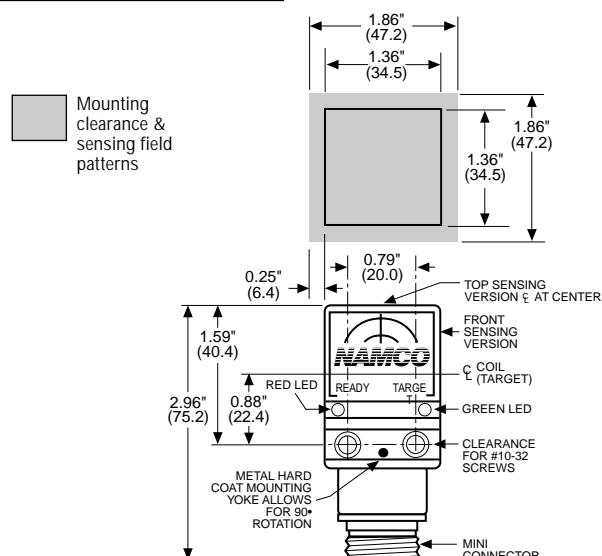
CABLE MODELS



Dimensional Drawings

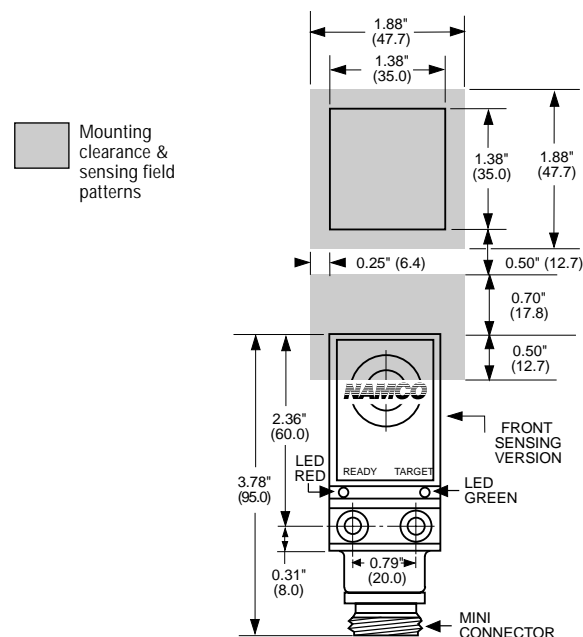
DC, AC/DC

ROTATABLE SENSORS – SHORT HOUSING



ROTATABLE SENSORS – LONG HOUSING

Rectangular/Ultra Long Range models

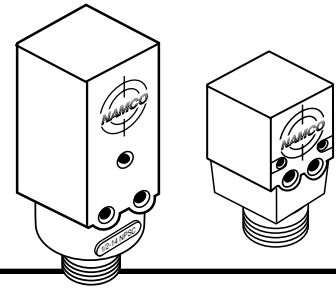


Proximity Sensors

NAMCO

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- Weld Field and Electrical Noise Immunity
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in
- Weld Spatter Resistant Housings Will Not Support Combustion
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP Available for DC Models only

These sensors are specifically designed for extreme duty use in harsh applications such as automotive fabrication and assembly plants. The rectangular series has been the standard of the automotive industry for over 25 years. In that time several different versions, all with a common mounting, have been developed for use as part present and machine location sensors. In addition, specific accessories have been developed to make these sensors even more reliable in your application.

0.5" Range (Unshielded) Thermoset Sensors

Connector Type	Circuit Description	Front Sense Model No.	Left Sense Model No.	Right Sense Model No.	Top Sense Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Short Circuit Protected	Inrush Current
SHORT HOUSING DC 10-30V										
4-pin Euro	3W, PNP, NO	EE510-55440	EE510-56440	EE510-58440	EE510-59440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-55040	EE510-56040	EE510-58040	EE510-59040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
SHORT HOUSING AC/DC 20-230V										
3-pin Mini	2W, NO, LL	EE530-55400	EE530-56400	EE530-58400	EE530-59400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Mini	2W, NO, HL	EE560-55400	EE560-56400	EE560-58400	EE560-59400	500mA	4.5mA	<10V	Latching	3A (20ms)
LONG HOUSING DC 10-30V										
4-pin Mini	3W, PNP, NO	EE510-50400	EE510-51400	EE510-53400	EE510-54400	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Mini	3W, PNP, NO	EE510-50000	EE510-51000	EE510-53000	EE510-54000	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-50440	EE510-51440	EE510-53440	EE510-54440	200mA	10µA	2.0V @ 100mA	Latching	N/A
4-pin Euro	3W, PNP, NO	EE510-50040	EE510-51040	EE510-53040	EE510-54040	200mA	10µA	2.0V @ 100mA	Non-Latching	N/A
LONG HOUSING AC/DC 20-230V										
3-pin Mini	2W, NO, LL	EE530-50400	EE530-51400	EE530-53400	EE530-54400	500mA	1.7mA	<10V	Latching	3A (20ms)
3-pin Mini	2W, NO, HL	EE560-50400	EE560-51400	EE560-53400	EE560-54400	500mA	4.5mA	<10V	Latching	3A (20ms)
8' Cable	2W, NO, HL	EE560-50415	EE560-51415	EE560-53415	EE560-54415	500mA	4.5mA	<10V	Latching	3A (20ms)
LONG HOUSING AC/DC 20-230V DUAL SENSING										
5-pin Mini	2W, NO, LL	EE530-65500	-	-	-	500mA	1.7mA	<10V	Latching	3A (20ms)
5-pin Mini	2W, NO, HL	EE560-65500	-	-	-	500mA	4.5mA	<10V	Latching	3A (20ms)

* Across conducting sensor

- "LL" indicates *Low Leakage* and "HL" indicates *High Leakage*.
- Consult factory for normally closed model availability.



Common Sensor Characteristics

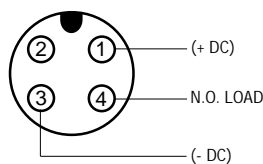
THERMOSET INDUCTIVE RECTANGULAR SENSORS	
Nominal Sensing Range ($\pm 10\%$)	0.5"
Short Circuit Protection	yes
Repeatability	$< \pm 1\%$
Hysteresis	3-10%
Temperature Drift (max.)	$\pm 10\%$
Ambient Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Housing	Weld Flash Proof
Cable Type	PVC
Shipping Weight	6 oz.
Maximum Switching Frequency	16Hz

Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

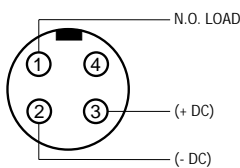
3 Wire DC N.O.



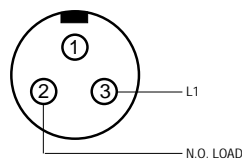
MINI CONNECTOR MODELS

Male views shown

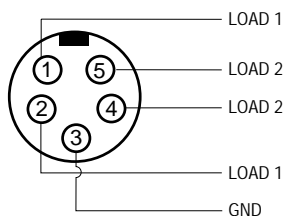
3 Wire DC N.O.



2 Wire AC/DC N.O.

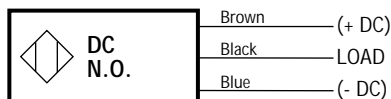


5 Wire AC/DC N.O.

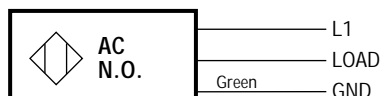


CABLE MODELS

3 Wire DC N.O.

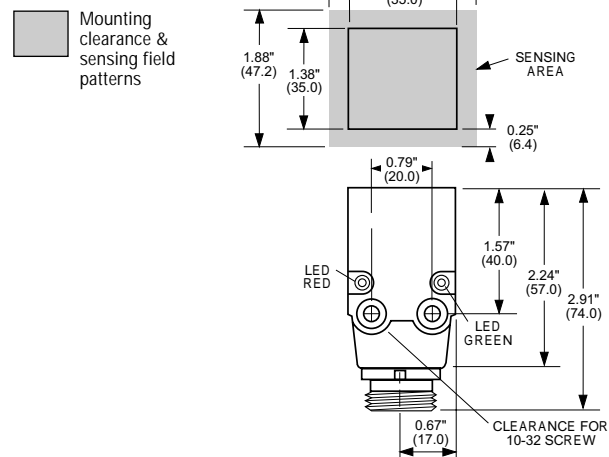


2 Wire AC/DC N.O.

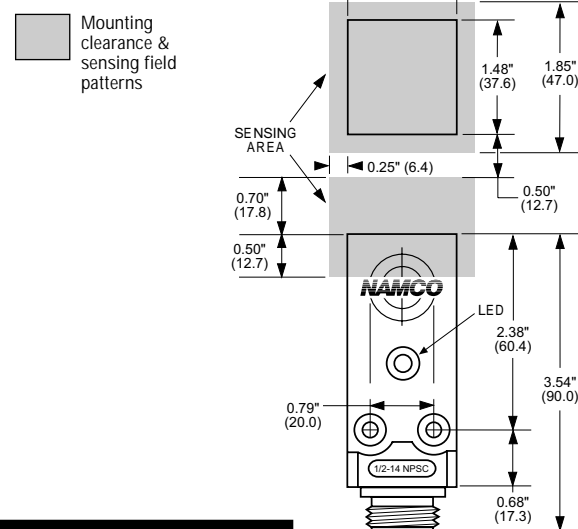


Dimensional Drawings

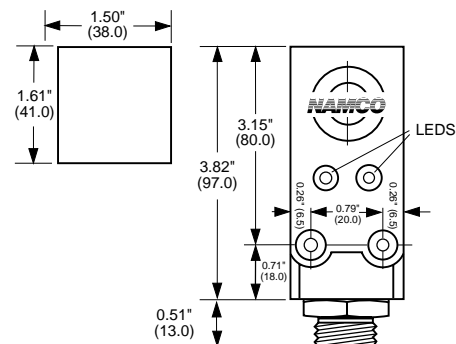
THERMOSET SENSORS – SHORT HOUSING



THERMOSET SENSORS – LONG HOUSING



THERMOSET SENSORS – DUAL SENSING



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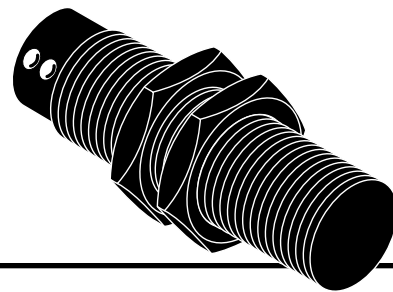
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12mm
18mm

Inductive Tubular Threaded Barrel

Weld
Field
Immune



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP available for DC models only
- Predictable, consistent electrical performance
- New Hardcoat housings are resistant to weld expulsion

These sensors are specifically designed for extreme duty use in harsh applications (i.e., automotive fabrication, assembly plants, etc.). The tubular series is popular as part present and machine location sensors for demanding applications such as resistance welding of body assemblies. Namco's proprietary Hardcoat housings will not allow the hot weld expulsion to adhere to the housing.

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
12mm WFI DC 10-30V Hardcoat, 2mm (Shielded) and 4mm (Unshielded) Sensing Ranges)											
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-78442	EE510-79442	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-78042	EE510-79042	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
18mm WFI DC 10-30V Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73442	EE510-72442	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73042	EE510-72042	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
90° 4-pin Euro	3W, PNP, NO	Metal-HC**	67mm	EE510-73452	EE510-72452	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
90° 4-pin Euro	3W, PNP, NO	Metal-HC**	76mm	EE510-73052	EE510-72052	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73402	EE510-72402	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73002	EE510-72002	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
90° 4-pin Mini	3W, PNP, NO	Metal-HC**	67mm	EE510-73422	EE510-72422	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
90° 4-pin Mini	3W, PNP, NO	Metal-HC**	76mm	EE510-73022	EE510-72022	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
18mm WFI AC/DC 20-230V Hardcoat, 5mm (Shielded) and 8mm (Unshielded) Sensing Ranges)											
3-pin Mini	2W, NO	Metal-HC**	76mm	EE530-73402	EE530-72402	500mA	1.7mA	<10V	16Hz	16Hz	Latching
3-pin Mini	2W, NO	Metal-HC**	76mm	EE560-73402	EE560-72402	500mA	4.5mA	<10V	16Hz	16Hz	Latching
3-pin Micro	2W, NO	Metal-HC**	76mm	EE530-73432	EE530-72432	500mA	1.7mA	<10V	16Hz	16Hz	Latching
90° 3-pin Mini	2W, NO	Metal-HC**	67mm	EE530-73422	EE530-72422	500mA	1.7mA	<10V	16Hz	16Hz	Latching
90° 3-pin Mini	2W, NO	Metal-HC**	67mm	EE560-73422	EE560-72422	500mA	4.5mA	<10V	16Hz	16Hz	Latching

* Across conducting sensor

** Hard Coat: Weld spatter resistant

*** Non-hardcoat versions

► Consult factory for normally closed model availability.



Common Sensor Characteristics

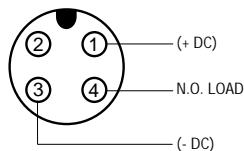
18mm DIAMETER WFI SENSORS		
	18mm	12mm
Shielded Sensing Range ($\pm 10\%$)	5mm	2mm
Unshielded Sensing Range ($\pm 10\%$)	8mm	4mm
Short Circuit Protection	yes	yes
Repeatability	$< \pm 1\%$	
Hysteresis	3-10%	
Temperature Drift (max.)	$\pm 10\%$	
Ambient Temperature Range	-4°F to $+158^{\circ}\text{F}$	
Reverse Polarity Protected	yes	
Current Consumption (3-wire DC only)	10mA	
NEMA Enclosure Type	1, 3, 4, 6, 13	
LED Indicator (AC/DC)	red = power, grn = target	
LED Indicator (DC)	grn = pwr, Amber = target	
Metal Housings	Weld Flash Proof	
Shipping Weight	4 oz.	

Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

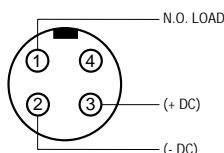
3 Wire DC N.O.



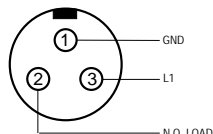
MINI CONNECTOR MODELS

Male views shown

3 Wire DC N.O.



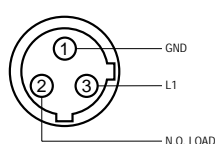
2 Wire AC/DC N.O.



MICRO CONNECTOR

Male view shown

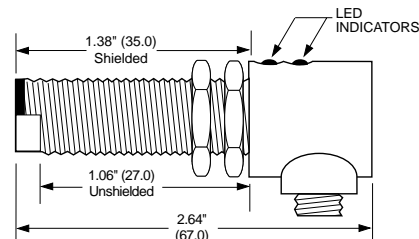
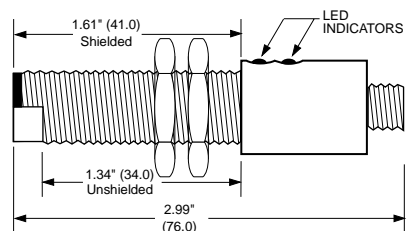
2 Wire AC/DC N.O.



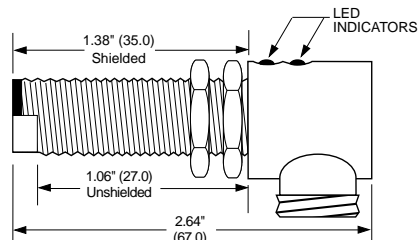
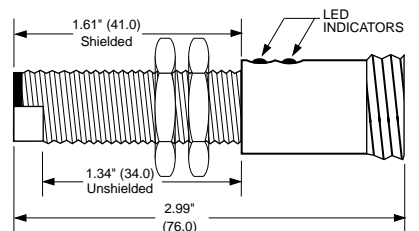
Dimensional Drawings 12/18mm-WFI

18mm EURO CONNECTOR

Body threads = M18x1

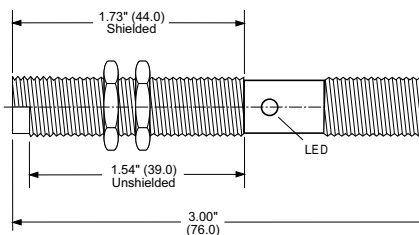


18mm MINI CONNECTOR



12mm EURO CONNECTOR

Body threads = M12x1



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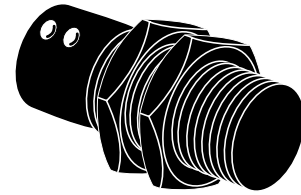
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30mm

Inductive Tubular Threaded Barrel

Weld Field Immune



Proximity Sensors

- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP available for DC models only.
- Dual LED indicators
- Predictable, consistent electrical performance
- 100% tested & burned-in
- New Hardcoat housings are resistant to weld expulsion

These sensors are specifically designed for extreme duty use in harsh applications (i.e., automotive fabrication, assembly plants, etc.). The tubular series is popular as part present and machine location sensors for demanding applications such as resistance welding of body assemblies. Namco's proprietary Hardcoat housings will not allow the hot weld expulsion to adhere to the housing.

10mm (Shielded) and 15mm (Unshielded) Sensing Range

Connector Type	Circuit Description	Housing Material	Housing Length	Shielded Model No.	Unshielded Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency		Short Circuit Protected
									Shielded	Unshielded	
WFI DC 10-30V											
4-pin Euro	3W, PNP, NO	Metal-HC	76mm	EE510-77442	EE510-76442	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Mini	3W, PNP, NO	Metal-HC	76mm	EE510-77402	EE510-76402	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Latching
4-pin Euro	3W, PNP, NO	Metal-HC	76mm	EE510-77042	EE510-76042	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Metal-HC	76mm	EE510-77002	EE510-76002	200mA	10µA	2 VDC @ 100mA	16Hz	16Hz	Non-Latching
WFI AC/DC 20-230V											
3-pin Mini	2W, AC/DC, NO,LL	Metal-HC	76mm	EE530-77402	EE530-76402	500mA	1.7mA	<10V	16Hz	16Hz	Latching
3-pin Mini	2W, AC/DC, NO, HL	Metal-HC	76mm	EE560-77402	EE560-76402	500mA	4.5mA	<10V	16Hz	16Hz	Latching
3-pin Micro	2W, AC/DC, NO	Metal-HC	76mm	EE530-77432	EE530-76432	500mA	1.7mA	<10V	16Hz	16Hz	Latching

* Across conducting sensor

► Consult factory for normally closed model availability.



Common Sensor Characteristics

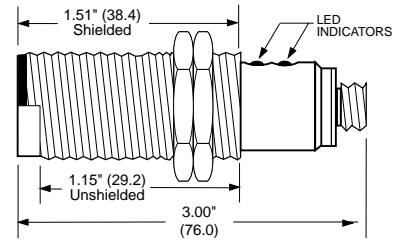
30mm DIAMETER WFI SENSORS	
Shielded Sensing Range ($\pm 10\%$)	10mm
Unshielded Sensing Range ($\pm 10\%$)	15mm
Short Circuit Protection	yes
Repeatability	$< \pm 1\%$
Hysteresis	3-10%
Range Drift over Temperature	$\pm 10\%$
Operating Temperature Range	-4°F to +158°F
Reverse Polarity Protected	yes
Current Consumption (3-wire DC only)	10mA
NEMA Enclosure Type	1, 3, 4, 6, 13
LED Indicator (AC/DC)	red = pwr, green = target
LED Indicator (DC)	green = pwr, amber = target
Metal Housings	Weld Flash Proof
Shipping Weight	5 oz.

Dimensional Drawings

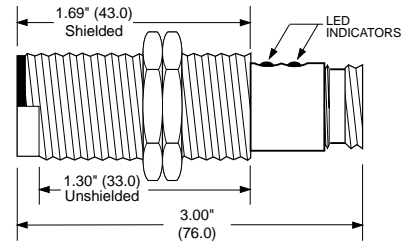
30mm-WFI

EURO/MICRO CONNECTOR MODELS

Body threads = M30x1.5



MINI CONNECTOR MODELS

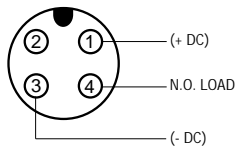


Circuit Drawings

EURO CONNECTOR MODELS

Male view shown

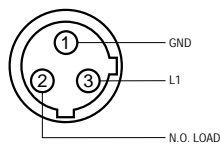
3 Wire DC N.O.



MICRO CONNECTOR MODELS

Male view shown

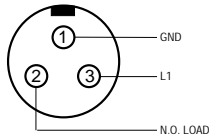
2 Wire AC/DC N.O.



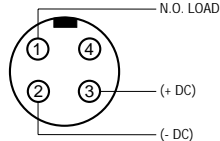
MINI CONNECTOR MODELS

Male views shown

2 Wire AC/DC N.O.



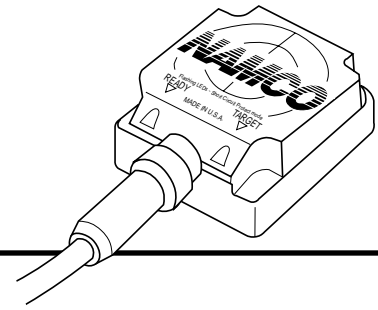
3 Wire DC N.O.



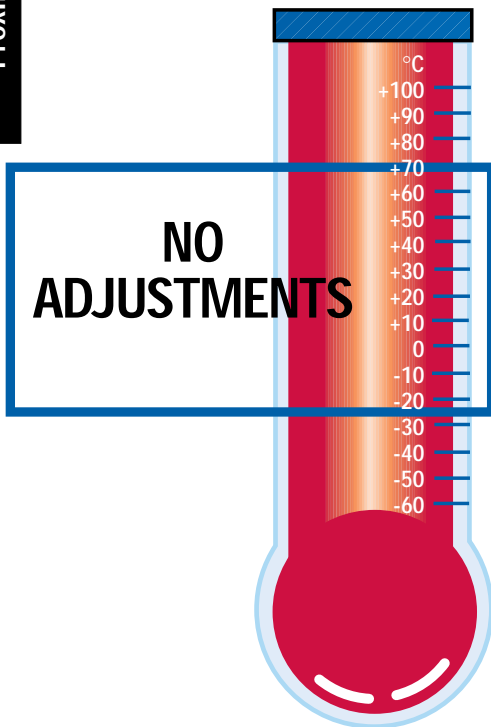
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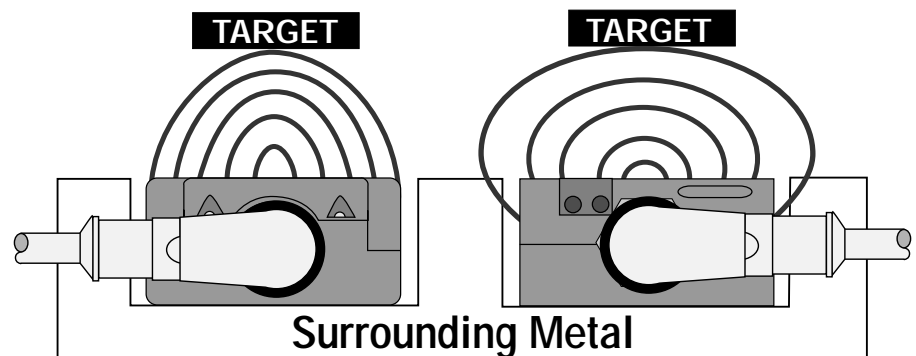
Focused Field FlatPak™ Sensor: Range Stable to 70°C, Never Needs Range Adjustments



The Namco Focused Field FlatPak™ Proximity Sensor is a Super Heavy Duty, completely encapsulated sensor designed to sense large metal objects at long ranges. It is the first sensor of this body style to offer a focused sensing field.

The focused sensing field allows this sensor to be mounted flush with surrounding metal with only a .25 inch gap between the sensor and the metal surface. This sensor will operate reliably in this setting without sensing range adjustments all year round regardless of changes in ambient temperature.

Competitive sensors have traditionally included a trim pot to enable the user to revise the sensing distance when ambient conditions changed. These sensors were susceptible to substantial growth in sensing range when ambient temperature changed from season to season. They would eventually "lock on" to surrounding metal due to this growth in range and to the un-focused nature of their sensing fields. Only a .25 inch clearance is necessary to insure that the Focused Field FlatPak will never lock on to surrounding metal.

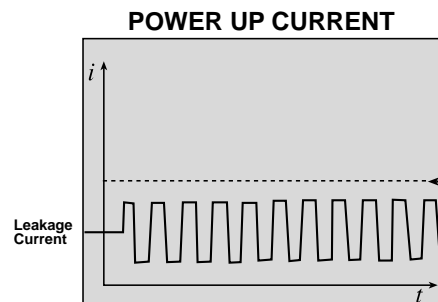


Namco FlatPak

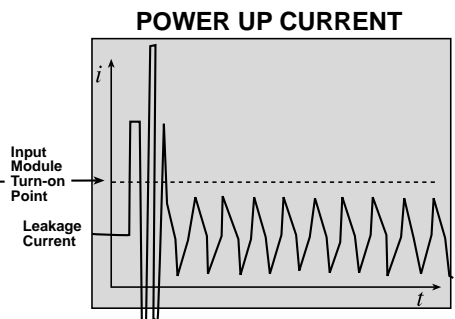
Other Extended Range Sensors

No TRANSIENTS at Power-Up

The Namco FlatPak sensor has the most noise resistant circuitry in the business, **Namco's patented Weld Field Immune (WFI) circuitry**. Not only will the sensor operate reliably in the presence of 20,000 amp weld fields, it also powers-up glitch-free and is extremely resistant to radio frequency interference and other forms of electrical noise. Problems such as "false detection" and "dropping out" are non-existent, further minimizing programming and maintenance requirements.



Namco Focused Field FlatPak Sensor. A clean wave means predictable performance.



Power-up current draw of competitive sensor will turn on PLC inputs.

An Easy Upgrade... Directly Replaces Other Extended Range Sensors

The Namco Focused Field FlatPak™ Sensor is designed to directly replace existing sensors of this format. It mounts on 65mm bolt centers and is the only sensor of this type that is made in the USA. It comes with a Lifetime Free Replacement Warranty.



Assists in Troubleshooting

Namco's WFI circuit includes latching Short Circuit Protection (SCP). If the sensor detects excessive current, it reverts to a sleep state with LEDs alternately flashing. This provides a clear indication of a problem in the circuit, simplifying the troubleshooting task. The sensor draws minimal current (2mA) and can remain in this state indefinitely.

No sensing range adjustments, ever.

Namco Weld Field Immune circuitry is designed to operate in presence of resistance welding electrodes carrying 20,000 Amperes RMS (45,000 Amperes peak).

Weld-splatter resistant housing.

Super Reliable—Covered by Namco Lifetime Replacement Program.

Built-in connector available.

Available with either 40mm or 50mm sensing range.

Namco's patented latching short circuit protection is very fast acting. Prolonged shorts will not damage electronics; latching feature aids in the diagnosis of troublesome intermittent faults.

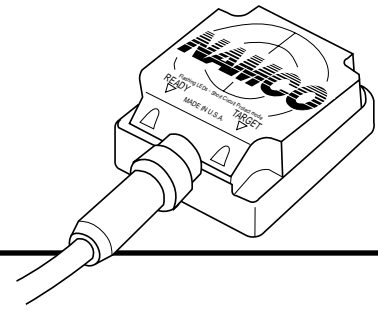
Available in either 20-150 VAC/DC or 10-30 VDC styles.

Only extended range sensor made in the USA.



You can mount flush with metal floors or within metal channel.

Focused Field Long Range Sensors



- 40mm or 50mm Sensing Range
- “No Adjustment” Sensor
- Flush Mountable - Focused Field Will not Lock on Surrounding Metal
- Easy Upgrade/Direct Replacement
- Sensing Range - Stable From -25°C to 70°C
- Namco Weld Field Immune Circuit
- Clean PowerUp - No Turn-on Transients
- Latching SCP - Simplifies Troubleshooting
- Super Reliable, Fully Epoxy-Encapsulated: Covered by Lifetime Free Replacement Program
- **ONLY SENSOR OF ITS TYPE MADE IN USA**



The NAMCO Focused Field FlatPak™ Proximity Sensor is a Super Heavy Duty, completely encapsulated sensor designed to sense large metal objects at long ranges in tough environments. It is the first sensor of this body style to offer a focused sensing field.

Competitive sensors have traditionally included a trim pot to enable the user to revise the sensing distance when ambient conditions change. These sensors are susceptible to substantial growth in sensing range when ambient temperatures change from season to season. They eventually “lock on” to surrounding metal due to this growth in range and to the unfocused nature of their sensing fields.

The Namco Focused Field FlatPak™ Sensor has two advantages over competitive products that eliminate the need for constant adjustment. **In fact, there are no sensitivity adjustments to be made, ever!!!**

The first advantage is the focused field. The shape of this field minimizes sensing of surrounding metal. When mounted in an identical setting to the competitive switch, it's sensing range changes less than 10%, and the shape of the field stays focused forward of the switch.

The second advantage is exceptional stability over temperature. The Namco FlatPak's range will increase a maximum of 10% even at the maximum ambient tempera-

ture, and the shape of the field will continue in a non-side-sensing focused field.

The Namco Focused Field FlatPak™ proximity sensor requires only a .25 inch clearance to surrounding metal. Once installed with this clearance, the sensor will never lock on to surrounding metal.

This Namco FlatPak also includes the most noise resistant circuitry in the business, Namco's patented Weld Field Immune (WFI) circuitry. Not only will the sensor operate reliably in the presence of 20,000 amp weld fields, it also powers up glitch-free and is extremely resistant to radio frequency interference and other forms of electrical noise. Problems such as “false detection” and “dropping out” are non-existent, further minimizing programming and maintenance requirements.

Namco's WFI circuit includes latching Short Circuit Protection (SCP). If the sensor detects excessive current, it reverts to a sleep state with LEDs flashing. This provides a clear indication of a problem in the circuit, simplifying the troubleshooting task. The sensor draws minimal current (2 mA) and can remain in this state indefinitely.

The Namco Focused Field FlatPak™ Sensor is designed to directly replace existing sensors of this format. It mounts on 65mm bolt centers and is **the only sensor of this type that is Made in the USA**. It comes with a Lifetime Free Replacement Warranty.

Connector Type	Circuit Description	Housing Material	Housing Dimensions	Model No.	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
40mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-86440	200mA	<10µA	<2.5V @ 200mA	15Hz	Latching
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-86040	200mA	<10µA	<2.5V @ 200mA	15Hz	Non-latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-86400	200mA	<10µA	<2.5V @ 200mA	15Hz	Latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-86000	200mA	<10µA	<2.5V @ 200mA	15Hz	Non-latching
40mm SENSING RANGE AC/DC 20-150V									
3-pin Micro	2W, NO	Fortron	79x92x40mm	EE530-86420	200mA	1.7mA	≤10V	15Hz	Latching
3-pin Mini	2W, NO	Fortron	79x92x40mm	EE530-86400	200mA	1.7mA	≤10V	15Hz	Latching
50mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-88440	200mA	<10µA	<2.5V @ 200mA	15Hz	Latching
4-pin Euro	3W, PNP, NO	Fortron	79x92x40mm	EE510-88040	200mA	<10µA	<2.5V @ 200mA	15Hz	Non-latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-88400	200mA	<10µA	<2.5V @ 200mA	15Hz	Latching
4-pin Mini	3W, PNP, NO	Fortron	79x92x40mm	EE510-88000	200mA	<10µA	<2.5V @ 200mA	15Hz	Non-latching
50mm SENSING RANGE AC/DC 20-150V									
3-pin Micro	2W, NO	Fortron	79x92x40mm	EE530-88420	200mA	1.7mA	≤10V	15Hz	Latching
3-pin Mini	2W, NO	Fortron	79x92x40mm	EE530-88400	200mA	1.7mA	≤10V	15Hz	Latching

Note: For Minimum-On-Delay* versions of any of the part numbers above - Replace the “0” at the end of the part number with a “5”.

(i.e.: EE510-86445 is the Minimum-On-Delay version of the EE510-86440).

* Minimum-On-Delay provides an output “On” for a minimum 0.5 sec., no matter how short a period the target is present.

Common Sensor Characteristics

FLATPAK PROXIMITY SENSORS		
Supply Voltage	10-30V DC	20-150V AC/DC
Voltage Drop	≤ 2.5V @ 200mA	≤ 10V
	≤ 2.0V @ ≤ 100mA	
Max. Load Current @ 25°C	200mA	
Inrush Current (rms 1Hz)	-	1.5A
Leakage Current	10μA	1.7mA
Sensing Range	40mm/50mm	
Response Time	30ms	
Power-up Time	70ms	
Max. Switching Frequency	15Hz	
Ambient Temp. Range	-25°C to 70°C (-13°F to 158°F)	

LED Functions

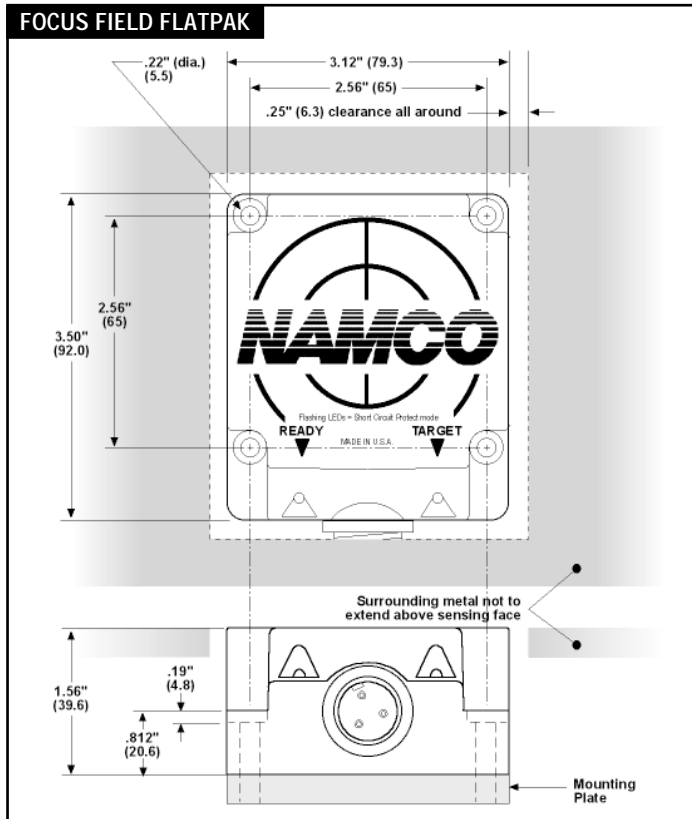
	10-30V DC		20-150V AC/DC	
	Green	Amber	Red	Green
Power Off	Off	Off	Off	Off
Power On Load De-energized	On	Off	On	Off
Power On Load Energized	On	On	Off	On
*SCP Mode Activated	Flashing		Flashing	

*Short Circuit Protection: If the sensor is shorted, the sensor's Short Circuit Protection (SCP) will be activated. When this occurs, both LEDs will flash and the sensor will limit current flow to about 2.0mA.

Dimensional Drawings

EE500

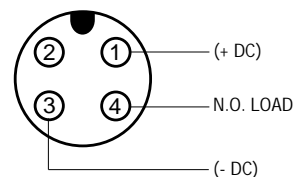
Proximity Sensors



Circuit Drawings

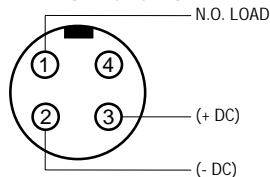
EURO CONNECTOR MODELS

3 Wire DC N.O.

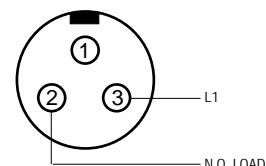


MINI CONNECTOR MODELS

3 Wire DC N.O.

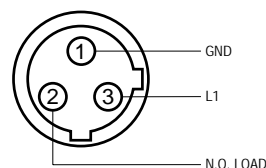


2 Wire AC/DC N.O.



MICRO CONNECTOR MODELS

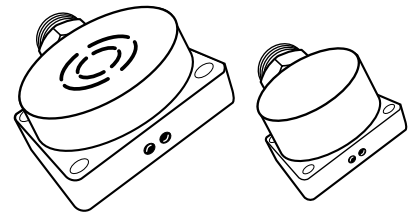
2 Wire AC N.O.



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- Weld Field and Electrical Noise Immunity
- Standard Latching Short Circuit Protection (SCP), Non-Latching SCP Available for DC Models Only
- Predictable, Consistent Electrical Performance
- 100% Tested and Burned-in

These sensors are specifically designed for extreme duty use in harsh applications such as automotive fabrication and assembly plants. Our Extended Range sensors have been designed primarily for use as part present sensors for sheet metal operations, or other applications where target to sensor relationship cannot be guaranteed during operation. For the 25mm range unit, a special cover is available to protect the thermoset housing from damage caused by extreme weld expulsion.

Connector Type	Circuit Description	Housing Material	Housing Dimensions	Model No. (Unshielded)	Maximum Load Current	Leakage Current	Voltage Drop*	Maximum Switching Frequency	Short Circuit Protected
25mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83441	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Euro	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83041	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83401	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Mini	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83001	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
8' Cable	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83411	200mA	10µA	2.0V @ 100mA	16Hz	Latching
8' Cable	3W, PNP, NO	Thermoset	74x50x41mm	EE510-83011	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
25mm SENSING RANGE AC/DC 20-230V									
3-pin Micro	2W, NO, LL	Thermoset	74x50x41mm	EE530-83421	500mA	1.7mA	<10V	16Hz	Latching
3-pin Micro	2W, NO, HL	Thermoset	74x50x41mm	EE560-83421	500mA	4.5mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, LL	Thermoset	74x50x41mm	EE530-83401	500mA	1.7mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, HL	Thermoset	74x50x41mm	EE560-83401	500mA	4.5mA	<10V	16Hz	Latching
8' Cable	2W, NO, HL	Thermoset	74x50x41mm	EE560-83411	500mA	4.5mA	<10V	16Hz	Latching
50mm SENSING RANGE DC 10-30V									
4-pin Euro	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84440	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Euro	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84040	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
4-pin Mini	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84400	200mA	10µA	2.0V @ 100mA	16Hz	Latching
4-pin Mini	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84000	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
8' Cable	3W, PNP, NO	Thermoplastic	117x101x50mm	EE510-84010	200mA	10µA	2.0V @ 100mA	16Hz	Non-Latching
50mm SENSING RANGE AC/DC 20-230V									
3-pin Micro	2W, NO, LL	Thermoplastic	117x101x50mm	EE530-84420	500mA	1.7mA	<10V	16Hz	Latching
3-pin Micro	2W, NO, HL	Thermoplastic	117x101x50mm	EE560-84420	500mA	4.5mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, LL	Thermoplastic	117x101x50mm	EE530-84400	500mA	1.7mA	<10V	16Hz	Latching
3-pin Mini	2W, NO, HL	Thermoplastic	117x101x50mm	EE560-84400	500mA	4.5mA	<10V	16Hz	Latching
8' Cable	2W, NO, HL	Thermoplastic	117x101x50mm	EE560-84410	500mA	4.5mA	<10V	16Hz	Latching

* Across conducting sensor

- ▶ "LL" indicates *Low Leakage* and "HL" indicates *High Leakage*.
- ▶ Consult factory for normally closed model availability.

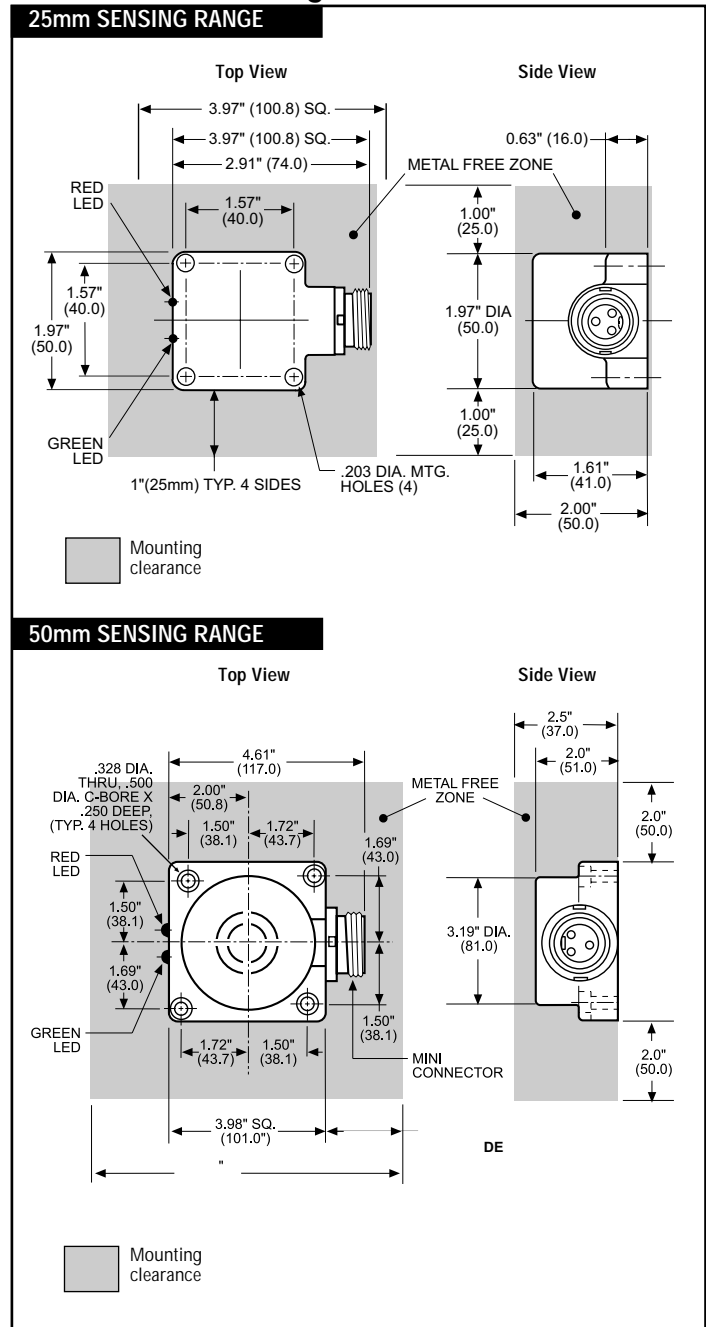


Common Sensor Characteristics

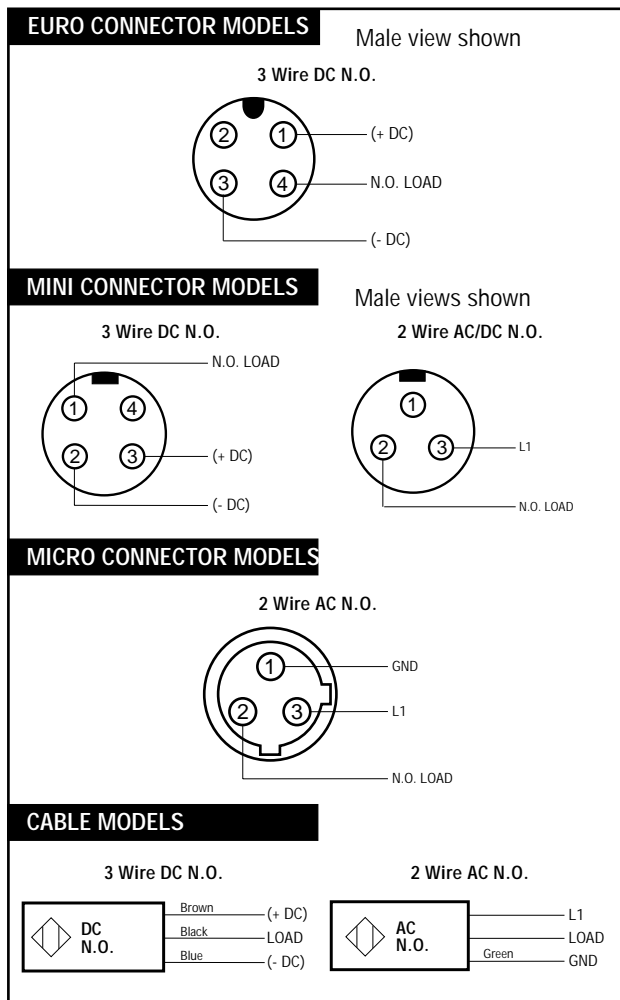
EXTENDED RANGE SENSORS		
	2W AC/DC	3W DC
Nominal Sensing Range ($\pm 10\%$)	25mm & 50mm	
Current Consumption	N/A	10mA
Short Circuit Protection	yes	
Reverse Polarity Protected	yes	
Temperature Drift (Max.)	$\pm 10\%$	
Ambient Temperature Range	25mm: -4°F to $+158^{\circ}\text{F}$ 50mm: -4°F to $+122^{\circ}\text{F}$	
Cable Type	PVC	
Hysteresis	3-10%	
Repeatability	$< \pm 1\%$	
LED Indicator	red = power green = target	grn = power amber = target
Shipping Weight	25mm	50mm
Connector model:	10 oz.	2 lb.
Cable model:	15 oz.	2 lb. 5 oz.

* See Proximity Reference Information Section for details on mounting clearances for extended range sensors.

Dimensional Drawings



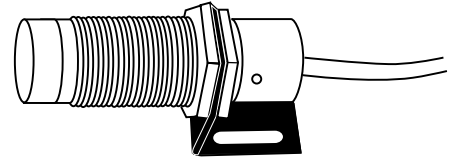
Circuit Drawings



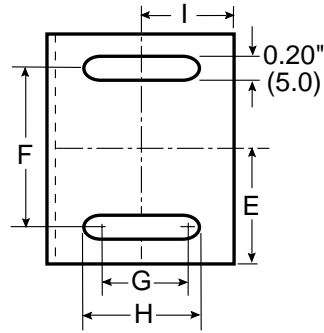
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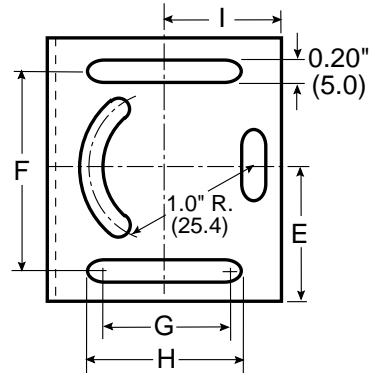
For technical assistance, call 1-800-NAMTECH



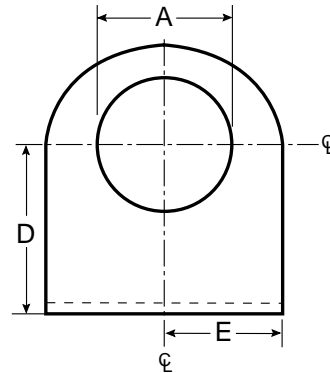
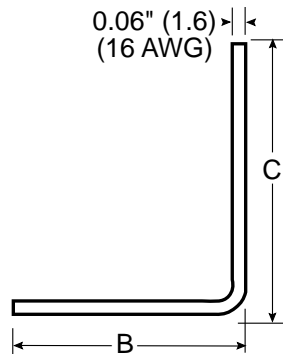
12-47mm TUBULAR MOUNTING BRACKETS



12-30mm Base



47mm Base



12-47mm Side and Front

Model No.	Sensor Diameter	Hole Diameter	Depth	Height	Height to Center	Width to Center	Slot Centers	Drill Centers	Slot Length	Depth Center	Material
		A	B	C	D	E	F	G	H	I	
EE972-01803	8mm	0.38" (9.6)	1.00" (25.4)	1.25" (31.8)	0.75" (19.1)	0.50" (12.7)	0.51" (13.0)	0.36" (9.1)	0.56" (14.2)	0.50" (12.7)	C. F. Steel
EE972-01804	12mm	0.50" (12.7)	1.00" (25.4)	1.25" (31.8)	0.75" (19.1)	0.50" (12.7)	0.51" (13.0)	0.36" (9.1)	0.56" (14.2)	0.50" (12.7)	C. F. Steel
EE972-01835	18mm	0.76" (19.5)	1.00" (25.4)	1.51" (38.2)	0.88" (22.3)	0.63" (15.8)	0.80" (20.3)	0.46" (11.6)	0.66" (16.7)	0.56" (14.2)	C. F. Steel
EE972-01807	30mm	1.25" (31.8)	1.50" (38.1)	1.92" (48.6)	1.09" (27.6)	0.83" (20.9)	1.16" (29.3)	0.80" (20.3)	1.00" (25.4)	0.75" (19.0)	C. F. Steel
EE972-02001	47mm	1.86" (47.2)	1.50" (38.1)	2.84" (72.0)	1.59" (40.3)	1.25" (31.8)	2.00" (50.8)	0.80" (20.3)	1.00" (25.4)	0.75" (19.0)	C. F. Steel

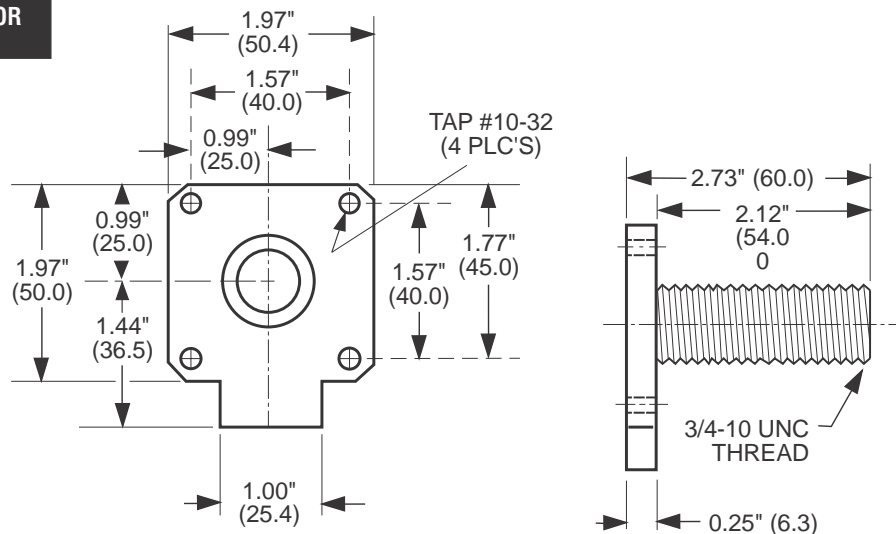
25mm ADJUSTABLE EXTENDED RANGE SENSOR MOUNTING BRACKET KIT

Part No. EE972-01860

Allows 25mm Proximity Sensors to be adjusted similarly to a standard tubular sensor. Kit includes (4) #10-32 socket head cap screws and (2) hex jam nuts.

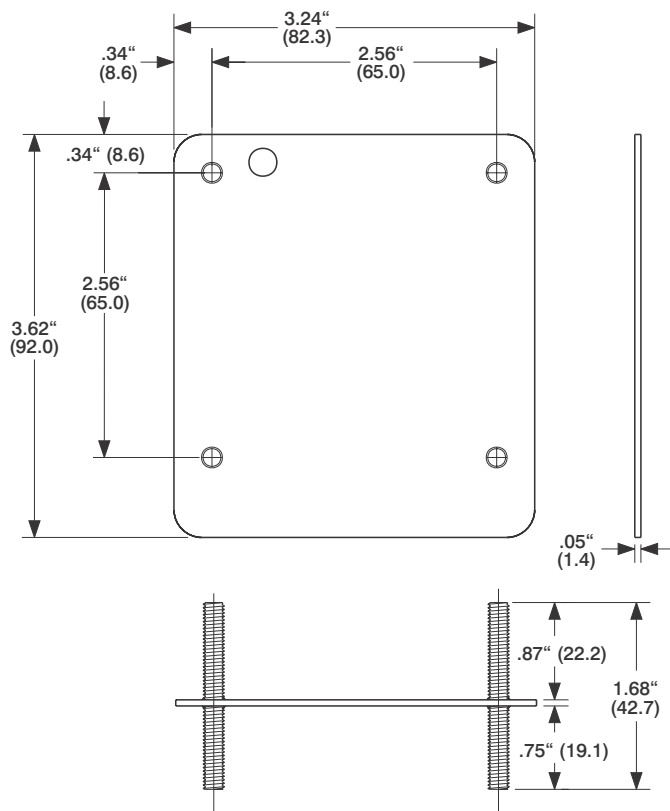
Part No. EE972-01861

Bracket only.



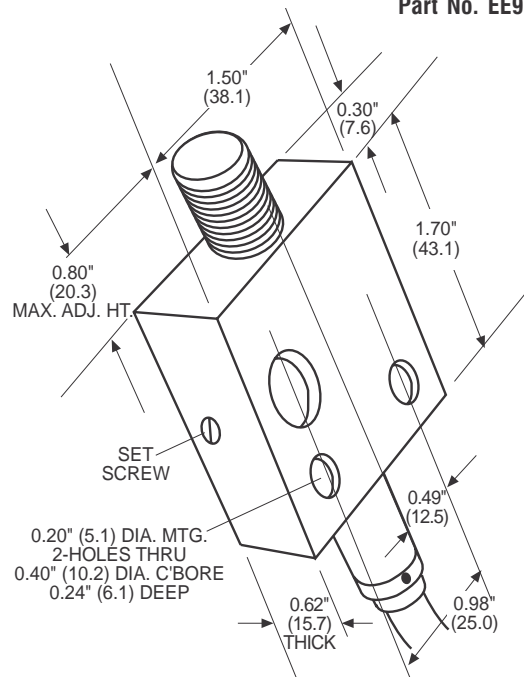
40mm FLATPAK BRACKET

Part No. EE972-01859



12mm TUBULAR BRACKET

Part No. EE972-01834



Continued on
next page. ➡

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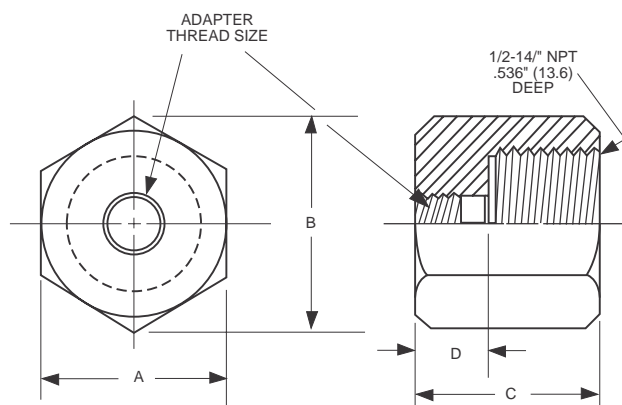
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Brackets, etc.

Proximity Sensor Accessories

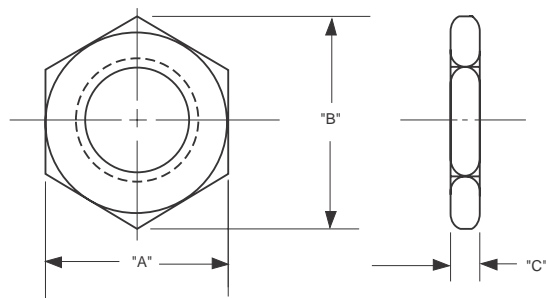
CONDUIT ADAPTERS



Material: Aluminum 2024
Stainless Steel version available on special order.
Consult factory.

Adapter Thread Size (mm)	HEX SIZE				Model No.
	Flats	Corners	Length	Depth	
	A	B	C	D	
8	1.00" (25.4)	1.15" (29.2)	1.00" (25.4)	0.25" (6.3)	EE014-20009
12	1.00" (25.4)	1.15" (29.2)	1.50" (38.1)	0.25" (6.3)	EE014-20010
18	1.00" (25.4)	1.15" (29.2)	2.00" (50.8)	0.25" (6.3)	EE014-20011
30	1.50" (38.1)	1.73" (43.9)	2.25" (57.1)	0.38" (9.6)	EE014-20012
47	2.00" (50.8)	2.31" (58.7)	2.50" (63.5)	0.38" (9.6)	EE014-20013

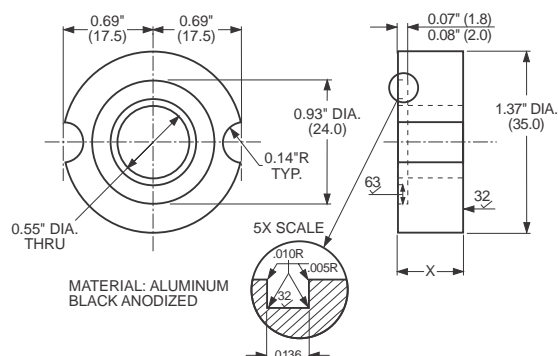
MOUNTING NUTS



I.D.	Mounting Nuts				Lock Washer	
	Dimensions			Model No.		Black, Serrated
	A	B	C	Metal	Plastic	
3/4-20	1.06" (26.9)	1.22" (30.9)	0.16" (4.1)	EE154-80001*	—	—
8mm	0.51" (13.0)	0.58" (14.7)	0.16" (4.1)	EE013-80011	EE013-80000	—
12mm	0.67" (17.0)	0.77" (19.5)	0.22" (5.6)	EE013-80003	EE013-81003	EE100-00139
18mm	0.94" (23.8)	1.06" (26.9)	0.16" (4.1)	EE013-80002*	EE013-81002	EE100-00137
30mm	1.44" (36.6)	1.66" (42.2)	0.19" (4.8)	EE013-80001*	EE013-81001	EE100-00138
47mm	2.00" (50.8)	2.20" (55.9)	0.20" (5.1)	EE013-80004	—	—

*Quantity one (1) per package; all others are shipped two (2) per package.

CYLINDRICATOR® SENSOR SPACER KITS



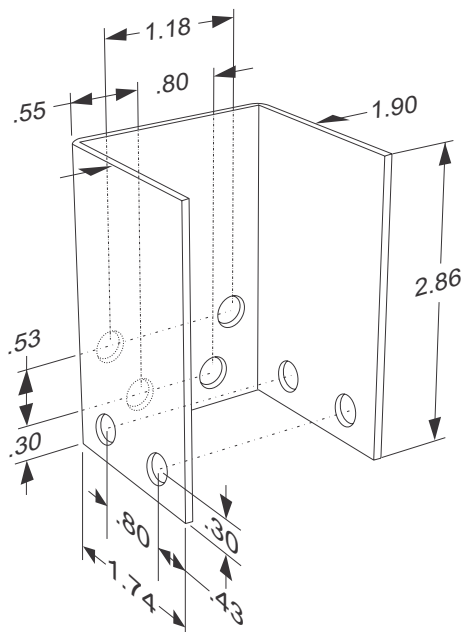
Kits include two mounting bolts and O-Ring. Replacement O-Ring is EE972-19306 (Equivalent to Parker # 2-116V709-90). Specify spacer height.

NOTE: Please consult factory before using spacer kits with LPR Cylindricator® sensors.

Dimension "X"	Model No.
0.19"	EE972-01827
0.25"	EE972-01822
0.31"	EE972-01829
0.38"	EE972-01831
0.50"	EE972-01820

Stainless Steel Protective Brackets

- Protects sensor from impact damage
- 14 gauge 304 Stainless superior to painted steel — resists weld slag buildup, minimally effects sensor performance
- Ideal for load/unload stations or locations where typical part tolerances make impact with sensors unavoidable



Part No. EE972-01910

HammerHead Sensors 9-Way Configurable Proximity Sensors

Model Number	Shielded Range	Unshielded Range	Effective Range (Sensor Mounted in SS Bracket)
EE5X0-90XX0	15mm	—	12mm
EE5X0-91XX0	20mm	—	16mm
EE5X0-92XX0	—	25mm	Not Recommended
EE5X0-93XX0	25mm	—	20mm
EE5X0-94XX0	—	35mm	Not Recommended

DuraProx Sensors 9-Way Configurable Proximity Sensors

Model Number	Shielded Range	Unshielded Range	Effective Range (Sensor Mounted in SS Bracket)
EE5X0-90XX1	15mm	—	12mm
EE5X0-91XX1	20mm	—	16mm
EE5X0-92XX1	—	25mm	Not Recommended
EE5X0-93XX1	25mm	—	20mm
EE5X0-94XX1	—	25mm	Not Recommended

TEFLON® CAPS

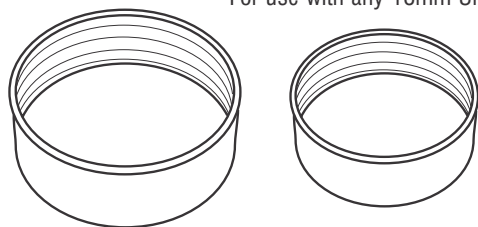
Repel weld slag;
increase sensor life.

Part No. EE505-60002

For use with any 18mm Shielded Sensor

Part No. EE505-60004

For use with any 18mm Unshielded Sensor



Part No. EE505-60003

For use with any 30mm Shielded Sensor

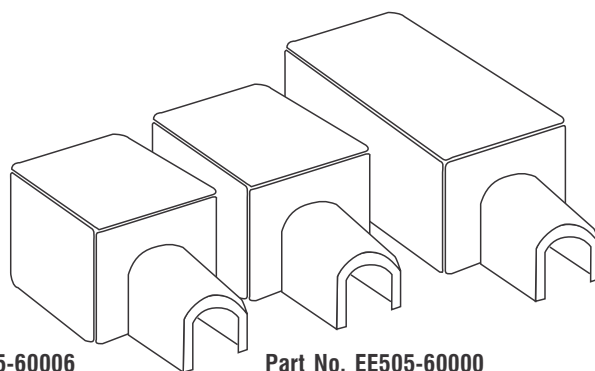
Part No. EE505-60005

For use with any 30mm Unshielded Sensor

WELD-SPLATTER RESISTANT COVERS

Part No. EE505-60001

For use with EE500-1 Rotatable Rectangular Sensors



Part No. EE505-60006

For use with EE500-9 HammerHead Sensors

Part No. EE505-60000

For use with EE500-8 25mm Extended Range Sensors

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Principles of Operation

Inductive

Proximity sensors are generally constructed with four main elements: (1) a coil and ferrite core assembly; (2) an oscillator; (3) a convertor/trigger circuit (detector) and; (4) an output device.

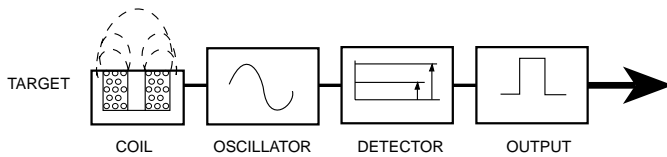


Figure 1

The oscillator creates a radio frequency field that is shaped and defined by the coil and core. As a target is placed in this field, eddy currents are set up in the surface of the target. The oscillator, being a limited power device, will lower its amplitude as the eddy currents are produced. The convertor/trigger circuit rectifies the AC sine wave signal to DC, compares the level against a preset reference, and actuates the sensor output if a target is present. Switching is clean, with none of the bounce of mechanical switches.

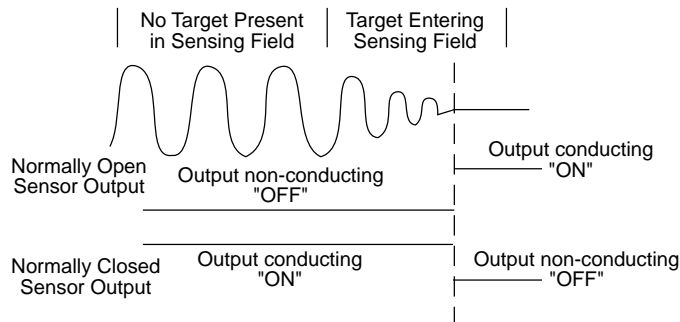


Figure 2

Capacitive

Essentially similar except that the coil is replaced by a sensing plate, and the oscillator is not running until the object to be detected is within range.

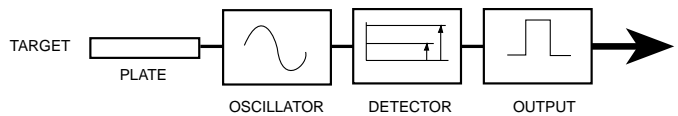


Figure 3

Capacitive sensors depend on the coupling between the sensing plate and earth ground. If a target is placed within range, the capacitance level will vary depending on target density, conductivity, and relative humidity. If the adjustment potentiometer is correctly set, the oscillator will be turned on when a target is within range.

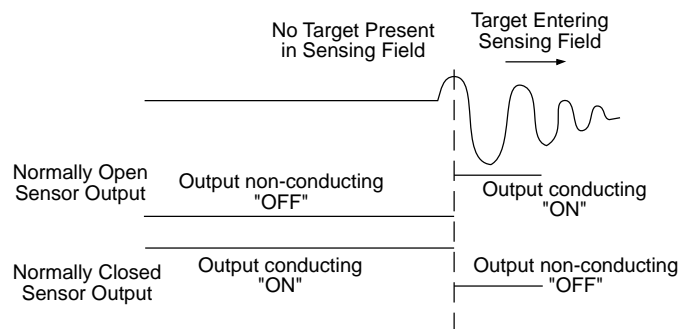


Figure 4

Important Note: Never use a metal body capacitive sensor in wet environments. Moisture between the sensing plate and the metal body will cause the sensor to "lock on." For wet environments, always use a plastic bodied sensor.

Inductive Sensor Selection

1. Target Identification

This is the most critical step in proper application of inductive and capacitive sensors. Most application problems stem from improper selection of a sensor for a particular target. This usually comes from a desire to "standardize" a design. Generally the following rules apply to all inductive sensors:

The sensor face should equal or be smaller than the target surface area. All manufacturers calibrate the range of a particular sensor with a "standard target." This standard target is always larger than the diameter of the sensor face. Although it is possible to sense targets smaller than the sensor face diameter, rated range cannot be achieved using a target that is smaller than the sensor face. The following changes in the sensing range will occur if the dimensions of the target are larger or smaller than the standard target specified.

Target size in %	150	125	100 (Standard Target)	75	50	25	12.5
Deviation from Sn in %	+10	+7	0	-7	-14	-27	-45

Figure 5

2. Air Gap Determination

When examining your application, remember that most shielded inductive sensors (Fig. 6) will have a maximum range that is approximately one third of the diameter of the sensing face.

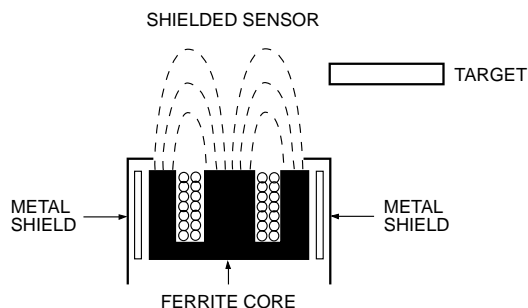


Figure 6

It is often necessary to allow a rather large air gap between the target and the sensor. When this is required, an unshielded sensor (Fig. 7) will be required. The unshielded sensor will generally have the plastic "nose" of the sensor projecting out of the metal barrel, or (plastic bodied types) it will not have a shielding ring around the core. These unshielded sensors will typically sense at ranges 3 to 50 percent greater than shielded types. A penalty is paid, however, as it is necessary to provide a metal-free area around the sensor that is much larger than the shielded types.

NONSHIELDED SENSOR

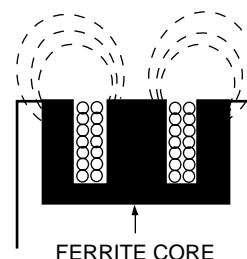


Figure 7

(See 3. Mounting Clearances)

Positioning of the sensor should allow the target to penetrate approximately 30% into the field to allow for manufacturing tolerances, resistance to vibration, and inaccuracies that are common to all initial start-ups.

When determining the air gap (sensing distance) required, it should be noted that an inductive sensor will produce its rated range only against a standard target of mild steel. Other materials will reduce the sensing range (SN) as follows:

- Mild Steel SN x 1.0
- Aluminum Foil SN x 1.0
- Stainless Steel SN x 0.85
- Brass SN x 0.5
- Copper SN x 0.46
- Aluminum SN x 0.4

*Continued on
next page.* ➡

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Example: If a sensor with a 5mm sensing range is used to sense a standard target made of copper, the sensing range of the sensor is reduced as indicated below:

$$5\text{mm} (0.46) = 2.3\text{mm} (\text{maximum})$$

When mounting a sensor it is always preferred to position the target so that it "slides by" the sensor face. This type of mounting will ensure that the sensor face is not damaged by contact with the target. If your application dictates a "head on" approach, it is essential that the target does not use the sensor face as a physical stop. Failure to provide clearance in either the slide-by or head-on modes will result in damage to the sensor and possible failure of the device.

Hysteresis (Fig. 8) must be allowed for as the target must move far enough away from the sensing field so that the sensor cannot detect it. If a target is placed within the hysteresis band, vibration of the target can cause the switch to turn on and off rapidly ("chatter"). All sensor manufacturers build in a certain amount of hysteresis to minimize chatter.

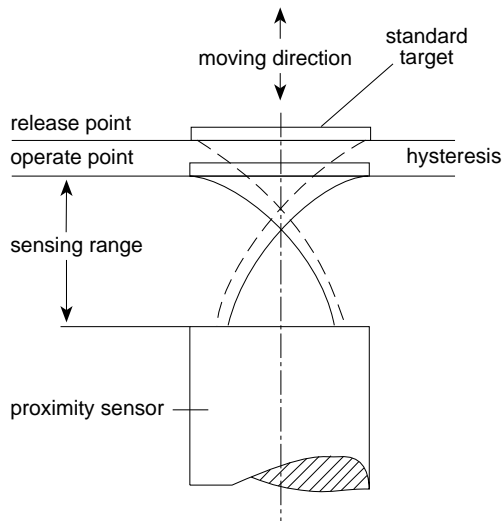
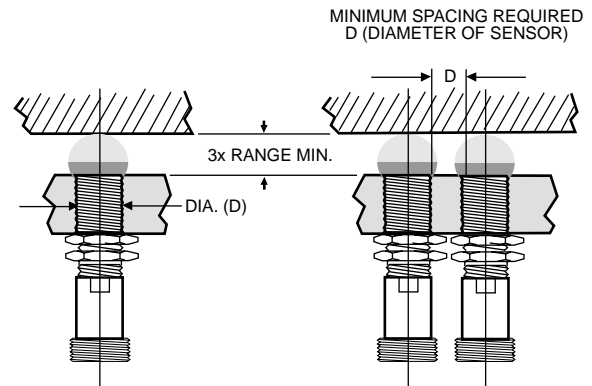


Figure 8

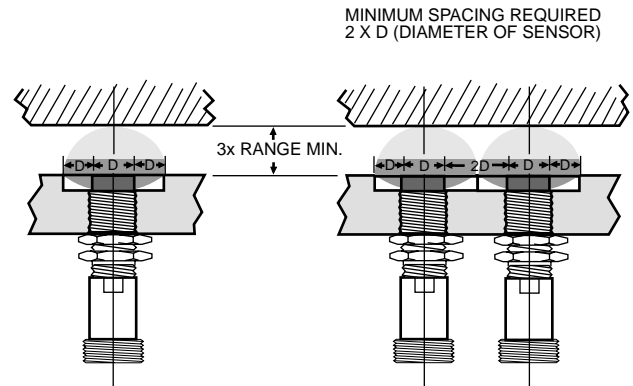
3. Mounting Clearances

Mounting of sensors should follow industry accepted practices as shown. Failure to properly position the sensor is the single largest cause of field problems.

SHIELDED SENSORS (FLUSH MOUNTABLE)



UNSHIELDED SENSORS REQUIRE METAL-FREE AREA



SENSORS MUST BE MOUNTED SUCH THAT SURROUNDING METAL IS NOT IN THE SENSING AREA.

OPPOSING SENSORS

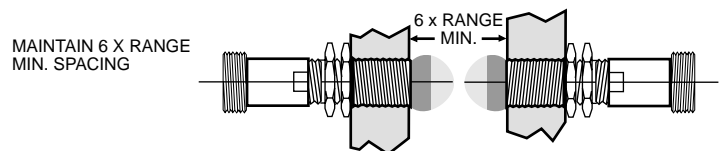


Figure 9

4. Housing Selection

After you have determined the target and air gap, it is then possible to select the style of housing for the application. Sensors are typically grouped according to range against a standard target. The most often used types are the metal barrel styles. These are great for general purpose uses but should not be used in areas where liquids are present. For wet environments, the all-plastic types are preferred. To determine your best specific type, consult the Enclosure Types below.

Various accessories are available for sealing, conduit, and mounting. Also, many sensors are available with quick disconnects. This is more expensive initially but can be justified if the sensor is placed on moving equipment where the cable is flexed often. The weak link then becomes the entry point of the cable to the housing. When failure occurs, it is necessary to replace the complete assembly because the cable failed. It's also easier to position the sensor mechanically, then complete the electrical wiring.

Industrial Control Equipment - UL 508
Table 6.1 – Enclosure Designations

Designation	Intended Use and Description	Designation	Intended Use and Description
1	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.	4X	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.
2	Indoor use to provide a degree of protection against limited amounts of falling water and dirt.	6	Indoor or outdoor use to provide against the entry of water during temporary, limited submersion; undamaged by the formation of ice on the enclosure.
3	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	6P	Indoor and outdoor use to provide a degree of protection against the entry of water during prolonged submersion at limited depths.
3R	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	11	Indoor use to provide by oil immersion a degree of protection of the enclosed equipment against the corrosion effects of corrosive liquids and gases.
3S	Outdoor use to provide a degree of protection against windblown dust, windblown rain, and sleet; external mechanisms remain operable while ice laden.	12, 12K	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids.
4	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	13	Indoor use to provide a degree of protection against lint, dust seepage, external condensation, and spraying of water, oil, and noncorrosive liquids.

Table 6.1 revised December 5, 1986
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*Continued on
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Cylindicator Sensor Installation

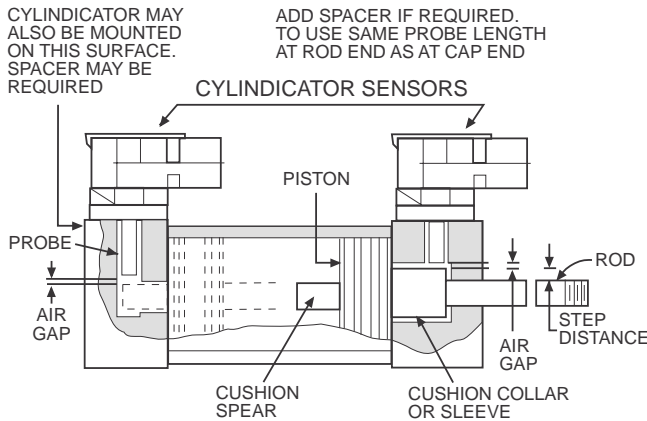


Figure 1

Proper operation of your Namco Cylindicator depends in large part on these factors:

Establishment of a proper air gap between the probe face and the target.

The air gap is the actual distance between the tip of the probe and the part of the piston which is the "target." The target can be the collar or cushion sleeve, cushion spear, or the end of the rod inside the cylinder. **This target must be close enough to actuate the Cylindicator Sensor but not so close as to actually contact the probe.**

Experience has shown an air gap of 0.025 inches to be optimum in most applications. The air gap should always be greater than 0.015 inches and less than 0.045 inches, including worst case tolerances. Gaps in excess of 0.045 inches are not recommended and could result in inconsistent operation.

Assuring a minimum "step distance" between the cushion collar and the piston rod.

Standard Namco Cylindicator Sensors have a nominal sensing range of 0.080 inches beyond the stated probe length. The minimum step distance (cushion to rod) must be greater than 0.095 inches to guarantee that the sensor will "drop out" when the target is no longer present. This minimum step distance accounts for mechanical tolerances, temperature effects, and hysteresis effects.

Sensing a known metallic target.

In all applications referred to in this publication, the target is assumed to be of a ferrous metal. Consult Namco if a different metal such as aluminum, brass, or stainless steel must be used as the sensing range is reduced.

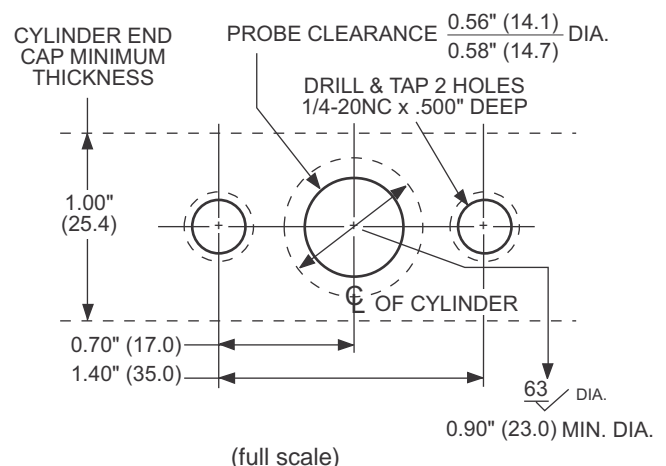
Mounting to a proper cylinder endcap.

The clearance hole for the sensing probe must be 0.560" diameter minimum/0.580" diameter maximum. The end block must be designed so that the probe tip is flush to 0.04" extended beyond surrounding metal within 0.5" of the probe side walls.

Other Tips:

- Never operate the cylinder at pressures which exceed the Cylindicator sensor's ratings.
- Do not exceed ambient temperature range.
- The Cylindicator Sensor must be positioned so that the target area (cushion spear, cushion collar, etc.) will completely cover the probe sensing face when the sensor is operated.
- Do not mount the Cylindicator Sensor on the bottom of the cylinder. Debris could accumulate around the probe which might cause damage or inconsistent operation.
- All Cylindicator Sensors are completely epoxy potted and as such contain no serviceable parts inside. Do not remove the cover or tamper with the cable or connector.
- Cylindicator Sensors must have the O-Ring probe seal that is supplied with each unit installed around the probe before mounting.
- Do not attempt to modify the probe by cutting, grinding, filing, etc.

Mounting Dimensions and Template



“Stroke To Go” vs. “Air Gap”

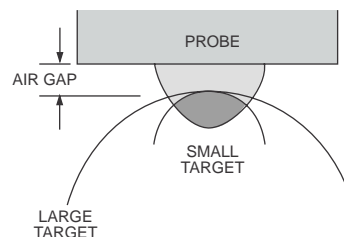
“Stroke To Go”

The amount of stroke remaining in the cylinder after the Cylindicator Sensor activates.

NOTE: If a cylinder is mechanically restrained from going full stroke — no target will be present for the switch to detect (no switch output).

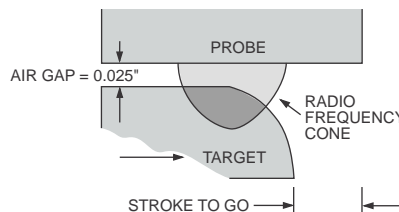
Target End View

Smaller diameter targets have less metal in the sensing field at a constant air gap. Loss of stroke-to-go is more pronounced on smaller bore cylinders as air gap increases.



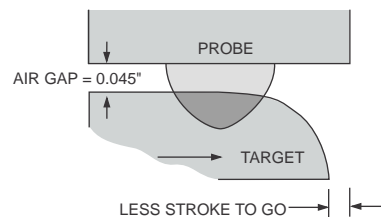
Switch Actuated

Recommended nominal air gap distance provides the stated maximum stroke to go.



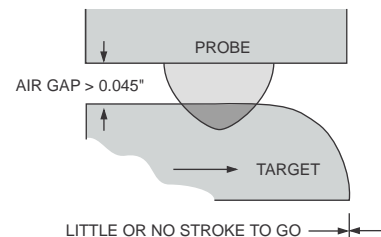
Switch Actuated

Variations from the recommended nominal air gap distance results in loss of stroke to go.



Switch Probably Not Actuated

Increased variations from the recommended nominal air gap distance results in little or no stroke to go and possible erratic operation.



**Loss of stated maximum stroke to go can prevent the proximity sensor from activating in plant equipment and tools with positive stops.*

NAMCO

2013 West Meeting Street • Lancaster, SC 29720
1-803-286-8491 • FAX: 1-800-678-6263
www.namcocontrols.com

For technical assistance, call 1-800-NAMTECH

1/4" Grid

Sensing Solutions Worksheet



Conditions of Sale

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- 1. ACCEPTANCE, GOVERNING PROVISIONS, AND CANCELLATIONS.** No order for Seller's products or services shall be binding upon Seller until accepted in writing by an authorized official of Seller or by shipment or other performance of such order. Any such order shall be subject to these Conditions of Sale, and acceptance shall be expressly conditioned on assent to such Conditions, which assent shall be deemed given unless Purchaser shall expressly notify Seller to the contrary prior to any shipment or other performance of an order by Seller and, in any event, within five (5) days after receipt of any acknowledgment or confirmation of such order.

No order accepted by Seller may be altered or modified by Purchaser unless agreed to in writing signed by an authorized official of Seller, and no such order may be cancelled or terminated except upon payment of Seller's loss, damage and expense arising from such cancellation or termination.

No modified or other conditions will be recognized by Seller unless specifically agreed to in writing, and failure of Seller to object to provisions contained in any purchase order or other communication from a Purchaser (including, without limitation, penalty clauses of any kind) shall not be construed as a waiver of these Conditions nor an acceptance of any such provisions.

Any contract for sale and these Conditions shall be governed by and construed according to the Laws of the State of Ohio.

- 2. QUOTATIONS AND PRICES.** Written quotations are conditioned upon acceptance by Purchaser within thirty (30) days from date issued and shall be considered as offers by Seller to sell during such thirty (30) day period unless sooner terminated by notice. Other Seller publications are maintained as sources of general information and are not quotations or offers to sell.

All prices are subject to change without notice. In the event of a net price change, the price of products on order but unshipped will be adjusted to the price in effect at the time of shipment. Downward adjustment of prices shall apply only to unshipped portions of outstanding orders.

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All clerical errors are subject to correction.

- 3. PAYMENT TERMS.** Except as may otherwise be stated in quotations, discount schedules, catalogs, or other Seller publications, terms of payment to Purchaser of satisfactory credit are 30 days net.

Seller reserves the right at any time to demand full or portion payment before proceeding with a contract of sale if, in its judgment, the financial condition of Purchaser shall not justify the terms of payment specified. If delivery is delayed or deferred by Purchaser beyond the scheduled date, payment shall be due in full when Seller is prepared to ship and the products may be stored at the risk and expense of Purchaser. If Purchaser defaults when any payment is due, then the whole contract price shall become due and payable upon demand, or Seller, at its option, without prejudice to other lawful remedies, may defer delivery or cancel the contract for sale.

- 4. TAXES AND OTHER CHARGES.** Any manufacturer's tax, retailer's occupation tax, use tax, sales tax, excise tax (except the Federal excise tax on vehicles), duty, custom, inspection or testing fee, or other tax, fee or charge of any nature whatsoever, imposed by any governmental authority, on or measured by any transaction between Seller and Purchaser, shall be paid by Purchaser in addition to the prices quoted or invoiced. In the event Seller shall be required to pay any such tax, fee or charge, Purchaser shall reimburse Seller therefore; or, in lieu of such payment, Purchaser shall provide Seller at the time the order is submitted with an exemption certificate or other document acceptable to the authority imposing the same. Purchase orders must state the existence and amount of any such tax, fee or charge which it shall be Seller's responsibility to collect from Purchaser and pay.

- 5. DELIVERY.** Delivery of product to a carrier at any of Seller's plants or other shipping point shall constitute delivery to Purchaser; and, regardless of freight payment, title and all risk of loss or damage in transit shall pass to Purchaser at that time.

Great care is taken in packing Seller's product. Seller cannot be held responsible for breakage after having received "in good order" receipts from the transportation company. All claims for loss and damage must be made by Purchaser to the carrier.

Claims for shortages or other errors must be made in writing to Seller within 30 days after receipt of shipment, and failure to give such notice shall constitute unqualified acceptance and a waiver of all such claims by Purchaser.

Except as may otherwise be stated in quotations, discount schedules, catalogs, or other Seller publications, freight will be allowed to the common carrier free delivery point nearest the destination on shipments within THE UNITED STATES EXCLUDING ALASKA AND HAWAII.

For shipment to ANY OTHER DESTINATION, INCLUDING ALASKA AND HAWAII, consult Seller's home office for terms that apply.

No allowance will be made in lieu of transportation if Purchaser accepts shipment at factory, warehouse, freight station, or otherwise supplies its own transportation.

Method and route of shipment will be at the discretion of Seller unless Purchaser shall specify otherwise, and any additional expense of the method or route of shipment specified by Purchaser shall be borne by Purchaser.

Seller reserves the right to make delivery in installments, unless otherwise expressly stipulated in the contract for sale; and all such installments when separately invoiced

shall be paid for when due per invoice, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Purchaser of its obligations to accept remaining deliveries. Seller shall not be liable for any damage as a result of any delay due to any cause beyond Seller's reasonable control, including, without limitation, an act of God, an act of Purchaser or Seller's supplier, embargo or other governmental act, regulation or request; fire, accident, strike, slowdown, war, riot, delay in transportation, and inability to obtain necessary labor, materials or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time lost by reason of the delay.

- 6. SUBSTITUTES.** Seller may furnish suitable substitutes for materials unobtainable because of priorities or regulations established by governmental authority or nonavailability of materials from suppliers, and assumes no liability for deviation from published dimensions and descriptive information not essential to proper performance of the product.

- 7. WARRANTY.** Seller warrants products manufactured by it to be free from defects in materials and workmanship for a period of one (1) year from date of shipment to Purchaser. If within this period any such products shall be proven to Seller's reasonable satisfaction to be so defective, they shall be repaired or replaced at Seller's option. This warranty shall not apply to (a) products not manufactured by Seller, (b) products which shall have been repaired or altered by others than Seller so as, in its judgment, to affect same adversely, (c) products which shall have been subjected to negligence, accident or damage by circumstances beyond seller's control, or to improper operation, maintenance or storage, or to other than normal use or service. With respect to products not manufactured by Seller, the warranty obligations of Seller shall conform to the warranty actually extended to Seller by its supplier, subject to the limitations and exclusions hereafter stated. The foregoing warranties do not cover reimbursement for transportation, removal, installation, or other expenses which may be incurred in connection with repair or replacement.

Except as may be expressly provided in the authorized writing by Seller, Seller shall not be subject to any other obligations or liabilities whatsoever with respect to products manufactured by Seller or services rendered by Seller.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES EXCEPT WARRANTIES OF TITLE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

- 8. LIMITATIONS OF LIABILITY AND REMEDIES.** SELLER SHALL NOT BE LIABLE, AND PURCHASER WAIVES ALL CLAIMS AGAINST SELLER, FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER OR NOT BASED UPON SELLER'S NEGLIGENCE OR BREACH OF WARRANTY OR STRICT LIABILITY IN TORT OR ANY OTHER CAUSE OF ACTION. Buyer's exclusive remedy for any cause of action under this contract is a claim for damages and in no event will damages or any other recovery of any kind against Seller exceed the price of the specific products as to which the claim is made. Seller will not be liable to Purchaser for any loss, damage or injury to persons or property resulting from the handling, storage, transportation, resale or use of the products in manufacturing processes, or otherwise.

- 9. RETURN OF PRODUCTS.** No products may be returned without first obtaining Seller's written permission and a returned material identification tag.

Products accepted for credit, not involving an error on Seller's part, shall be subject to a minimum service charge of 10% of the invoice price and all transportation charges shall be prepaid by Purchaser.

Returned products must be securely packed to reach Seller without damage; any cost incurred by Seller to put equipment in first class condition will be charged to Purchaser.

- 10. PATENTS.** As to products proposed and furnished by Seller, Seller shall defend any suit or proceeding brought against Purchaser so far as based on a claim that said equipment constitutes an infringement of any patent of the United States, if notified promptly in writing and given authority, information and assistance at Seller's expense for the defense of the same. In event of a final award of costs and damages, Seller shall pay such award. In event the use of said product by Purchaser is enjoined in such a suit, Seller shall, at its own expense, either (a) procure for Purchaser the right to continue using said equipment, (b) modify said equipment to render it noninfringing, (c) replace said equipment with noninfringing equipment, or (d) refund the purchase price (less depreciation) and the transportation and installation costs of said equipment. Seller will not be responsible for any compromise or settlement made without its written consent.

The foregoing states the entire liability of Seller for patent infringement, and in no event shall Seller be liable if the infringement charge is based on the use of Seller's products for a purpose other than that for which sold by Seller. As to any products furnished by Seller to Purchaser and manufactured in accordance with designs proposed by Purchaser, Purchaser shall indemnify Seller against any award made against Seller for patent, trademark, or copyright infringements.

- 11. NUCLEAR INDEMNITY BY PURCHASER.** If the products furnished by Seller are to be used in any nuclear installation or activity, then Purchaser shall, or cause the ultimate user to (a) secure and maintain the maximum nuclear property damage and liability insurance protection available, (b) enter into and maintain a Government Indemnity Agreement and (c) waive and require its insurers to waive all rights of recovery or subrogation against Seller and its suppliers and subcontractors or every tier for, and indemnify and hold Seller harmless from and against, any claims, losses or damages whatsoever (including contractual or special damages of any kind) arising out of a Nuclear Incident as that term is defined in the Atomic Energy Act of 1954, as amended.



Reliable Solutions for Presence & Position Sensing

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www.namcocontrols.com

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General Information

Price Lists

All price lists are covered in separate publications and are subject to change without notice.

Application Assistance

NAMCO sales representatives are available to assist with the specification and selection of NAMCO products. If additional assistance is required, you may refer requests directly to the Marketing Department.

For more detailed technical information, questions on specially manufactured units or any questions concerning non-standard items, requests should be referred to the appropriate applications engineers. Application engineering assistance is available for all Namco products.

Hot Line 1-800-NAMTECH 1-800-626-8324

Hotline calls go directly to the Application Department and are intended for technical support only.

Customer Service

Customer Service personnel deal with day-to-day order requirements including standard pricing and product availability.

NAMCO
Customer Service
Mayfield Village, Ohio 44143
(440) 460-1360
FAX (440) 460-3800

Customer Service is available from 8:00 a.m. until 5:00 p.m., Eastern Standard Time.

Returned Goods

Returned goods are governed by provisions as stated in "Conditions of Sale." All requests for material return must be made in writing to the Supervisor of Customer Service at NAMCO's Mentor office, or to the local NAMCO representative who will obtain written returned goods authorization.

Only standard stock items qualify for normal return. Any non-stock or made-to-order merchandise is non-returnable. Not all items listed in currently published catalogs are stock items. (See ANPL.)

All requests for return must be made within 30 days of original shipment. Once return authorization has been granted, material must be returned within 30 days or that authorization will be considered null and void. All authorized returns due to NAMCO error will be credited at the actual purchase price plus the actual cost of return motor freight less any handling charges necessary due to abuse or improper packing. All other requests for return, if authorized, must be returned with freight prepaid.

With the exception of items qualifying for return under warranty, any product which has been installed and used does not qualify for return under any circumstances.

Dimensions

For certified construction drawings, request as a separate item when ordering or contact customer service department.

WARNING:

A SWITCH IN A PROTECTIVE INTERLOCKING CIRCUIT SHOULD BE USED WITH AT LEAST ONE OTHER DEVICE THAT WILL PROVIDE A REDUNDANT PROTECTIVE FUNCTION, AND THE CIRCUIT SHOULD BE SO ARRANGED THAT EITHER DEVICE WILL INTERRUPT THE INTENDED OPERATION OF THE CONTROLLED EQUIPMENT. (PROPOSED NEMA ICS 2-225.95 ST'D.)

SERVICING ENERGIZED INDUSTRIAL CONTROL EQUIPMENT CAN BE HAZARDOUS. SEVERE INJURY OR DEATH CAN RESULT FROM ELECTRICAL SHOCK, BURN OR UNINTENDED ACTUATION OF CONTROLLED EQUIPMENT.

RECOMMENDED PRACTICE IS TO DISCONNECT AND LOCK OUT CONTROL EQUIPMENT FROM POWER SOURCES, AND DISCHARGE STORED ENERGY TO CAPACITORS, IF PRESENT. IF IT IS NECESSARY TO WORK IN THE VICINITY OF ENERGIZED EQUIPMENT, ONLY QUALIFIED PERSONNEL SHOULD BE PERMITTED TO PERFORM SUCH WORK, USING ALL APPLICABLE SAFETY PRACTICES AND PROTECTIVE EQUIPMENT.

The user should refer to NFPA 70B, RECOMMENDED PRACTICE FOR ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association, for additional information.

Conditions of Sale

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Except as may be expressly provided in the authorized writing by Seller, Seller shall not be subject to any other obligations or liabilities whatsoever with respect to products manufactured by Seller or services rendered by Seller.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES EXCEPT WARRANTIES OF TITLE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

- 8. LIMITATIONS OF LIABILITY AND REMEDIES.** SELLER SHALL NOT BE LIABLE, AND PURCHASER WAIVES ALL CLAIMS AGAINST SELLER, FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER OR NOT BASED UPON SELLER'S NEGLIGENCE OR BREACH OF WARRANTY OR STRICT LIABILITY IN TORT OR ANY OTHER CAUSE OF ACTION. Buyer's exclusive remedy for any cause of action under this contract is a claim for damages and in no event will damages or any other recovery of any kind against Seller exceed the price of the specific products as to which the claim is made. Seller will not be liable to Purchaser for any loss, damage or injury to persons or property resulting from the handling, storage, transportation, resale or use of the products in manufacturing processes, or otherwise.

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