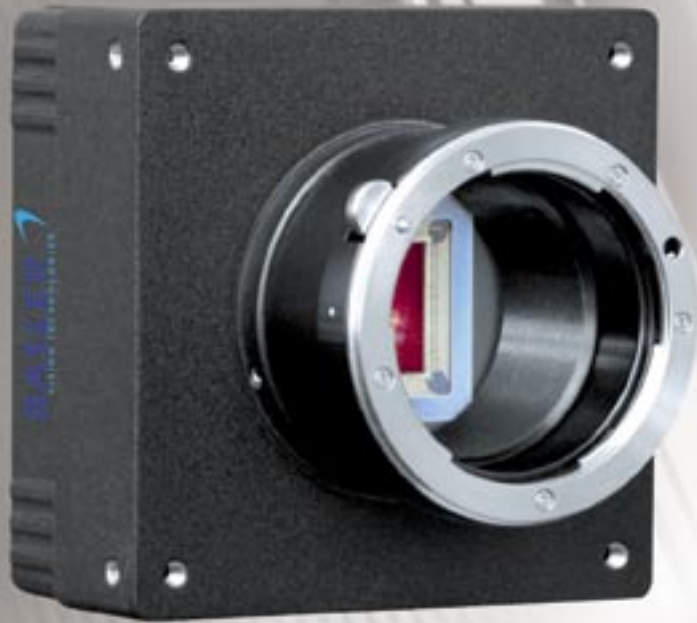


BASLER A400



The A400 Series

Introduction

Basler cameras have been prominent on the market even since they were first launched in 1997. They have stood for top performance, high quality, reliability and user friendliness ever since. The portfolio includes line scan cameras, area scan cameras and intelligent cameras. Basler's Vision Components business unit (Basler-VC) offers digital camera solutions for industrial and non-industrial applications in the semiconductor, electronics, medical and emerging markets. Basler-VC also offers customizations for individual solutions to meet the needs of our worldwide customers even more effectively.

Basler's competence covers all relevant disciplines in R&D including cameras, optics illumination, image processing computers, software, and mechanics. Our commitment to product development, performance, reliability and responsiveness means that our customers recognize us as an integral business partner.

At Basler-VC we focus on your needs. Let us help you to reach your quality and profitability goals.

Features and Benefits of the A400 Variants:

All A400 variants contain a high quality CMOS sensor with 2352x1726 active pixels. While the speeds of the most common CCD sensors are limited to 15 fps, the A400 variants offer superior maximum frame rates:

- **A402k/kc: 24 fps at full resolution**
- **A403k/kc: 48 fps at full resolution**
- **A404k/kc: 96 fps at full resolution.**

The A400 variants set new standards in performance and image quality which is at least comparable with CCD cameras.

The extraordinary image quality is based on the highly sophisticated sensors and on the electronics of the A400 cameras. The quality is enhanced still further by three different image enhancement features:

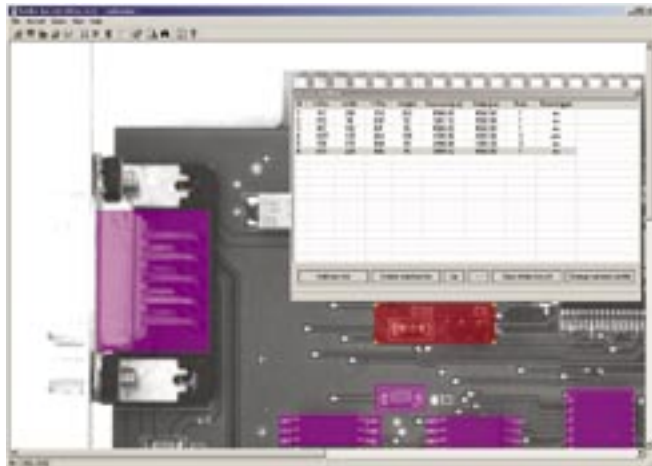
- **Column shading correction to eliminate the fixed pattern noise**
- **DSNU shading correction to eliminate dark signal non-uniformity**
- **PRNU shading correction to eliminate photo response non-uniformity**

The absence of blooming or smear represents another advantage over CCD sensors. Missing codes are not an issue for the A400. The images are also very homogeneous in this respect. The fast FPGA of the A400 cameras enables the option of pre-processing inside the cameras. It is therefore possible to implement individual algorithms that are adapted to the customer's requirements.

Only the most important parts of the image can be transmitted out of the camera using the area of interest (AOI). This allows the customer to further increase the frame rate and to reduce the amount of data.

For each individual AOI, different parameters like AOI position, AOI dimension, exposure time and flash activation can be defined in the AOI list. The resulting sets of parameters can be saved in the camera and executed internally. The slow serial communication port is therefore not necessary. This enables the highest frame rates during operation.

The AOI editor makes creating the AOI list simple. With this easy-to-use tool the AOIs can be created in a graphical way by positioning them in the most interesting regions and adjusting their sizes. The AOI list is automatically created and gives an overview of positions, sizes, exposure times, delay times and flash activation. The program indicates impossible settings and provides information for achieving the correct solutions.



A400 cameras are particularly useful in applications like PCB inspection where the AOI feature is very often used. The bare board inspection and flat panel display inspection are also applications where superior image quality and the highest speed are both required. Wafer inspection, bonding inspection, die placement and packaging are all typical applications in the semiconductor market. Further applications include 3D measurement, document processing, and postal and document sorting.

CameraLink® Interface

CameraLink is a communication link for visual applications in the fields of science and industry.

CameraLink was founded in the year 2000 by the leading companies in the machine vision arena:

BASLER, COGNEX, CORECO, DALSA, DATA TRANSLATION, DATACUBE, EPIX, EURESYS, FORESIGHT IMAGING, INTEGRAL TECHNOLOGIES, MATROX, NATIONAL INSTRUMENTS, PULNIX America.

CameraLink enables a maximum data transmission rate of 680 MB per second depending on the configuration.

Frame grabbers which collect and evaluate the data are usually used to connect the camera and the PC via the CameraLink interface.

The most important benefits afforded by CameraLink are:

- Accepted communication standard for vision technologies (camera frame grabber)
- Simple and standardized cable concept
- Particular suitability for high data rates
- Standardized data protocol for several types of data transfer, for example single/dual tap, 8 bit, 10 bit, RGB, etc.
- Serial communication to the camera via the frame grabber communication port

The CameraLink standard means that many frame grabbers produced by different vendors are compatible with the A400 cameras. These frame grabbers include:

Basler A400 Series	Grabber	Interface	A402k/kc	A403k/kc	A404k/kc
Matrox	Odyssey XCL	CL-Full	●	●	●
	Helios XCL	CL-Full	●	●	●
	Solios XCL	CL-Medium	●	●	
Coreco-Imaging	X64-CL Full	CL-Full	●	●	●
	X64-CL iPro	CL-Medium	●	●	●
	PC-CamLink	CL-Base	●		
	PC2-CamLink	CL-Base	●		
National Instruments	IMAQ 1428	CL-Base	●		
	PCIe-1429	CL-Full	●	●	●
Euresys	GrabLink Value	CL-Base	●		
	GrabLink Express	CL-Medium	●	●	
Matrix Vision	MVtitan-CL	CL-Medium	●		
BitFlow	R3-PCI-CL	CL-Base	●		
	R64-CL	CL-Full	●	●	●
	R64-Cle	CL-Full	●	●	●
Mikrotron	Inspecta 4C	CL-Base	●		
Silicon Software	microEnable II	CL-Base	●		
	microEnable III	CL-Medium	●	●	
Arvoo	Leonardo PCI 64CL	CL-Full	●	●	●
Data Translation	DT3145	CL-Base	●		
EDT	PCI-DVC-Link	CL-Full	●		
Epix Inc.	PIXCI-CL3	CL-Full /10	●	●	●
	PIXCI-CL1	CL-Base	●		
IDS	Baracuda-CL	CL-Medium	●		

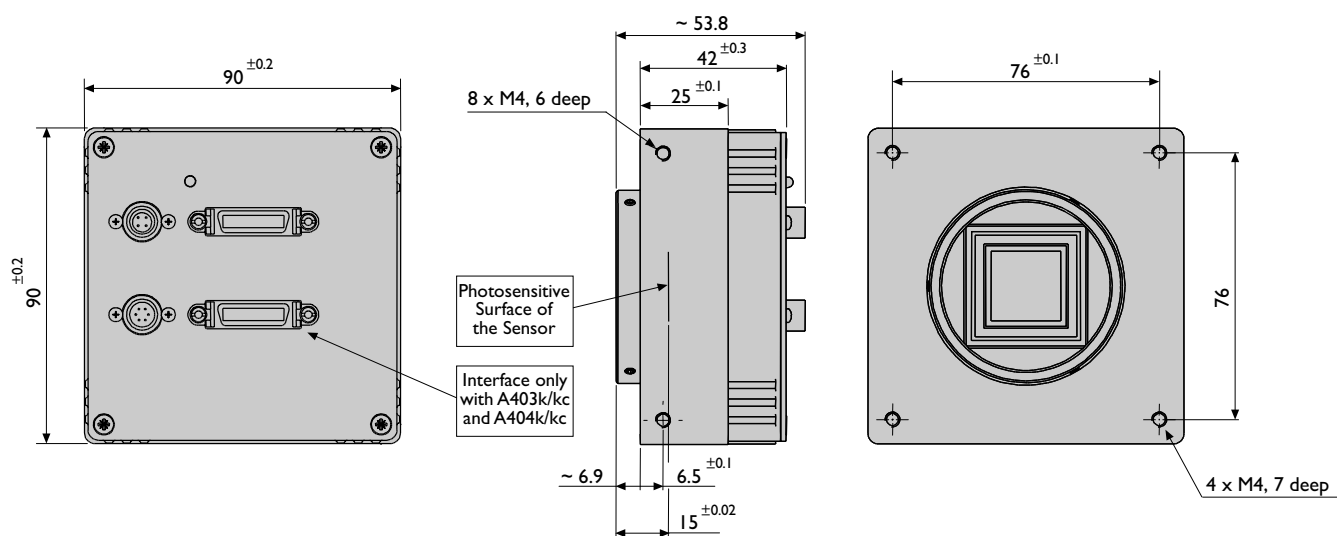
● possible

Specifications

Basler A400 Series	A402k/kc	A403k/kc	A404k/kc
Sensor Size (H x V Pixels)	2352 X 1726		
Sensor Type	Progressive Scan CMOS		
Pixel Size	7 μ m x 7 μ m		
CameraLink Clock	50 MHz	50 MHz	50 MHz
Max. Frame Rate at Full Resolution	24 frames/s	48 frames/s	96 frames/s
Color / Mono	Color/Mono	Color/Mono	Color/Mono
Video Output Type	Camera Link (Base)*	Camera Link (Medium)	Camera Link (Full)
Video Output Format	2 taps, 8 bits/10 bits	4 taps, 8 bits/10 bits	8 taps, 8 bits 4 taps, 8 bits/10 bits
Synchronization	Via external trigger or free-run		
Exposure Control	Level-controlled, or programmable		
Power Requirements	12VDC (\pm 10%) max. 6.5 W	12VDC (\pm 10%) max. 7.0 W	12VDC (\pm 10%) max. 7.2 W
Lens Mount	F-mount		
Housing Size (L x W x H) (without lens adapter)	42 mm x 90 mm x 90 mm		
Weight	max. 605 g	max. 615 g	max. 615 g
Conformity	CE, FCC		

Specifications may change without prior notice

Dimensions



What Makes Basler Camera Quality so Special?

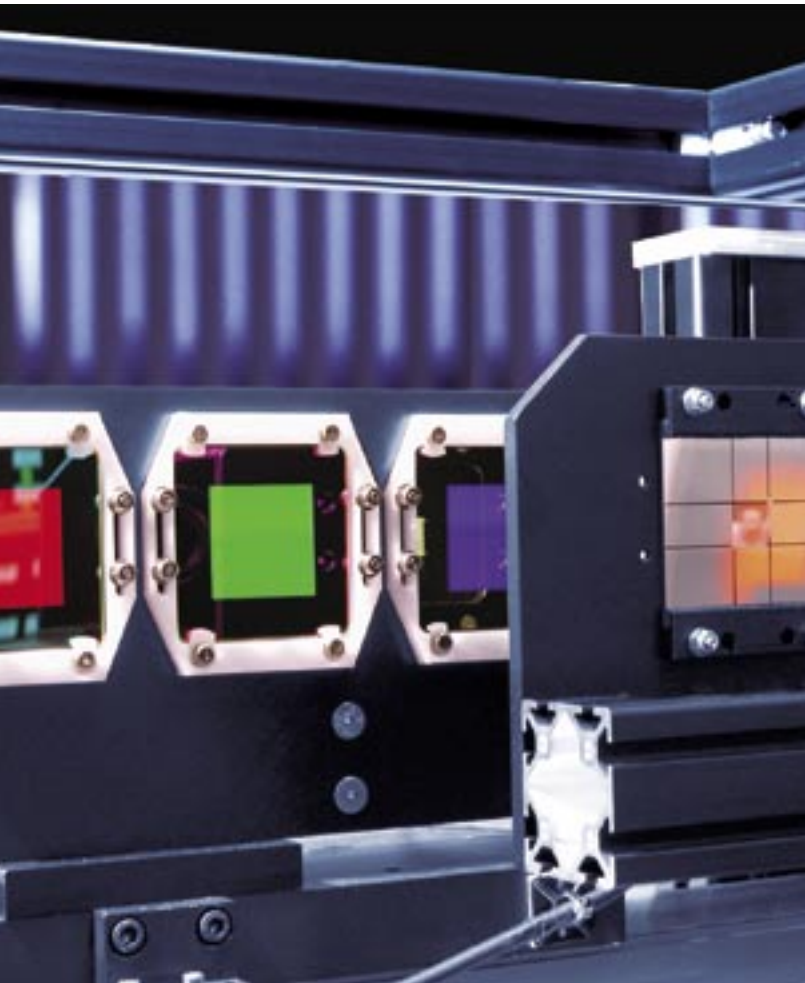


Basler Camera Test Tool

To ensure consistently high product quality, we employ several quality inspection procedures during manufacturing. This list describes three 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 compliance to 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.
- As a final check, our cameras must pass a stress test. Each camera is tested over the entire temperature range specified in our documentation. By doing this, we can identify and remove temperature sensitive weak spots in the camera. Thus, consistent image quality in conditions with quickly changing temperatures is guaranteed.





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