

3DPIXA | System Requirements

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1 About Chromasens

The name of our company, Chromasens, is a combination of 'Chroma' which means color, and 'Sens' which stands for sensor technology.

Chromasens designs, develops and produces high-quality and user-friendly products:

- Color line scan cameras
- 3D stereo line scan cameras
- Multi-spectral line scan cameras
- Camera systems
- Camera illumination systems
- Image acquisition systems
- Image processing solutions

Today, Chromasens GmbH is experiencing steady growth and is continually penetrating new sales markets around the globe. The company's technologies are used, for example, in products and for applications such as book and document scanners, sorting systems and inspection systems for quality assurance monitoring.

Customers from all over the world of a wide range of industrial sectors have placed their trust in the experience of Chromasens in the field of industrial image processing.

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Visit our website at <http://www.chromasens.de> for detailed information on our company and products.

2 Hardware Requirements

- ✔ 3DPIXA camera (shipped)
 - Moving stage/conveyer:
 - The moving stage should be of high quality in order to achieve high accurate 3D-measurement results. The moving stage should have a stable and non-vibrating movement. Note that vibrating moving stages influence the measurement results.
 - Optional: lifting table
 - Fine scale lifting table might be needed, if objects with different heights are measured. Your object can be placed at the best focus plane of the camera with the help of the lifting table. A lifting table is especially recommended, e.g. for a 3D-demonstration scanner system and if it is difficult to lift up and down your 3DPIXA camera.
 - CameraLink framegrabber(s)
 - 3DPIXA compact camera: 1 x Medium framegrabber or 1 x Base framegrabber
 - 3DPIXA dual camera: 2 x Medium framegrabber/1 Dual Base framegrabber or 2 x Base framegrabber

Dependent on required scanning speed, 3DPIXA can be operated in base or medium mode. For more information about compatible framegrabbers, refer to chapter 2.1.
 - Line scan illumination (can be ordered on request)
 - Chromasens manufactures its own high quality line scan illumination “Corona II” with extremely bright and homogeneous light. Especially the Chromasens Tube light is highly suitable for 3DPIXA applications as it reduces shadows on objects with its uniform light distribution. Please contact us for further information about our line scan illumination varieties.
 - CameraLink cables:
 - 3DPIXA compact camera: 2xCL-cables if operated in medium mode, 1x in base mode
 - 3DPIXA dual camera: 4xCL-cables if operated in medium mode, 2x in base mode

The 3DPIXA provides **MDR connectors**. Check the connectors of your Framegrabber in order to decide, if you need MDR-MDR or MDR-SDR CameraLink cables.
 - Power-cable(s): Hirose 6-pin plug “female” (HR10A-7P-6S) (Can be ordered on request)
 - 3DPIXA compact camera: 1 x power cable
 - 3DPIXA dual camera: 2 x power cable
 - Optional: Encoder/light barrier-If using 3DPIXA dual camera, a frame start signal has to be connected to the Master camera to ensure the acquisition of two images simultaneously
 - Encoder - line trigger
 - Light barrier - frame trigger
 - PC with correct configuration setting
 - System: Windows 7 x 64
 - Quad Core >2,4 GHz
 - >8GB RAM, 16GB recommended

- Enough PCIe slots for GPU and framegrabbers - Take note that the installed GPU might occupy lot of space inside the PC and hinder the access to other PCIe slots in the PC
- CUDA 3.0 capable GPU hardware with at least 2 GB RAM (see in the chapter 2.2 for tested GPU's)
- Enough power supply for the GPU
- Minimum -_NVIDIA Driver Version 378.66 or newer - can be installed from the website <http://www.nvidia.de/download/index.aspx>
- RS232 port recommended, if using "Corona II" illumination manufactured by Chromasens
- Software-protection dongle (silver USB-stick) (included)
 - Required for 3D calculation with the 3D-Software
- Chromasens 3D-Software USB-stick (orange USB-stick) (included)
 - Includes necessary software, drivers, firmware, calibration files, technical drawings, etc.
- **Only with 3DPIXA dual camera:**
 - Master/Slave cable (can be ordered on request)
 - Optional: 2 gauge blocks
 - For adjusting camera position
- Power supply for 3DPIXA camera (24 VDC +/- 10 %; 1A; typical 16 W /per plug), moving stage and your line scan illumination.

2.1 Framegrabber

3DPIXA is compatible to CameraLink framegrabbers which support the following configurations:

CameraLink Medium configuration:

Full performance of the 3DPIXA is reached by using the medium configuration with a line frequency of 21.2 kHz.

- Configuration: 2 Taps with 24 bits 2XE (2 pixels with 24 bits)
- Bandwidth: 6 Bytes @ 85MHz pixel clock frequency = 510MBytes/s

2XE (line-scan)

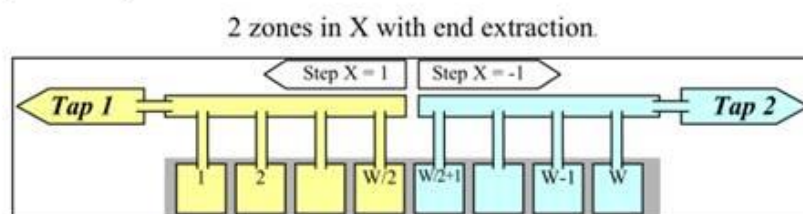


Figure 1

CameraLink Base configuration:

If a line frequency of 21.2 kHz is not required, the 3DPIXA can also be operated in base mode with a line frequency of 11,6 kHz.

- Configuration: 1 Tap with 24 bits 1X (1 pixel with 24 bits)
- Bandwidth: 3 Bytes @ 85MHz pixel clock frequency = 255MBytes/s

1X (line-scan)

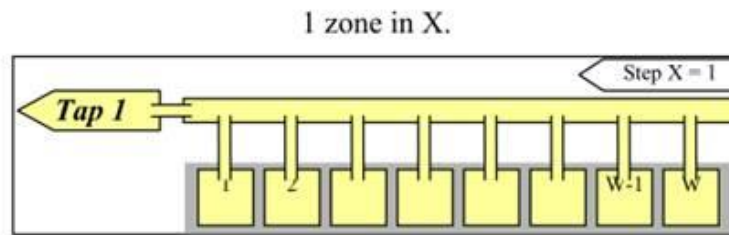


Figure 2

2.1.1 Qualified Framegrabbers

In general, all framegrabbers, which support the configuration as mentioned in chapter 2.1, can be used. The compatibility of the 3DPIXA with the following CameraLink framegrabbers is tested:

- Euresys
 - GrabLink Full
- Matrix Vision
 - mvHYPERION-CLm
 - mvHYPERION-CLf
- Matrox
 - Matrox Solios eV-CL
 - Matrox Radient eCL
- National Instruments
 - NI-PCIE-1433
- Silicon Software
 - microEnable IV AD4-CL
 - microEnable IV VD4-CL
- Dalsa Correco
 - X64 Xcelera-CL PX4 Dual
 - X64 Xcelera-CL PX4 Full
- Bitflow
 - Karbon CL2-F (for compact camera in medium mode)
 - Karbon CL4-F (for dual camera in medium mode)
 - Neon CLB (for compact camera in base mode)
 - Neon CLD (for dual camera in base mode)

Grabber files are available on request for the following framegrabber manufacturers:

- Bitflow
- Dalsa
- Euresys
- Matrix Vision
- Matrox
- National Instruments
- Silicon Software

2.2 GPU

In general, every ≥ 3.0 CUDA capable GPU with ≥ 2 GB RAM upward can be used.

Calculation speed of the 3D data depends on the GPU used for your 3DPIXA application.

The following GPUs were tested for their compatibility:

Not compatible:

- NVidia GTX 285
- NVidia GTX 480
- NVidia GTX 580

Compatibility tested:

- NVidia GTX 680
- NVidia GTX 770
- NVidia GTX 780 TI
- NVidia GTX Titan
- NVidia GTX 980
- NVidia GTX 980 TI
- NVidia GTX 1080

3 Software Requirements

- The general requirements of the PC can be found in chapter 2 - Hardware Requirements.
- **Chromasens 3D- and camera software** (provided with a USB-stick, see chapter 3.1).
- **Framegrabber software** for image acquisition (should be provided by the framegrabber manufacturer)
- 3DPIXA camera -firmware package: V 1.42
- Optional: For CS-3D-API examples only:
 - Development environment
 - Microsoft Visual Studios 2010
 - MFC
 - OpenCV – Library v2.4

3.1 Included Chromasens-Software

3D-Viewer:

The Chromasens 3D-Viewer is a C# program that uses the 3D-API to calculate 3D information from the captured image(s).

CS-3D-API:

The Chromasens CS-3D-API is a C++ library which provides you functions to calculate 3D information in a fast and scalable manner. The CS-3D-API calculates a rectified RGB/BGR/GRAY-image or/and a 8-/16-bit disparity image.

Camera Setup Tool - CST:

Camera settings are adjusted to the desired operating condition by using the CST.

CS-API:

The CS-API is a library that allows you to directly control the camera without the CST. By using the library, you may adjust and control camera settings directly from your own application.

XLC4-Commander (for Corona II illumination only):

The XLC4-Commander gives you direct access to control the Chromasens Line Scan Illumination

3.2 Interfaces with Imaging Libraries

- **MVTec HALCON** extension:
 - HALCON 11.0.3 - 64 bit
 - HALCON 12.0.2 - 64 bit
 - HALCON 13.0.0.2 - 64 bit <http://www.halcon.com>
- Chromasens 3D **LabVIEW** Toolkit from <http://sine.ni.com/nips/cds/view/p/lang/de/nid/212780>
or from <http://www.chromasens.de>
Required are:
 - LabVIEW 2012/2013/2014 - 64 bit in combination with
 - NI Vision Development module and
 - NI Vision Acquisition Software
- General C++
 - Examples for **Matrox MIL** 10 delivered with Processing Pack 1.
 - In general, our CS-3D-API can be used in any C++ program.

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