

TECH update

Product Change Information By Basler Vision Components

Differences Between the A101f/fc and the A102f/fc

Version 1.1, October 13, 2003

Introduction

Basler is introducing a new megapixel camera family at the Vision Show 2003 (October 21-23). As you know, the A101 family with either an RS-644 or an IEEE 1394 interface has been an all-round camera for a variety of uses. This camera family was used in electronics, semiconductor and component inspection, microscopy and medical imaging, manufacturing quality control, and food and beverage control. In addition to these in-door applications, A101 cameras were used in out-door applications including traffic control, snapshots on a roller coaster and many others. The A101f/fc with the IEEE1394 interface was an easy to integrate, high-performance camera that fit into many, many projects. Superior image quality and industrial design made this camera a top selling product worldwide. Our sensor supplier has discontinued the sensor used in the A101 family and has issued an improved design. In 2002, Basler developed the A102k with a Camera Link™ interface, its first successor using the improved sensor. Now the A102f and A102fc, monochrome and color cameras with an IEEE1394 interface, are being introduced at the Vision Show and will complete the family. Further features will follow.

Sensor Properties

When developing cameras based on the improved CCD sensor, our first aim was to increase sensitivity and signal-to-noise ratio (SNR). This goal was achieved in the A102f/fc with a 3 dB increase (+ 40 %) in sensitivity and up to a 6 dB increase (+ 100 %) in SNR. When processing a single image, the SNR is limited by the photon noise and conversion with an 8 bit ADC is sufficient. When averaging images, the need for a higher bit depth is obvious. By reducing the readout noise, the output depth has been increased to 12 bits. The frame rate of the A102f/fc has increased from 12 frames per second (fps) to 15 fps. When the camera is outputting images at 12 bit depth, the mono 16 format will be used. In this case, the frame rate will be lower due to the higher data amount per image. As you would expect, an Area of Interest (AOI) feature with speed increase will be available. Much of this performance enhancement was realized by a better layout of the electronics and improved microlenses in the sensor.

09/03. Specifications are subject to change without prior notice.

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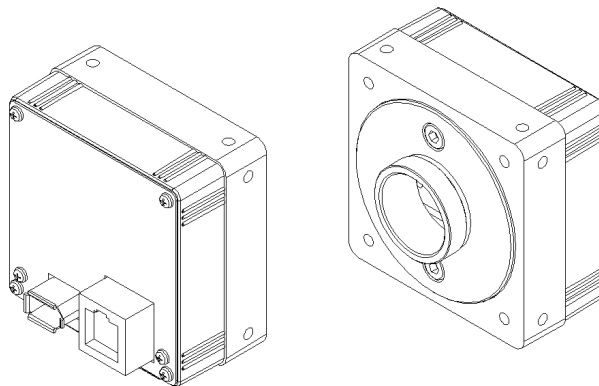
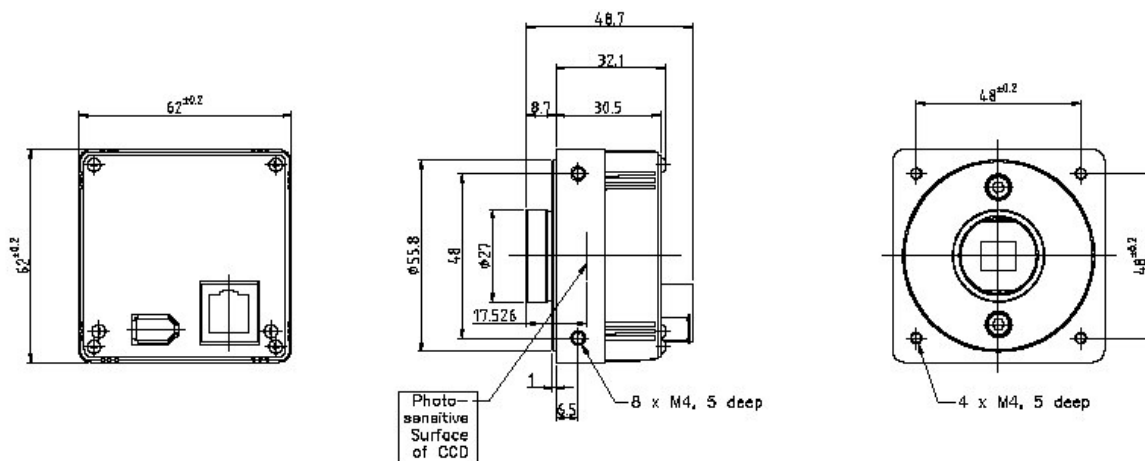
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Improvement

Sensitivity	+ 3 dB (+ 40 %)
SNR	+ 6 dB (+ 100 %)
Quantum efficiency	from 27 % to 40 % (at 550 nm)
Bit depth	from 8 to 12 bits
Frame rate	from 12 to 15 fps
Manual gain	+ 4 dB (+ 60 %)
Power consumption:	approx. 30 % less

Mechanics and Connectors

Basler's focus during development of the A102f/fc was to be 100% compatible with the A101f/fc. We take our responsibility to our OEM customers seriously. This means that the location and size of the mounting holes on the front and the sides of the camera are the same as the ones on the previous model. The outer dimensions (62 mm wide x 62 mm high) are also unchanged. The depth of the camera was shortened. See the drawings for details.



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Pixel Size and Optics

An important change is the vertical size of the sensor. Even though the vertical resolution increased by ten pixels, the vertical size was reduced by 2.8 % (from 6.9 mm to 6.7 mm). There are two ways to handle this. First, you can select another lens with a slightly shorter focal length. Note that the nominal focal length differs from the actual one, e.g., a 35 mm lens might have an actual focal length of 34.5 mm. This varies from vendor to vendor. See the following table listing lenses from Schneider-Kreuznach and Linos. Please be aware that there are many more lenses available, but with the exception of macro lenses, these are the most commonly used ones for machine vision. See Basler's optics recommendation guide at www.basler-vc.com/popups/606/Optics_Recommendation.pdf for more details.

Nominal focal length	Schneider-Kreuznach Compact Series	Linos MeVis Series
8 mm	8.2 mm, F/# 1.4	
12 mm	12.6 mm, F/# 1.4	12.0 mm, F/# 1.6
16 or 17 mm	17.6 mm, F/# 1.4	16.0 mm, F/# 1.6
23 or 25 mm	22.5 mm, F/# 1.4	25.0 mm, F/# 1.6
35 mm	34.5 mm, F/# 1.9	35.0 mm, F/# 1.6
50 mm		49.9 mm, F/# 1.8

A second way to handle the vertical resolution change is to move the camera away from the object by 2.8 % of the object distance. In cases where the resolution must be the same as in the past, the factor will be 3.7 %. If you change the 12.6 mm Schneider lens to a 12 mm Linos lens, you will have the same field of view (FOV), meaning you will cover the same size of your object. In cases where a zoom lens is used, a small shift in the magnification is all that is required. If you have questions about adapting your individual application to the A102f/fc, please contact Basler technical support.

Color

As with the A101fc, the A102fc will use a Bayer pattern filter to create color images. The Bayer filter places a fixed pattern of red, green, and blue filters over the pixels in the sensor. Conversion to full color data for each pixel is performed inside of the camera and color output will be in the YUV 4:2:2 format. A format that supplies raw data output for each pixel will also be available. The A102fc includes a white balance feature that allows users to easily balance the colors in acquired images.

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Power Supply and IEEE1394 Cable

The voltage supplied to A102f/fc cameras can be in a range from +8 to +40 VDC.

Typical power consumption is 3.5 W at 12 VDC.

IEEE 1394 cables are available from Basler in 6-pin/6-pin and 6-pin/4-pin configurations and a variety of lengths. We offer cables with click-lock or screw-lock connectors. According to the IEEE 1394 specification, the maximum allowed cable length is 4.5 meters. Ordinarily, Basler advocates strict adherence to specifications, but we have tested cables up to 10 meters and found that in low EMI environments, longer cables often work reliably. We sell cables up to 10 meters long and although we can't guarantee performance with cables longer than 4.5 meters, we suggest that you experiment with longer cables to see if they work well in your environment.

Basler put all of its knowledge and experience into these new cameras. During the entire development project, we took our responsibilities to our customers, especially OEMs, seriously. The A102f/fc will be a worthy successor to the well accepted and successful A101f/fc.

BCAM

Due to the fact that the BCAM driver is certificated by Microsoft, especially for initializing hardware components, it is not possible to put the A102f/fc into older versions of BCAM. In BCAM 1.7 the A102f/fc is listed. In case of older BCAM versions the A102f has to be added "by hand". Please follow the guideline as listed in "BCAM 1394 Driver Getting Started Guide" (DA00051601), which is on every CD of BCAM. If there are further questions, please contact support.

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