Installation Instructions—E58 Series Harsh Duty Perfect Prox® Diffuse Reflective Sensors

CATALOG NUMBER COMPONENTS

E58-30DP150-GLPB-FSC

Item: "a" "b" "c" "d" "e" "f" "g" "h"

"a"	Product Family	E58	
"b"	Barrel Diameter	18	18 mm
		30	30 mm
"c"	Sense Mode	DP	Perfect Prox Diffuse Reflective
"d"	Sensing Range	50	50 mm
		100	100 mm
		150	150 mm
"e"	Voltage Style	B	3-wire DC, PNP
		C	3-wire DC, NPN
		D	2-wire DC
		E	2-wire AC/DC
		G	3-wire AC/DC
		H	4-wire DC
"f"	Operate Mode	L	Light operation
		D	Dark operation
"g"	Connection Style	Blank	Cable
		P	Micro Connector
		PB	Mini Connector
"h"	Package Options	Blank	303 Stainless Steel, threaded body
		FC	316 Stainless Steel, threaded body
		FSC	316 Stainless Steel, smooth body

⚠ WARNING

THESE PRODUCTS ARE NOT DESIGNED, TESTED, OR RECOMMENDED FOR USE IN HUMAN SAFETY APPLICATIONS.

THIS PRODUCT HAS NO USER-SERVICEABLE PARTS—PLEASE RETURN TO THE FACTORY FOR REPAIRS. THE CABLE CLAMP ON THE BACK OF THE SENSOR DOES NOT REQUIRE ADJUSTMENT. ANY ATTEMPT TO TIGHTEN OR LOOSEN THIS PART WILL COMPROMISE SEALING AND VOID WARRANTY.

AC/DC CONNECTOR VERSION SENSORS ARE EQUIPPED WITH AN AC-TYPE CONNECTOR. THE USE OF DC POWER WITH AC-TYPE CONNECTORS MAY NOT CONFORM WITH ESTABLISHED STANDARDS.

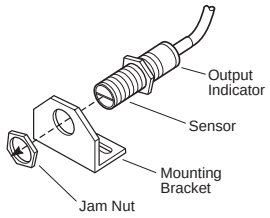
INTRODUCTION

The E58 Harsh Duty Photoelectric Sensor line was designed to withstand your harshest physical, chemical, and optical environments. A strong metal housing with surface mount electronics stand up to heavy shock and vibration. The materials used in this sensor provide exceptional protection in harsh environments. All components are mechanically assembled using Viton seals to ensure complete sealing and resistance to industry chemicals. Advanced optics, extremely high sensing power and our Perfect Prox technology combine to produce the most precise background rejection sensor line available.

Page 2 and 3 provide a detailed explanation of how the Perfect Prox sensor operates and gives hints on how to properly apply the sensor.

MOUNTING

The sensor features a threaded housing and includes jam nuts. This allows mounting into any 1.25 inch hole (30mm), a .75 inch hole (18mm), or a variety of accessory mounting brackets.



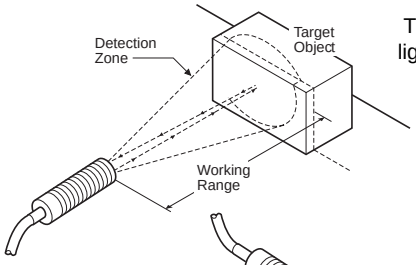
SENSOR LOCATION AND SET-UP

Select a mounting location with a clear view of the object to be detected. Mount the sensor so that it points at the most suitable part of the target object.

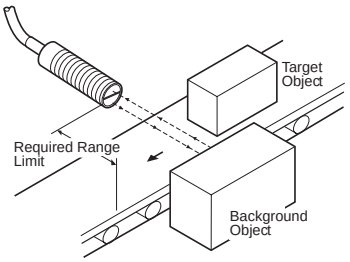
Be sure your power supply is off, then connect the sensor to the control circuit and power lines. Turn the power supply on and place a sample object in the beam. Slowly adjust the distance between the sensor and the target so that the target is detected each time and the background is not. The LED indicates output condition. See the "Optical Performance" section on the last page of this manual for more information on maximum ranges and cutoff ranges.

NOTE: Be sure to check for background detection when the target is removed (hysteresis latch-up after sensing an object).

Tighten all mounting hardware.



The detector "sees" light when the target surface enters the Detection Zone.



Perfect Prox sensors have the ability to ignore background objects just beyond the maximum range. This is known as cutoff range.

PERFECT PROX APPLICATION HINTS

Perfect Prox sensors combine high excess gain with a sharp cut-off. The optics that provide this performance can also make it possible to misapply the sensor, giving the appearance of a malfunction. Simple adjustments alleviate these application problems.

The next two pages give a simplified description of how the Perfect Prox works, and tips on adjusting the sensor for proper performance.

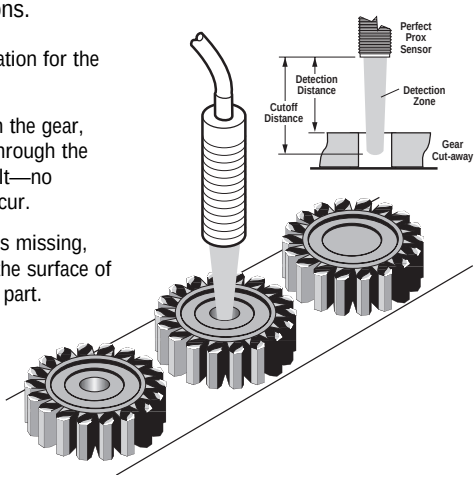
WHY MAKE A PERFECT PROX?

Diffuse reflective mode photoelectric sensors require high excess gain to detect objects with low reflectance. When these objects need to be detected against backgrounds with higher reflectance, problems can occur. Following are examples of these problems, along with simple solutions. We developed the Perfect Prox to have the high gain needed to detect low reflectance targets, but with a sharp cut-off to reject background reflections.

This is a typical application for the Perfect Prox.

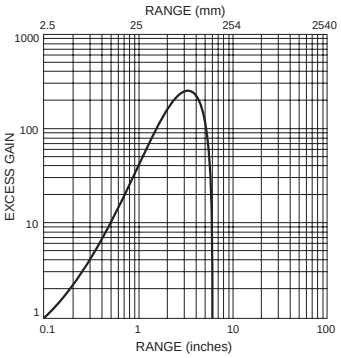
If the hole is present in the gear, the sensor will shine through the hole and ignore the belt—no detection event will occur.

If the hole in the gear is missing, the sensor will detect the surface of the gear and reject the part.



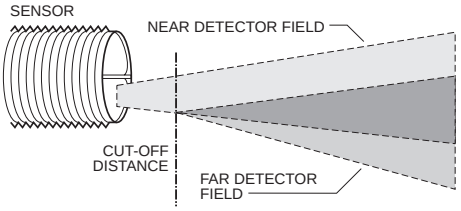
WHAT IS A PERFECT PROX?

Perfect Prox has extremely high gain. In fact, the 6-inch Perfect Prox models have as much gain as a 6-foot standard diffuse reflective sensor! But the Perfect Prox sensing ranges have extremely sharp cut-offs at much closer ranges. The graph clearly shows this cut-off for a 6-inch Perfect Prox.



HOW A PERFECT PROX WORKS

Let's look at how the 6-inch Perfect Prox works. To get the high gain and the sharp cut-off, the sensor has 2 different detectors. The first detector is the near detector with a range of 0 to 24 inches. The second is the far detector with a range of 6 to 24 inches (see the illustration below).



Objects closer than 6 inches are detected by only the near detector. Objects at distances of 6 inches or greater will be detected by both detectors.

If the near signal is stronger than the far signal, the sensor output is "on". If the far signal is stronger than or equal to the near signal, the output is "off." The result is a sensor with high excess gain for 6 inches followed by a sharp cutoff.

APPLICATION DIFFICULTIES?

As you look at the lens of the sensor, you will see that the lens is divided in half. When the sensor is oriented so that one half is above the other, the two detection fields are stacked one on top of the other as shown in the previous illustration. Application difficulties with Perfect Prox usually come from targets or backgrounds that reflect unequally to these two detectors. Fortunately, these kinds of problems are easily remedied by slight readjustment of the sensor's mounting. NOTE: Backgrounds that cause specular reflections, such as mirror-like surfaces, can sometimes reflect more light to the near detector than to the far detector. This will cause detection at distances greater than the sensor's cutoff range, resulting in a false "ON" condition. To avoid this, dull the surface to a matte finish, or angle the sensor or background to eliminate direct reflections.

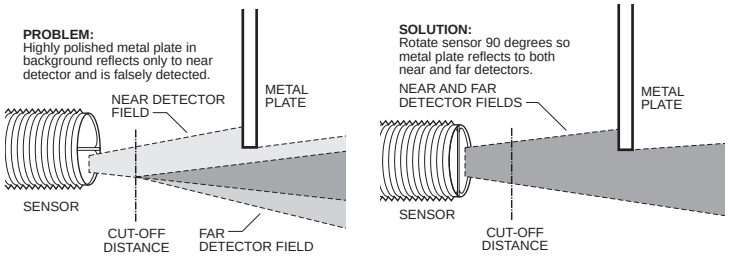
The following examples are simple solutions to three specific problems that can occur when installing the Perfect Prox sensor. All drawings exaggerate field placement for purposes of illustration.

BACKGROUND OBJECTS CAUSING UNEQUAL REFLECTIONS

Any background object that reflects light to only one detector can cause problems. Reflections to only the near detector can cause a false "on" condition. (Remember, these reflections can come from objects up to 2 feet away for diffuse objects, or 10 feet away for retroreflectors and mirrors.)

If the background object reflects only to the far detector, it may provide enough signal that the sensor cannot detect a near object. If the background object does not reflect enough light to be detected, it may reflect enough that the sensor will lock up and not turn "off" after a near target has left the sensor's field of view.

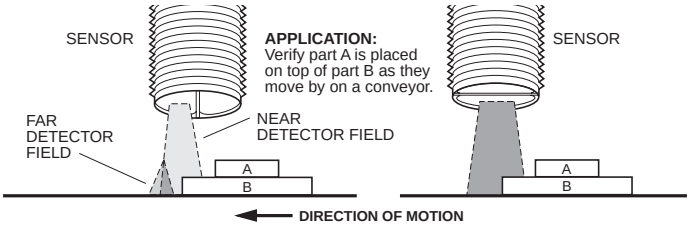
To solve these problems, rotate the sensor 90° to direct reflections to both detectors. Aiming the sensor at an angle to the background may also bring the background into the field of view of both detectors.



DETECTING TARGETS MOVING PARALLEL TO THE SENSOR'S LENS SURFACE

When one object is to be detected as it moves on a second "background" object, the background may cause a "false" pulse if the sensor is not oriented properly.

To avoid these pulses, the target must enter and leave both fields simultaneously. This is easily done by having the object approach the sensor as shown in the illustration.



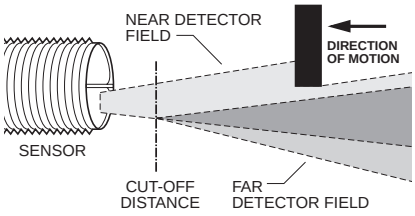
PROBLEM:
As part B enters the near field, the sensor turns on, giving a "false" pulse, until B enters the far field.

SOLUTION:
Rotate the sensor 90 degrees. Now part B enters the near and far fields simultaneously.

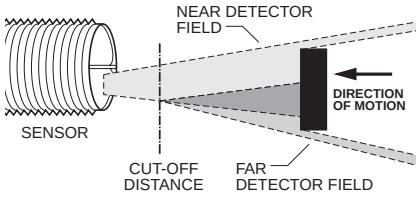
DETECTING TARGETS MOVING HEAD-ON TOWARDS THE SENSOR

Sometimes you need to detect an object as it approaches the sensor head on. If the object is not centered on the sensor's optical axis, it may reflect into just one of the detectors. The result is that the Perfect Prox will either not sense at all, or will act as a regular diffuse reflective sensor and detect the object at too great a distance. Repositioning the sensor or the object so that the object travels on the sensor's optical axis will solve the problem. You may also relocate the sensor so that the object moves in a plane parallel to the sensor's lens surface.

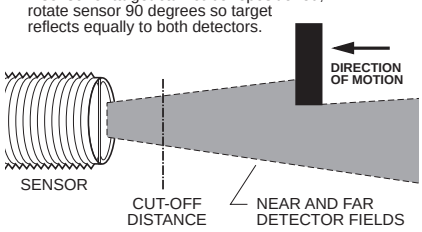
PROBLEM:
Target moving "off axis" toward sensor, reflects only to near detector and is detected too soon.



SOLUTION:
Reposition sensor or target so target moves on sensor's optical axis.

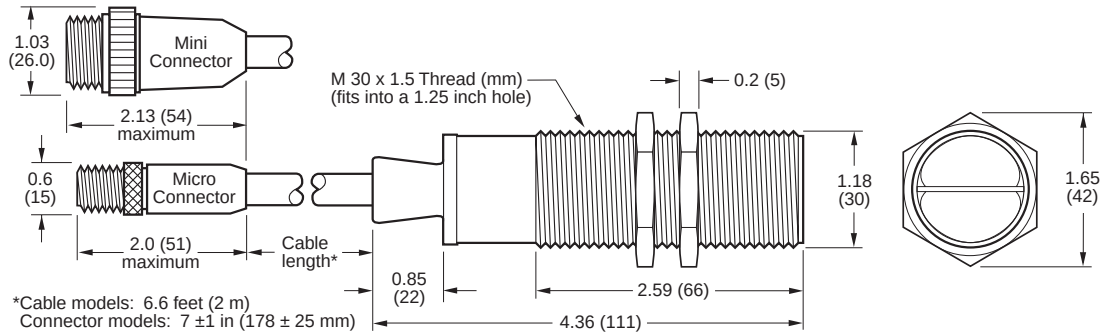


SOLUTION:
If sensor or target cannot be repositioned, rotate sensor 90 degrees so target reflects equally to both detectors.

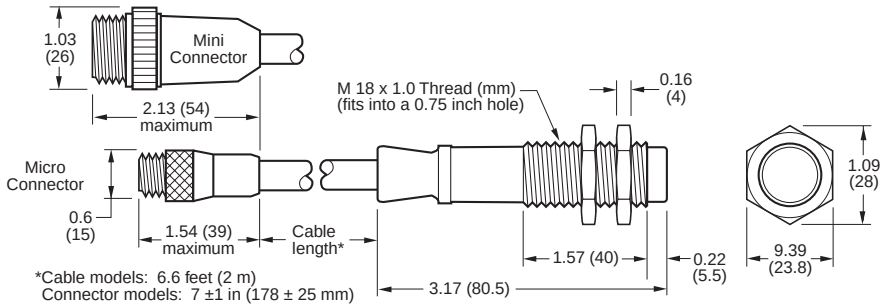


APPROXIMATE DIMENSIONS (SHOWN IN INCHES EXCEPT WHERE NOTED)

30MM DIAMETER (Threaded model shown)



18 MM DIAMETER (Threaded model shown)



SPECIFICATIONS

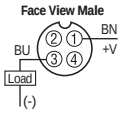
	3-Wire AC/DC Sensors		4-Wire DC Sensors	2-Wire Sensors	
(AC Operation)	AC/DC MODELS (DC Operation)	AC/DC MODELS	DC-ONLY MODELS (AC Operation)	AC/DC MODELS (DC Operation)	DC and AC/DC MODELS
Input Voltage	20 to 132 V ac, 50/60 Hz	15 to 30 V dc	10 to 30 V dc	90-132 V ac, 50/60 Hz	18-50 V dc
PowerDissipation	3W maximum	3W maximum	2W maximum	3W maximum	3W maximum
Output Type	VMOS (bi-directional)	NPN (sink)	4-Wire: NPN and PNP (dual outputs)	18mm models: DMOS/Bipolar 30mm models: DMOS	
Current Switching	300 mA maximum	300 mA maximum	PNP: 100 mA max.; NPN: 18mm models: 250 mA max.; 30mm models: 100mA max.	18mm models: 100 mA; 30mm models: 300 mA	
Voltage Switching	186 V peak maximum	186 V peak maximum	30 V dc maximum	186 V peak maximum	50 V dc maximum
Off-State Leakage	250 µA typical; 500 µA max.	250 µA typical; 500 µA max.	10 µA maximum	1.7 mA maximum	18mm: 1.7 mA max. 30mm: 1.5 mA max.
Surge Current	2 A maximum	2 A maximum	1 A maximum	1 A ac	1 A dc
On-State Voltage Drop	- - -	1.8 V at 10 mA 4.0 V at 300 mA	NPN: 1.2 V at 10 mA; 18mm: 2.0 V at 100 mA; 30mm: 2.0V at 250mA PNP: 2.8 V at 100 mA	10 Vac rms	18mm models: 10 V dc 30mm models: 8 V dc
Response Time	10 mS	2 mS	18mm: 1mS; 30mm: 2 mS	35 mS	35 mS
Short Circuit Protection	18mm models: Auto reset; 30 mm models: Sensor will turn off immediately when a short or overload is detected (Indicator LED will flash). Turn power OFF and back ON to reset.			Auto reset	Auto reset
Operating & Storage Temperature Range	-40° to 131° F (-40° to 55° C)			18mm models: -40° to 158° F (-40° to 70° C) 30mm models: -10° to 131° F (-25° to 55° C)	
Enclosure Material	30mm Cable Jacket: PVC Indicator Ring: PVDF (high-density fluorinated polymer) Seals: Viton® (registered trademark of Dupont)		18mm Cable Jacket: PVC (poly vinyl chloride) Lens Cover: Tempered Glass (hard-coated polycarbonate for models ending in FC or FSC) Body: 303 Stainless Steel (or 316 Stainless Steel for models ending in FC or FSC)		
Cable/Connector	Cable Models: 6-foot cable; Connector Models: Male mini and micro connectors on pigtail (refer to wiring diagrams for number of pins per model)				
Vibration & Shock	Vibration: 30 g over 20 Hz to 2 kHz; Shock: 100 g for 3 mS 1/2 sinewave pulse				
Indicator LED	Source: Lights when power is ON; Detector: Lights steady when output is ON, Flashes when short circuit protection is in latch condition (except 2-wire models and 18mm 4-wire models)				
Sunlight Immunity	5,000 foot-candles				
Enclosure Ratings	NEMA 1, 2, 3, 3R, 3S, 4, 4X, 6, 6P, 12, 12K, and 13; This product is suitable for high temperature, high pressure washdown (1200 psi).				
Chemical	This product was designed to withstand chemicals commonly used in the automotive, machine tool, food processing and forest industries.				
Compatibility	Consult factory for compatibility with specific chemicals.				
Approvals	Contact factory for the latest list of agency approvals.				

WIRING DIAGRAMS

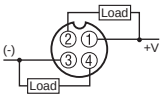
Connections shown for both cable versions (cable wire colors shown) and connector versions (connector face view shown). Pin numbers are for reference, rely on pin location when wiring.

MICRO-CONNECTOR MODELS

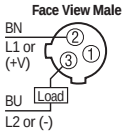
2W DC Models



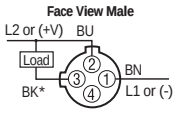
4W DC NPN & PNP



2W AC/DC

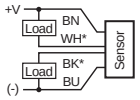


3W AC/DC Models



*No connection on TB source

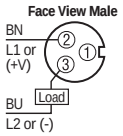
4W DC Models



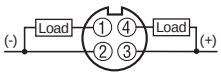
*No connection on TB source

MINI-CONNECTOR MODELS

2W AC/DC



4W DC NPN & PNP



OPTICAL PERFORMANCE

All optical specifications are guaranteed to be the minimum performance under clean conditions of any product delivered from stock. Typical performance may be higher.

Dirt in the environment will affect optical performance by reducing the amount of light the sensor receives. For best results, sensors should be used at distances where excess gain is higher than 1.5 (1.5 times the amount of sensing power required to detect an object under ideal conditions). Higher excess gain will allow the sensor to overcome higher levels of contamination on the lens.

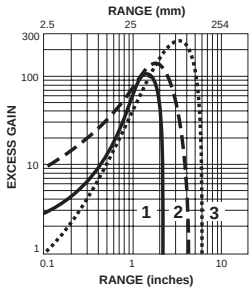
	E58-18DP50	E58-18DP100	E58-30DP150
Source Light	Visible red, 670 nm	Visible red, 670 nm	Visible red, 670 nm
Optimum Range	0.5 to 1.8 inches (10 to 45 mm)	0.5 to 3 inches (13 to 76 mm)	1 to 6 inches (26 to 150 mm)
Nominal Range *	2 inches (50 mm)	4 inches (100 mm)	6 inches (150 mm)
Cutoff Range **	2.25 inches (57 mm) & beyond	5 inches (127 mm) & beyond	6.5 inches (165 mm) & beyond
Field of View	0.10 inch dia. at 2 in.	0.38 inch dia. at 4 in.	0.75 inch dia. at 6 in.

* Sensor will detect a 90% reflectance card at this range.

** Sensor will ignore a 90% reflectance card at this range.

1. E58-18DP50
2. E58-18DP100
3. E58-30DP150

Ranges and excess gain graphs based on a 90% reflectance white card.



Still Need Help?

Contact the Cutler-Hammer Sensor Application Engineers

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