



## Sensors

### Image Sensor Technology

Basler uses both CCD (charge coupled device) and CMOS (complementary metal oxide semiconductor) image sensors in its cameras. The basic job of CCD and CMOS sensors is to convert light (photons) into electronic signals (electrons). The main difference between the two sensor types is the technical design of the sensor itself. Based on a camera's target application, Basler design engineers select the most appropriate sensor technology.

CCD sensors have been available for the last 25 years and they have been very successful in the industrial and consumer markets. A variety of technical advantages have made CCD sensors the preferred choice in the industrial marketplace for quite some time. But the many recent improvements in CMOS technology driven by memory device development have been a great benefit to CMOS sensor performance. A comparison of some of the technical details can be found in the table below.

In general, the low noise level, high fill factor, and good signal-to-noise ratio exhibited by CCD sensors result in very high quality images. These characteristics make cameras based on CCD sensors a good fit for machine vision applications. CMOS sensors have made a path into machine vision based largely on their advantage in speed (frame rate) and resolution (number of pixels) compared to CCD imagers. Improvements in CMOS technology and demand from high volume users such as the automotive market are making CMOS image sensors more and more attractive for machine vision applications.

Basler's broad product portfolio of CCD and CMOS cameras includes sensors from several different vendors. Basler continuously scouts the market to find sensors that meet the needs of machine vision and related systems. We then build cameras which emphasize the strengths of each sensor regardless of whether the sensor is CCD or CMOS.

The main technical differences between CCD and CMOS sensors include:

Parameter	CCD	CMOS
Fill Factor	High	High
Dark Noise	Low	Medium
Signal-to-Noise Ratio	High	Medium
Dynamic Range	Medium	High
Speed	Medium	High
Area of Interest	Limited	Individual
Blooming	Yes	No
Smearing	Yes	No