PCI-Bus frame grabber for greyscale and colour image processing
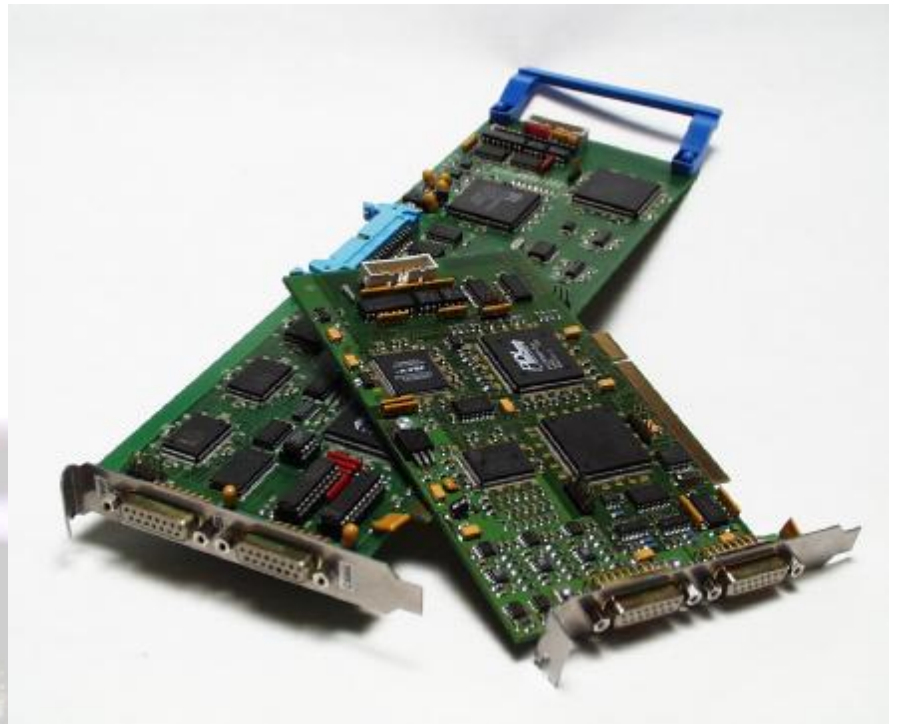# INSPECTA-SERIES

INSPECTA-3
Analog und Digital Frame Grabber
INSPECTA-4A
Analog Frame Grabber
INSPECTA-4D
Digital Frame Grabber
INSPECTA-4C
Camera Link Frame Grabber

Machine Vision · Industrial Inspection · Image Analysis

- Support of matrix and line scan cameras with any image format, CCIR/RS-170, progressive or interlaced scan

- Parallel 24-bit RGB true color

- Up to four independent video channels

- Six analog camera inputs, each up to 60 MS/s

- Digital 8-32-bit RS-422/644 camera input up to 50 MHz

- Maximum video data rate 80 MB/s

- Camera completely controlled by software

- Function library for DOSX, Windows 9x/ME, Windows NT 4.0/2000

- Driver for HALCON

MIKROTRON

General

The most striking feature of the INSPECTA frame grabbers by Mikrotron is its direct image data transfer at a PCI bus transfer rate of up to 132 MB/s, so that virtually any imaginable video source can be processed in real time. Even under heavy load on the PCI bus not a single pixel is lost, thanks to the ample FIFO memory. The camera interfaces have been designed to allow connection and processing of all video sources. Regardless whether they are analog or digital, according to CCIR or RS-170 or even outside of any video standard, whether they are linescan or matrix cameras. INSPECTA Frame Grabber by Mikrotron is able to process virtually any video source. For a list of currently available additional interfaces please refer to the following page or visit our website: www.mikrotron.de.

In this way, solutions for special requirements in new applications are realized quickly and economically without the necessity of replacing the entire frame grabber hardware and software.

Multiple image memories - no image is lost

While a new image is stored in the memory, the CPU should not have to wait for the completion of that task but process the previous image. In this way, the processing time is used in optimal fashion. INSPECTA frame grabbers are equipped with a two-dimensional DMA which is able to write each video line or each image into a different sector of the main memory.

After a random number of lines or an image, the second image memory address is activated automatically and the next image is stored there. The CPU always has unlimited random access to the image data in one of the memory sectors. At the same time, the other memory sector is ready for the storage of new image data.

Image memory for any image format

INSPECTA frame grabbers record the image line by line. A line can be of any length. The timing of the recording process depends only on the horizontal synchronization signal.

The start address of each line in the image memory can be changed by the CPU at any time. In this way, the image memory can always be written linear independent of the line length. The fields of a standard interlace camera can be stored in sequence or in one complete frame ("deinterlacing"). The vertical or horizontal sync trigger a PCI compatible interrupt. This interrupt enables the driver software to count the images and thus decide 'online' what to do with the next images.

No waiting - image capture and camera control in the background

The driver software works interrupt-controlled in the background. In this way, whole sequences and images can be recorded by switching cameras and each image can be recorded with different exposure times.

The application program merely defines the activities, initiates the procedure and then processes previously the recorded images. The program is never forced to wait for new images - they are simple there as soon as they are needed.

Multi-channel camera interface

The camera interfaces of INSPECTA-3 and INSPECTA-4A are equipped with six analog inputs and one digital 32-bit input for INSPECTA-3, which can be randomly distributed to one or up to four channels. The six analog inputs are connected via three multiplexers to three A/D converters, which operate with a conversion rate of 60 MS/s each. Gain and offset can be programmed for each channel. The synchronization signals are optionally extracted from one of the three video signals or from a separate sync signal at RGB cameras. Alternatively, separate TTL synchronization signals from the cameras or internally generated signals with 625 or 525 lines can also be used.

Synchronization

Cameras on INSPECTA frame grabbers can be operated in master or slave mode. The synchronization signals and the pixel cycle are either extracted from the composite video signal or fed in as separate, external TTL signals, or they can be generated internally by INSPECTA and routed to the camera. The internal sync generator is programmable for any desired line frequency and for fields or full frames with 525 or 625 lines.

Direct camera control by software

Special functions of cameras are served with four control lines. One control line can, for instance, control the asynchronous shutter input. In this process, variable pulse lengths or double pulses or a reset-restart signal can be generated. The impulse lengths are formed as "multiples" of the line frequency of the camera. Another control line may be used, for instance, to control the integration of the exposure time across several images.

Opto-coupled inputs/outputs

For the connection of sensors or for the control of 'actors' (e.g. for material transport or process parameter), the frame grabbers are equipped with four inputs with high-speed opto-couplers and four outputs with Darlington opto-couplers.
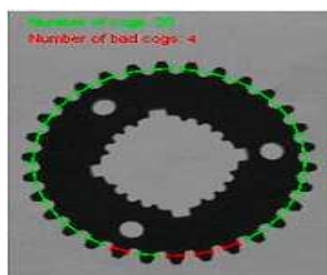
Software

The included driver library contains about 50 functions which control the adaptation of the hardware to the various different cameras and the storage of images in the memory. The functions are available as *.LIB for PharLap DOS Extender, as 32-bit DLL Windows 9x/ME, Windows NT4.0/2000 or for Linux.

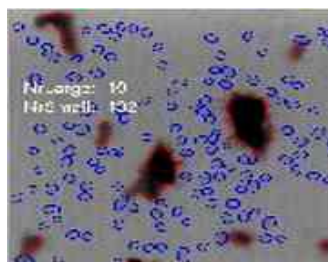Simple C-functions perform the following tasks:

- Initialize hardware
- Provide pointer to image memory
- Select cameras and set their operating modes
- Define how the images are stored in the memory
- Start/Stop or recording
- Control camera shutter
- Determine image sequence working with a image-by-image random selection of cameras, digitizing thresholds and shutter times.
- Provide background processing performing the execution of the defined sequence in the interrupt.
- Immediate or automatically synchronous exchange/switching of memory banks to the vertical sync.
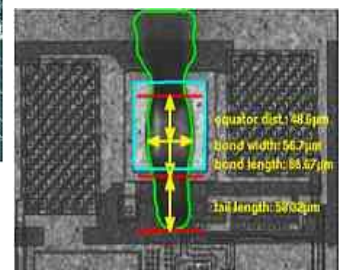
HALCON

Image processing software for the quick realization of applications

Mechanical inspection

Cell analysis

Technical Data

	INSPECTA-3	INSPECTA-4A	INSPECTA-4D/C
Video inputs	up to 6 (8) analog, (1,27 Vss on 75 Ohm) 32-bit digital (TTL) up to 4 channels simultaneously	up to 6 analog, (1,27 VSS on 75 Ohm) up to 3 channels simultaneously	3 x 8-bit or 2 x 10-bit or 2x 12-bit or 1 x 24-bit up to 24-bit simultaneously
Input formats	CCIR, RS170 nonstandard RS-422/644 (optional with B422A or B454 adapter)	CCIR, RS170 nonstandard	RS-422, RS-644, Camera Link
Video geometry	2:1 interlaced, noninterlaced progressive free selection of image resolution	2:1 interlaced, noninterlaced progressive free selection of image resolution	Noninterlaced, progressive free selection of image resolution
A/D converter	3	3	-
Data digitizing	60 MS/s per channel, 8-bit	60 MS/s per channel, 8-bit	up to 66 MHz per 8-bit channel
Offset	Programmable, 8-bit	Programmable, 8-bit	-
Gain	Programmable, 8-bit	Programmable, 8-bit	-
Transfer to host	Bus master burst DMA transfer	Bus master burst DMA transfer with scatter-gather capability	Bus master burst DMA transfer with scatter-gather capability
Transfer rate	up to 132 MB/s	up to 132 MB/s	up to 132 MB/s
Synchronization inputs	CVBS, pixel clock (75 Ohm), H/V (TTL)	CVBS, pixel clock (75 Ohm), H/V (TTL)	LVAL; FVAL, DVAL, Pixel Clock. RS-422, RS-644 or Camera Link.
Synchronization outputs	H/V (TTL), pixel clock, RS-422/644	H/V (TTL) , pixel clock, RS-422/644	HD, TTL
Camera control outputs	4 programmable outputs for async. shutter or Integration etc.	4 programmable outputs for async. shutter or Integration etc.	4 programmable outputs for async. shutter or integration etc.
Control input/output	4 inputs, opto-coupled 4 outputs, opto-coupled (for ext. camera triggering)	4 inputs, opto-coupled 4 outputs, opto-coupled (for ext. camera triggering)	4 inputs, opto-coupled 4 outputs, opto-coupled
Camera power supply	12 VDC, 1,2 A (self-healing fuse)	12 VDC, 1,2 A (self-healing fuse)	12 VDC, 1,2 A (self-healing fuse)
Power supply	+5 V / 2,5 A, +12 V / 0,1 A (without camera)	+5 V / 1 A, +12 V / 0,1 A (without camera)	+5 V /1 A
Ambient temperature	0 – 50°C	0 – 50°C	0 – 50°C
Accessories			
B446A	High speed analog interface up to 40MHz, short ISA card, for INSPECTA-3		
B454 (B422A)	32-bit (24-bit) RS-422/644 digital camera adapter up to 40 MHz (adapter card), for INSPECTA-3		
B408	3-fold camera connector box to connect up to 3 analog cameras, for INSPECTA-3/4A		

MIKROTRON