Basler sprint

The New Standard for Speed and Sensitivity

BASLER
VISION TECHNOLOGIES

The new Basler sprint family of line scan cameras includes members with 2k, 4k, and 8k resolution and a variety of line rates. Cameras will be available in both mono and color. All sprint variants are based on a next generation dual line CMOS sensor designed exclusively for Basler.

The Basler sprint is aimed at applications where high sensitivity, excellent image quality, and the highest speed are required. This speed and image quality let sprint camera users increase efficiency and throughput in many vision applications.

sprint CMOS Sensor Technology

To reach Basler's high goals for the sprint sensor, the positive properties of current sensor technologies were combined. The well-known image quality of CCD sensors was combined with the high speed of CMOS to achieve a "best of both worlds" result. The sprint development project resulted in a unique sensor design with a high QE (quantum efficiency) of up to 60%, a fill factor of 100%, and the highest SNR (signal-to-noise ratio) at low light conditions. This means that users will see very low noise levels and unique speed levels. A maximum line rate of 140 kHz can be reached at either 2k or 4k resolution. With 8k resolution a line rate of up to 70 kHz can be reached. The fact that there is no gap between the two active lines in the sensor makes it easy to fit the camera into both existing and new applications with no spatial artifacts.

Your benefits include:

- Increased throughput with maximum line rates of up to 140 kHz

- Mono and Color

- Higher sensitivity

- More capable vision-based inspection

- AOI (area of interest) with linear speed increase

- Easy integration into your application

- 100% quality checked and calibrated to give you consistent performance and reliability

Features

The dual line sensor offers high flexibility so that the sprint can meet a wide variety of application requirements and can be easily integrated. Some of the main unique properties and features of the Basler sprint are:

- AOI (area of interest) with linear speed increase
  The AOI feature lets you focus precisely on the area of an object that is important to you. This means that the amount of data transmitted by the camera will be reduced and that the image processing application in your host PC will not be overloaded with unnecessary data. In addition, you may see a linear increase in the camera's speed by reducing the AOI.

- Time delayed line sum
  This feature uses the dual line sensor to scan each object line twice in a time delayed fashion. The double information is combined in the sprint's internal memory and this technique doubles the sprint's sensitivity. It also significantly reduces noise and results in a 3 dB increase in the SNR.

- Time delayed line averaging
  With this feature, time delayed line summing is performed and then the doubled information is averaged. The advantages are an increase of 3 dB in the SNR and an increase of 3 dB in the dynamic range.

- Binning
  Both horizontal and vertical binning are available. Either two pixels or four pixels can be binned together (see the graphics illustrating binning).

- Shading correction (flat field correction)
  DSNU (dark signal non-uniformity) and PRNU (photo response non-uniformity) can be performed to correct for the non-homogeneous behavior of lighting, optics, and the sensor that can be present in real world applications.

- Color
  A Bayer pattern filter is used to create the color version of the sprint. One line in the sensor reports red and green information and the second line reports green and blue information. Image data in a raw format is transferred to the frame grabber where color processing happens in a fast, reliable way similar to common color area scan cameras. Several color creation schemes can be implemented. Depending on the application needs, the active color concept can focus on speed and reducing the amount of data, or it can focus on higher color fidelity. For higher color fidelity, each object line is scanned twice, thus two times color information is available for each image point. This approach has a big advantage because standard lenses and frame grabbers can be used. Because there is no gap between the sensor's two active lines, adapting the camera to your application/object is easy and no spatial correction is needed (see the Bayer pattern graphic).
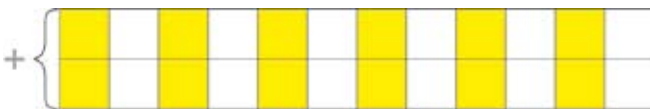
Vertical Binning
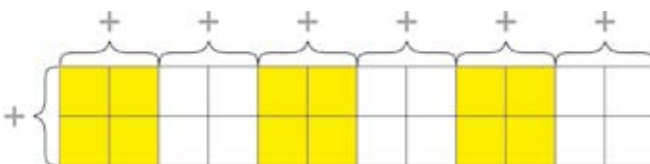
Horizontal and Vertical Binning

Sensor has no gap between pixels or lines
Bayer pattern filter

sprint Housing Concept

Unique Cooling and Positioning Architecture

Another important characteristic of Basler's sprint series is the new housing and cooling concept. The sensor module and the camera housing have been integrated as a single unit to optimize cooling and to reduce heat induced noise to a minimum. The sensor and the electronics that control the sensor are part of a ceramic module. The ceramic module is directly attached (both physically and thermally) to a heat sink system that pipes heat directly to the outside of the camera.

To achieve the smallest possible tolerances in six directions, the sensor is positioned in the camera by a specially designed automatic positioning tool (see the graphic showing the up, down, left, right, rotate, and tilt directions). Maintaining the smallest possible tolerances helps to ensure that each camera behaves in the same way. It also makes it easier for users to adjust the sprint to their application and to have a sharp focus over the entire sensor surface.
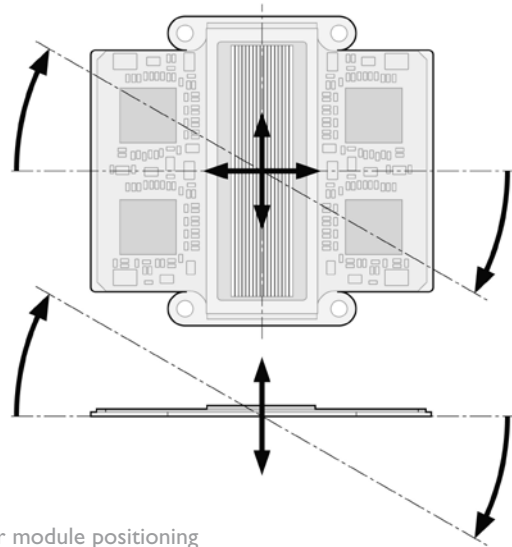
Sensor module positioning

Camera Link Interface

Camera Link is a camera communications interface designed for vision applications in science and industry. Camera Link was first established in 2000 by Basler and other leading companies in the machine vision arena. Camera Link enables a maximum data transmission rate of up to 680 MB per second depending on the configuration. The Camera Link interface is used to connect a camera to a compatible frame grabber in a host PC. The frame grabber collects and evaluates data from the camera.

The most important benefits offered by Camera Link are:

• An accepted and proven communications standard for vision technologies (cameras and frame grabbers)
• A simple, standardized cable concept
• Particularly suitable for high data rates
• Standardized protocols for several types of image data transfer, for example, 2, 4, or 8 tap camera output and 8 bit, 10 bit, or 12 bit pixel depth
• Serial communications to the camera via a port on the frame grabber

One main advantage of the Camera Link standard is that numerous frame grabbers produced by many different vendors are compatible with the Basler sprint series. The complete list of compatible frame grabbers can be found at www.baslerweb.com.

Typical Applications

Basler sprint cameras are perfect for use in applications such as;

• Web inspection of paper, foil, wood veneers, etc.
• Surface inspection of printed circuit boards, flat panels and displays, semiconductors, etc.
• Document scanning and postal sorting
• Food inspection

Specifications

Basler sprint	spL2048 -20kc*	spL2048 -39k/kc*	spL2048 -70k/kc*	spL2048 -140k	spL4096 -20k/kc	spL4096 -39k/kc	spL4096 -70k/kc	spL4096 -140k
Camera								
Sensor Size (pixels per line)	2048	2048	2048	2048	4096	4096	4096	4096
Sensor Type	Dual Line CMOS							
Mono/Color	Color	Mono/Color	Mono/Color	Mono	Mono/Color	Mono/Color	Mono/Color	Mono
Pixel Size	$10.0\ \mu m \times 10.0\ \mu m$							
Camera Link Pixel Clock	40 MHz	40 MHz	80 MHz	80 MHz	40 MHz	40 MHz	80 MHz	80 MHz
Data Speed	80 MHz	80/160 MHz	160/320 MHz	320 MHz	80/160 MHz	160/320 MHz	320/640 MHz	640 MHz
Max. Line Rate	19.3 kHz	38.6 kHz	70 kHz	140 kHz	19.3 kHz	38.6 kHz	70 kHz	140 kHz
Pixel Depths	Selectable 8 bit, 10 bit, or 12 bit							
Video Output Format**	2 tap	2 tap	3 tap	4 tap	2 tap/4 tap	2 tap/4 tap	4 tap/8 tap	8 tap
Synchronization	Via external signal or free run							
Exposure Control	Edge-controlled, level-controlled, or programmable							

Mechanical / Electrical								
Power Requirements	12 VDC (±10%), max 8.0 W @ 12 VDC				12 VDC (±10%), max 10.0 W @ 12 VDC			
Lens Mounts	F-mount, M42							
Housing Size (L x W x H)	53.4 mm x 87.0 mm x 62.0 mm							
Weight	360 g (without F-mount adapter)							
Conformity	CE, FCC							

Specifications are subject to change without prior notice
* Availability – Q4/2008   ** Tap Format can be changed via CCT+

Dimensions
(in mm)
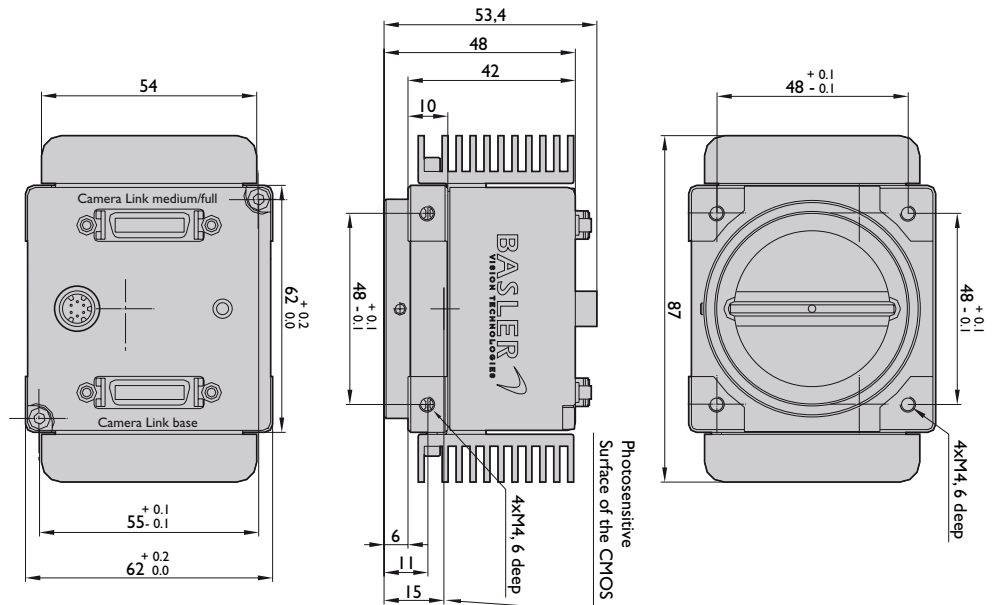
Specifications

Basler sprint	spL8192-20k*/kc*	spL8192-39k*/kc*	spL8192-70k
Camera			
Sensor Size (pixels per line)	8192	8192	8192
Sensor Type	Dual Line CMOS		
Mono/Color	Mono/Color	Mono/Color	Mono
Pixel Size	10.0 µm × 10.0 µm		
Camera Link Pixel Clock	40 MHz	40 MHz	80 MHz
Data Speed	160/320 MHz	320 MHz	640 MHz
Max. Line Rate	19.3 kHz	38.6 kHz	70 kHz
Pixel Depths	Selectable 8 bit, 10 bit, or 12 bit		
Video Output Format**	4 tap/8 tap	8 tap	8 tap
Synchronization	Via external signal or free run		
Exposure Control	Edge-controlled, level-controlled, or programmable		

Mechanical / Electrical			
Power Requirements	12 VDC (±10%), max 13.5 W @ 12 VDC		
Lens Mount Adapter Interface	V-92 mount for specific lens mount adapter		
Lens Mount Adapter	Unifoc 100/95/V-Basler helical mount, M58 × 0.75/V-Basler lens mount		
Housing Size (L × W × H)	53.7 mm × 102.0 mm × 92.0 mm		
Weight	580 g		
Conformity	CE, FCC		

Specifications are subject to change without prior notice
* Availability – Q4/2008   ** Tap Format can be changed via CCT+

Dimensions
(in mm)
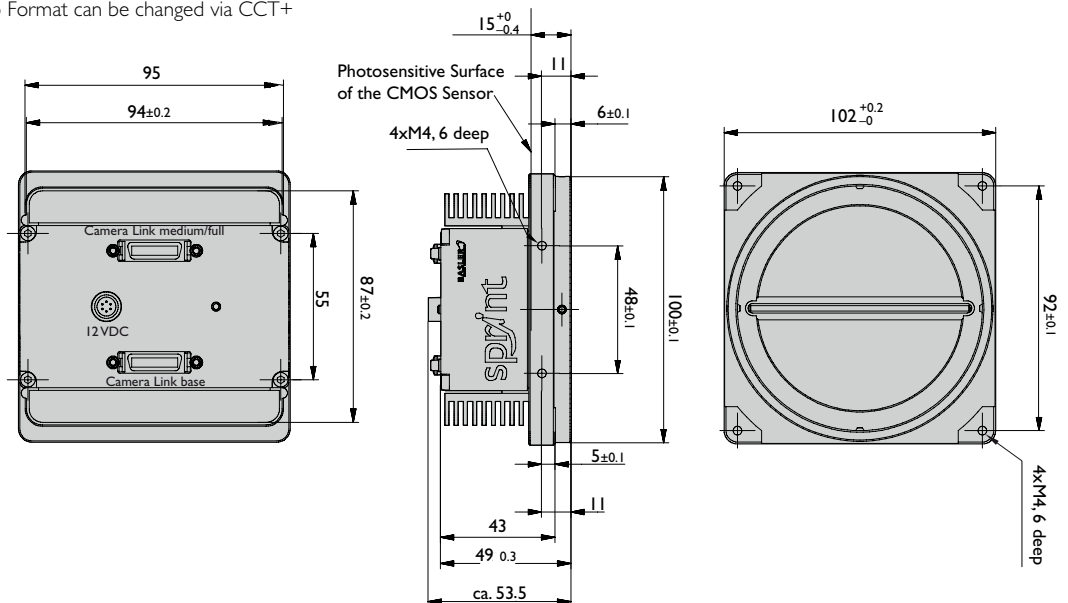
What Makes Basler Camera Quality So Special?

To ensure consistently high product quality, we employ several quality inspection procedures during manufacturing. This list describes some of the most essential actions we take to meet your highest requirements.

- The back focal length on each camera is carefully measured and adjusted. This guarantees an optimum distance between the lens flange and the sensor and ensures compliance with optics standards.

- **Our advanced Camera Test Tool (CTT+), the first fully-automated inspection system for digital cameras, checks all of the significant quality aspects of each camera we produce. The CTT+ is a unique combination of optics, hardware, and software that can be quickly and efficiently used to calibrate a camera and to measure its performance against a set of standards. For defined sets of conditions, an automated software program examines the camera's output, makes any calibration adjustments necessary, and compares the output to a strictly defined set of performance criteria.**

How Does Basler Measure and Define Image Quality?

Basler is leading the effort to standardize image quality and sensitivity measurement for machine vision cameras and sensors. All measurements done by Basler will be in 100% compliance with the new European Machine Vision Association EMVA 1288 standard.

Because it describes a unified method to measure, compute, and present the specification parameters for cameras and image sensors used in machine vision applications, Basler is giving the EMVA 1288 standard our strongest support.

The sprint family will be characterized and measured to provide information about the quality and sensitivity of the product.

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