

July 2005

## Introduction

Photoelectric sensors use light to detect the presence or absence of an object. The main advantages of photoelectric sensors are noncontact sensing of objects and greatly extended sensing ranges.

## Choosing the Right Sensor

There are many factors to consider when choosing a photoelectric sensor. The specific demands of your application will dictate the sensor required for the job. Some of the questions you should consider, and suggested areas to find more information:

- What range is required (how far is the sensor from the object to be detected)? (See "Modes of Detection", "Range" and "Excess Gain")
- What is the nature of the environment? (See "Contamination")
- What access do you have to both sides of the object to be detected (is wiring possible on one or both sides of the object)? (See "Modes of Detection")
- What size is the object being detected? (See "Modes of Detection")
- Is the object consistent in size, shape, and reflectivity? (See "Modes of Detection, Perfect Prox")
- What are the mechanical and electrical requirements? (Check the electrical specifications of the desired sensor.)
- What kind of output do you need? (Check the electrical specifications of the desired sensor.)
- Are logic functions needed at the sensing point? (If so, look for sensors with logic modules or built-in logic functions.)

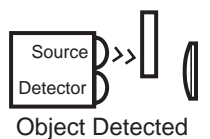
## Modes of Detection

### Thru-Beam

Source and detector elements are mounted in separate housings and aligned facing each other across an area which the target object crosses. Detection occurs when an object blocks the entire effective beam (the column of light that travels in a straight line between lenses). See **Page 11-23**.

### Reflex

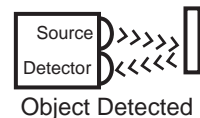
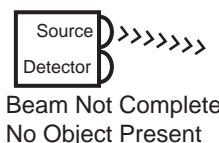
The source and detector are mounted in a single sensor housing and are positioned parallel to one another on the same side of the object to be detected. The light beam is transmitted from the source to a retroreflector that returns the light to the detector. Detection occurs when the target object blocks the entire effective beam. See **Page 11-23**.



*Reflex Detection Mode*

### Diffuse Reflective

The source and detector elements are mounted in a single sensor housing and are positioned on the same side of the object to be detected and aligned with crossed fields of view. When the target moves into this area light from the source is reflected off the target surface back to the detector and detection occurs. See **Page 11-23**.



*Diffuse Reflective Detection Mode*

### Perfect Prox®

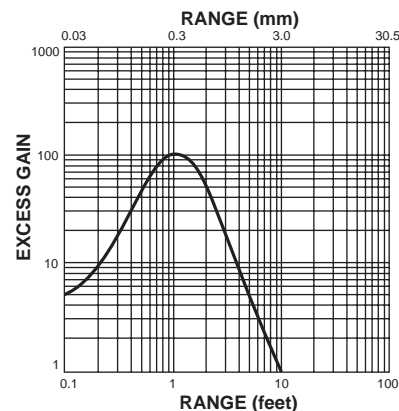
Perfect Prox® is a special type of diffuse reflective sensor that combines extremely high sensing power (excess gain) with a sharp optical cutoff. This allows the sensor to reliably detect targets regardless of variations in color, reflectance, contrast or surface shape, while ignoring background objects that are just slightly beyond the target range. See **Page 11-24**.

## Range

Each sensor listed in this catalog has a specific operating range. In general, thru-beam sensors offer the greatest range (most power), followed by reflex and then diffuse reflective sensors. Operating ranges vary, and there is some overlap among types and models. See Applying Excess Gain on **Page 11-25**.

## Excess Gain

Excess gain is a measure of the sensing power available in excess of that required to detect an object. The following excess gain chart shows this measurement graphically. Find your required range on the x-axis of the graph below. Then move up to the curve to read the excess gain value from the y-axis. An excess gain value of 1 is the minimum level required for sensor operation. Eaton normally recommends excess gain levels  $\geq 10$  for reliable sensor operation. See **Page 11-25**.



*Photoelectric Sensor Excess Gain Graph*

The excess gain charts in this catalog represent the minimum excess gain provided by the sensor (unless otherwise noted). Actual performance may be better.

## Contamination

The chart on **Page 11-28** shows the excess gain recommended in environments with varying levels of contamination for each sensing mode.