BASIC MACHINE VISION COMPONENTS TRAINING

visiomex
Your business, our vision

AGENDA

1. Vision Lighting
2. Cameras
3. Lenses
4. Filters
5. Accesories

Vision Lighting (Area Light)

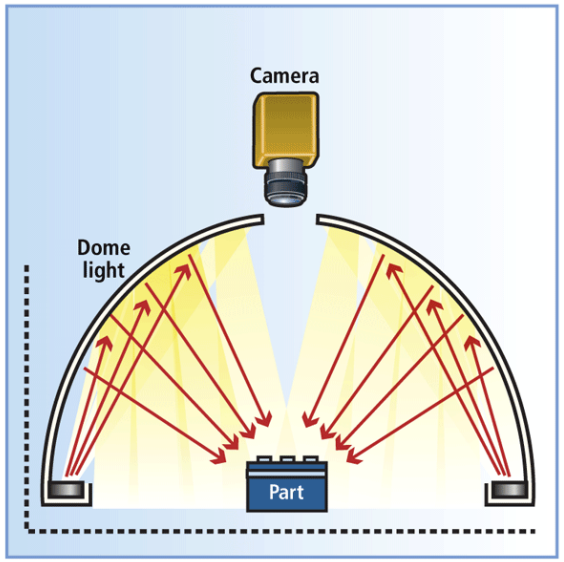
An area light provides even illumination in a concentrated area. Well-placed area lights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.

Creates shadows to detect changes in depth

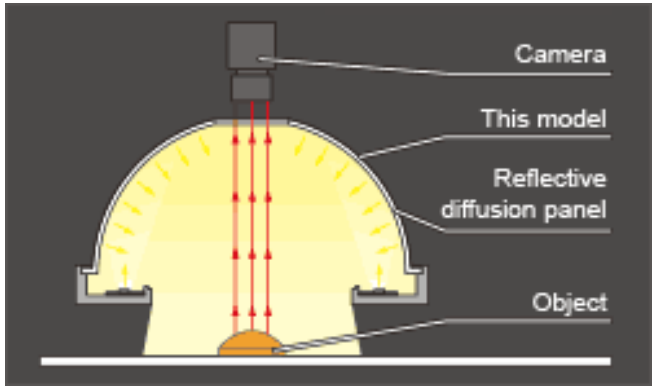
Illuminates specific surface angles

Avoids glare of reflective surfaces when directed at an angle away from lens

Vision Lighting (Dome Light)

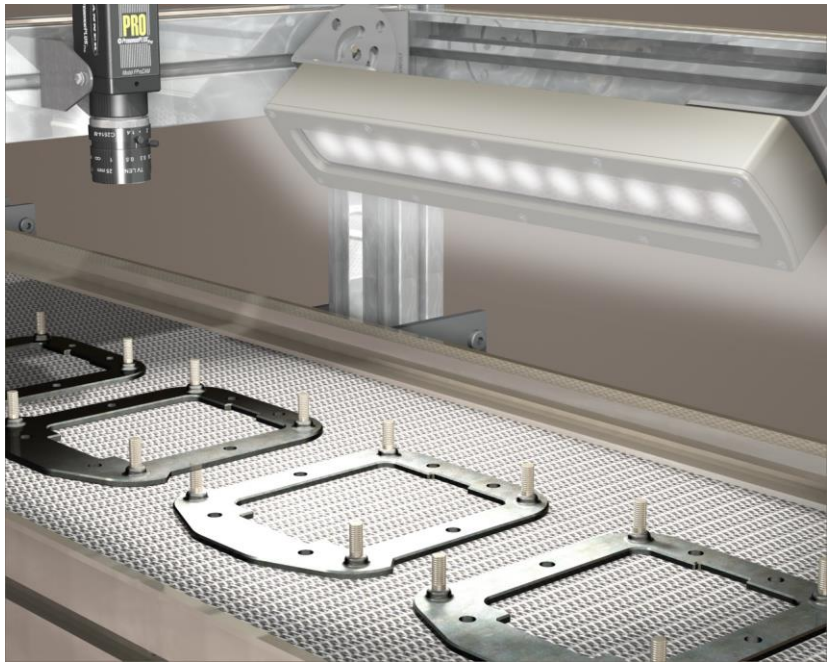


The dome lights are available in a wide range of sizes. Dome lights provide highly shadow free lighting in small working distances and avoid reflection from reflective objects more than ring lights. In order to prevent a ”camera hole shadow” it is possible to use a coaxial light together with the dome light.



Vision Lighting (Linear Array Lights)

Linear array lights provide high-intensity illumination of large areas, at long distances.



Vision Lighting (Ring Lights)

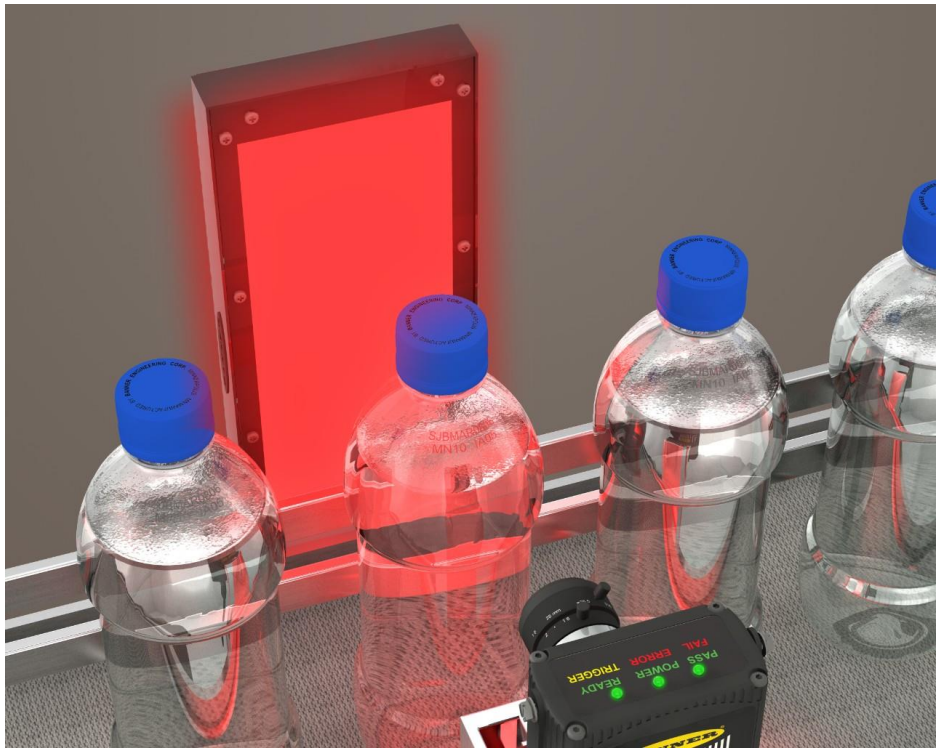
A ring light provides diffused illumination over a small area. With the lens axis through the center opening of the ring light assembly, the ring light illuminates the area directly in front of the camera.

Brightly illuminates small objects

Reduces shadows on images with protrusions

Centers the light on the image

Vision Lighting (Back Lights)



A backlight provides even, low-intensity light. It is placed behind the target and aimed directly back towards the camera. The resulting silhouette can be inspected for proper size and shape.

Installs directly behind the target
Determines the shape and size of target objects
Offers a highly diffused surface and uniform brightness, with a lower intensity than other lights
Provides the most robust lighting for measuring and gauging
Highlights through-holes in target objects

Vision Lighting (Low Angle Ring Lights)

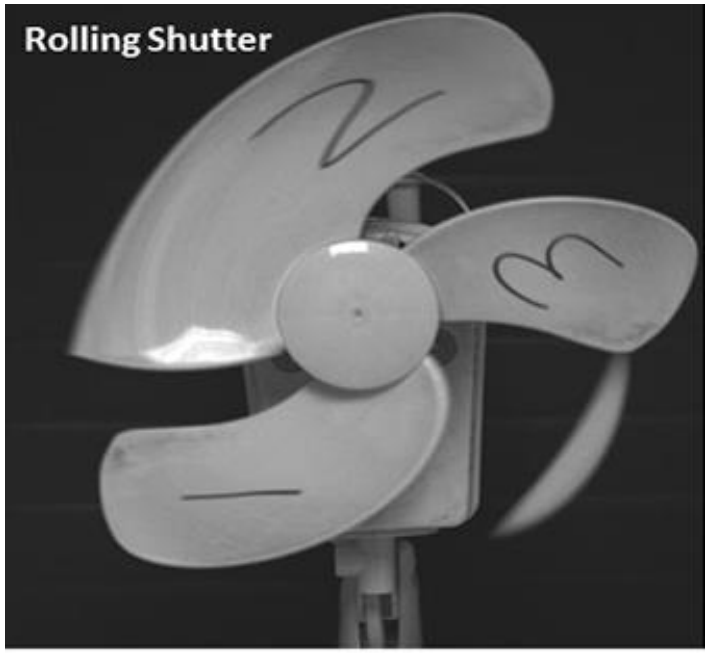
Low-angle vision lighting enhances the contrast of surface features. The low-angle light is aimed nearly perpendicular to the imaged surface of the target object, casting shadows that emphasize changes in elevation.

Illuminates from an angle nearly perpendicular to object

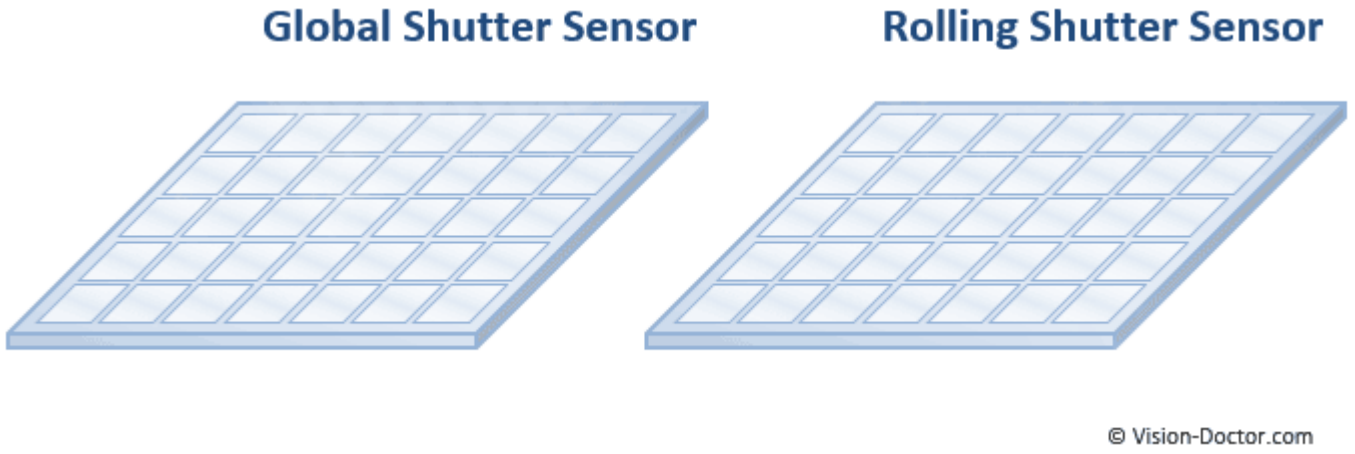
Emphasizes surface irregularities such as dust, dents, scratches and other surface defects

Highlights slight height differences such as etching, solder balls and embossing

Cameras (Rolling Shutter)

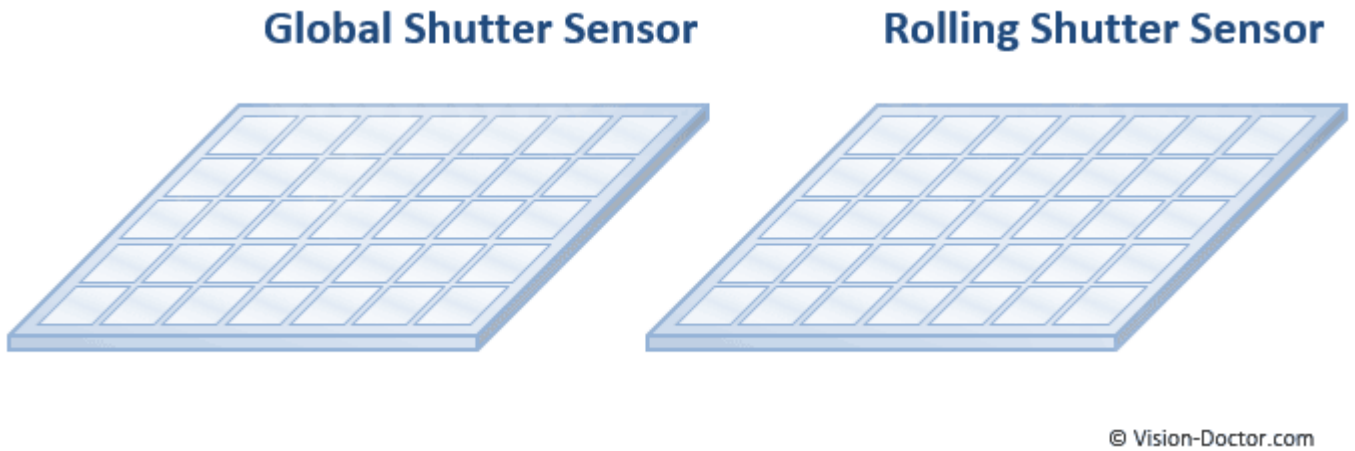


Rolling shutter is a method of image capture in which a still picture (in a still camera) or each frame of a video (in a video camera) is captured not by taking a snapshot of the entire scene at a single instant in time but rather by scanning across the scene rapidly, either vertically or horizontally.

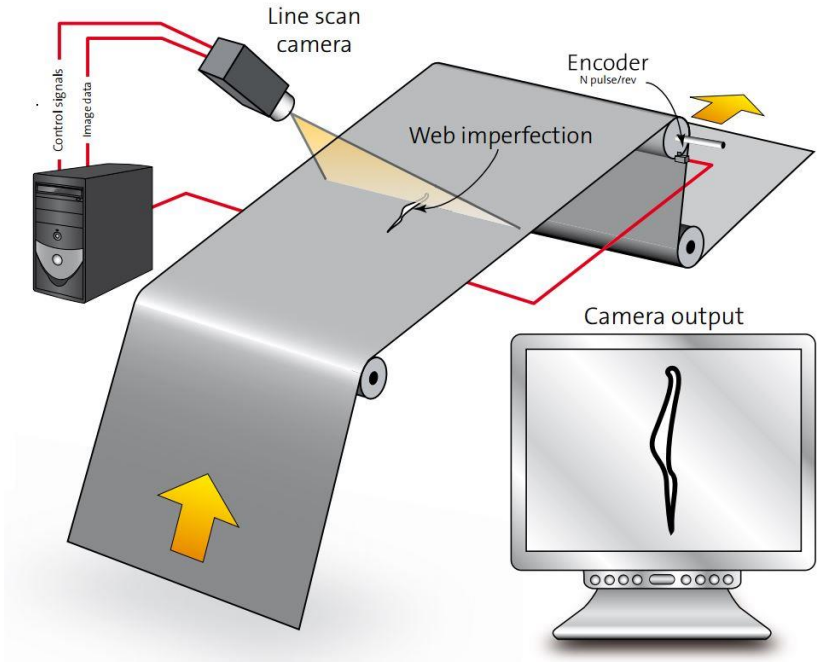


Cameras (Global Shutter)

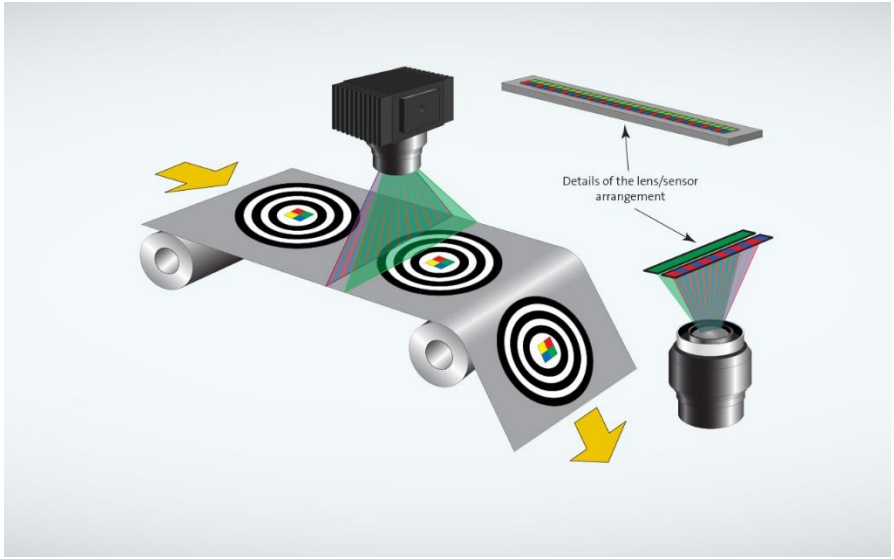
In contrast to that, “**global shutter**” is the technical term referring to sensors that scan the entire area of the image simultaneously. The vast majority of CCD sensors employ **global shutter** scanning.



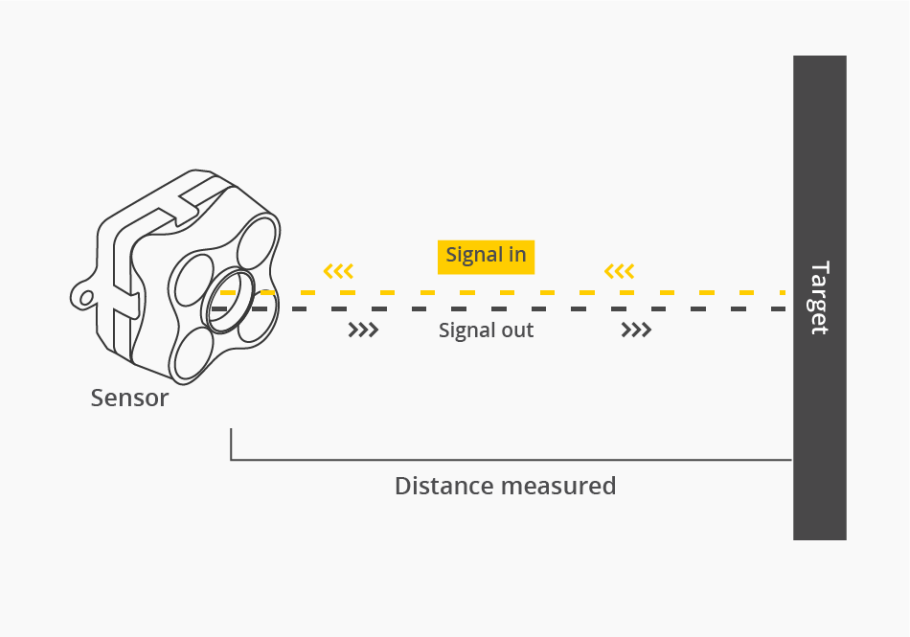
Cameras (LineScan)



Line scan cameras contain a single row of pixels used to capture data very quickly. As the object moves past the **camera**, a complete image can be reconstructed in software **line** by **line**. **Line scan** systems are best employed in high-speed processing or fast-moving conveyor **line** applications



Cameras (ToF -Time Of Flight)



A ToF camera uses infrared light (lasers invisible to human eyes) to determine depth information - a bit like how a bat senses it surroundings. The sensor emits a light signal, which hits the subject and returns to the sensor. The time it takes to bounce back is then measured and provides depth-mapping capabilities. This provides a huge advantage over other technologies, as it can accurately measure distances in a complete scene with a single laser pulse.

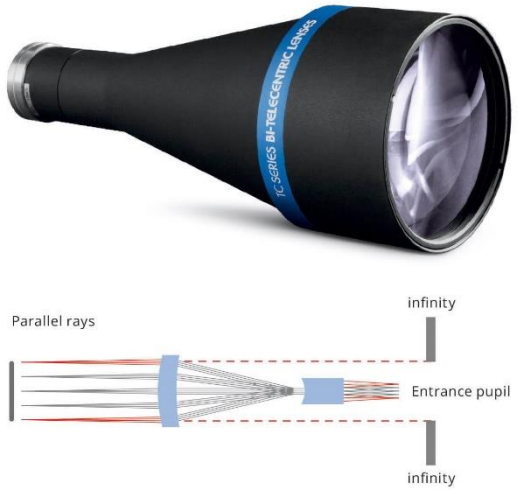
Lenses (Fixed Focal Lenght)

Fixed Focal Length Lenses are imaging **lens** assemblies designed with a single angular field of view, also known as constant **focal length**. These imaging **lenses** typically have a minimum working distance, but no maximum, extending performance out to infinity.

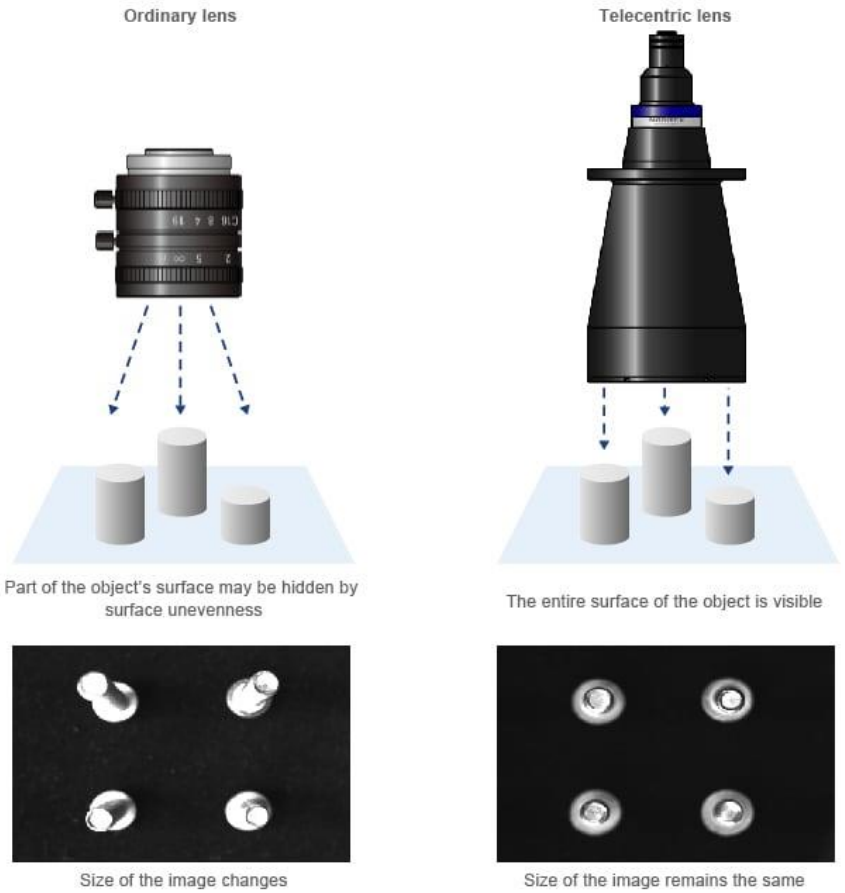
Lenses (Varifocal Lenght)

A **varifocal lens** is a camera **lens** with variable focal **length** in which focus changes as focal **length** (and magnification) changes, as compared to parfocal ("true") zoom **lens**, which remains in focus as the **lens** zooms (focal **length** and magnification change)

Lenses (Telecentric)



Telecentric lenses, the magnification in both image and object space is independent of distance (within the depth of field) or the position in the field of view. This attribute is ideal for machine vision applications: when measuring dimensions, a telecentric lens will yield the same measurement regardless of changes in object distance or position.



Lenses (Hypercenric - Pericentric)

Hypercentric Lenses provide a converging view of an object, focusing on the top and surrounding sides simultaneously, and are used to eliminate the need for multiple camera and imaging lens setups in machine vision inspection or identification applications.

Lenses (Liquid)

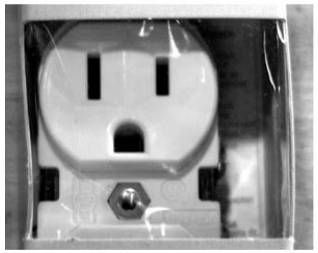
Liquid lenses allow imaging systems to overcome Depth of Field (DOF) limitations by allowing the focus to be electronically adjusted without requiring any mechanical movement. This can be a great solution for applications with varying object heights and working distances. Traditional solutions for these types of applications include motorized zoom lenses or physically repositioning the object to bring it into focus. Another way to increase the DOF in a traditional lens is to increase the f/# by reducing the aperture size of the imaging lens. However, this can also reduce the resolution and amount of light that gets through the imaging system, thereby reducing acquisition rates and image quality. By integrating a liquid lens, an imaging system can change focus electronically without compromising speed or image quality, regardless of the object's distance from the camera.

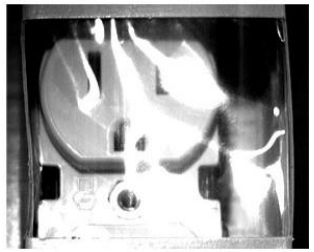
Lenses (Pinhole)

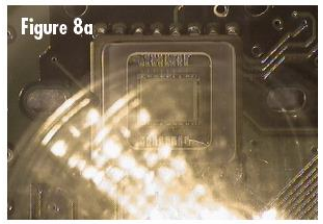
A pinhole can be used as a kind of small optical aperture: A pinhole is the simplest possible optical element for imaging; it can be used in a pinhole camera (camera obscura). A very small pinhole can be used for obtaining light with increased spatial coherence from incoherent light

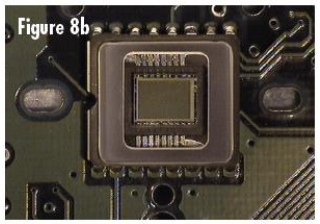
Filters

○ bandpass ○ multi bandpass ○ longpass ○ shortpass/nir cut ○ neutral density ○ polarizing
○ protective ○ acrylic ○ light balancing ● show all



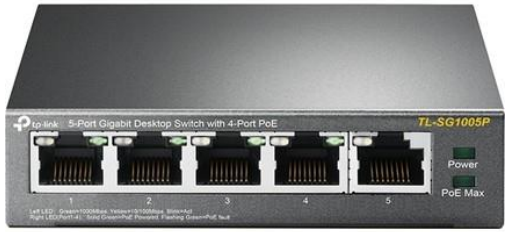






There are many different types of filters in machine vision that can be utilized to improve or change the image of the object under inspection. It is important to understand the different technologies behind the various types of filters in order to understand their advantages and limitations. Although there is a wide variety of filters, almost all can be divided into two primary categories: colored glass filters and coated filters.

Accesories



Power Over Ethernet (POE)

CAT Series Cables

USB 3.0 Camera Cable

Hirose I/O Cable