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INTRODUCTION

The following FAQs (Frequently Asked Questions) are made for all our camera models including the CX cameras and the CX-CS sensors. Some of the questions only refer to the CX or the CX-CS sensors. So please make sure that the question you are looking for is relevant for your camera and this option is available.

CONNECTION

How can I connect my camera to the PC?

Hardware:

The connection need a Gigabit Ethernet network. Ethernet throughput with less than 100 Mbit/s will cause problems and is not recommended.

The camera should be connected through a dedicated network. Connect the cameras directly with the network interface card (NIC) from the PC where each camera has its own subnet or when a switch is practical, you can connect several cameras with the switch where all cameras are summed in one subnet.

When you use a switch make sure that it is designed for a Gigabit Ethernet connection. The switch should therefore support Jumbo Frames (Ethernet packets larger than 1500 bytes).

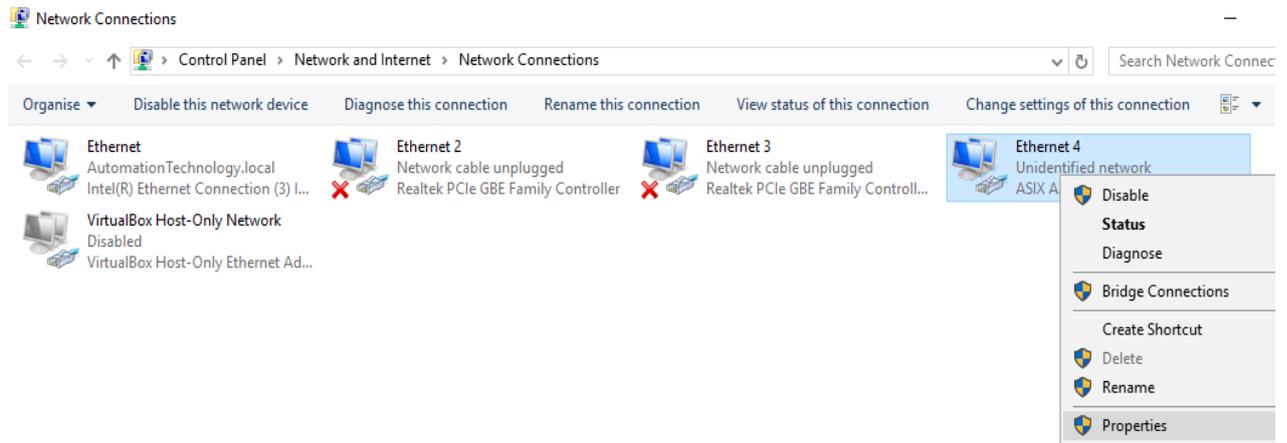
The same characteristic is recommended for your NIC. To reach the maximum speed of your 3D cameras, Jumbo Frames should be activated for the highest possible throughput.

Software Configuration:

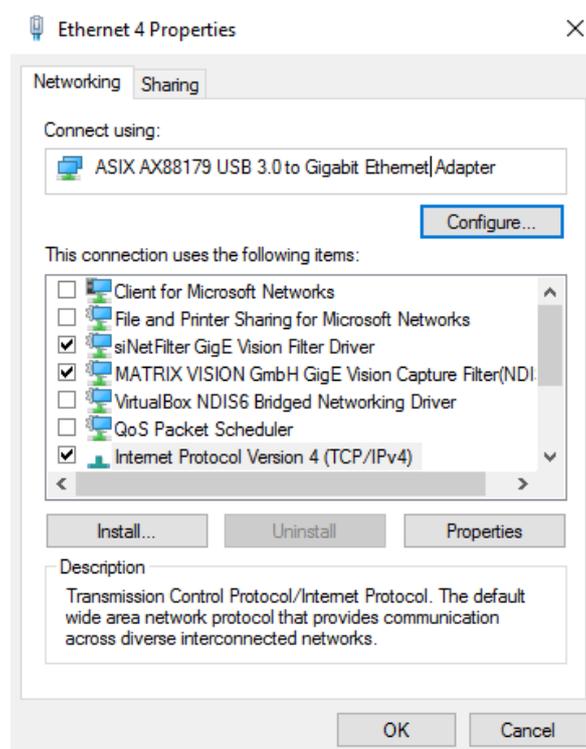
Camera and PC need to communicate on the same IP net. This means that the camera and the computer are configured so that they can communicate directly in the same local network. By default the cameras are delivered with DHCP (Dynamic Host Configuration Protocol) and LLA (Link-local address) mode active. If no DHCP server is available on host side then the cameras will use LLA and obtain an IP address in the range 169.254.0.0 to 169.254.255.255.

The PC should then set to the same subnet. Alternatively you can set the camera to a persistent IP Address. Follow the next steps to configure your PC proper.

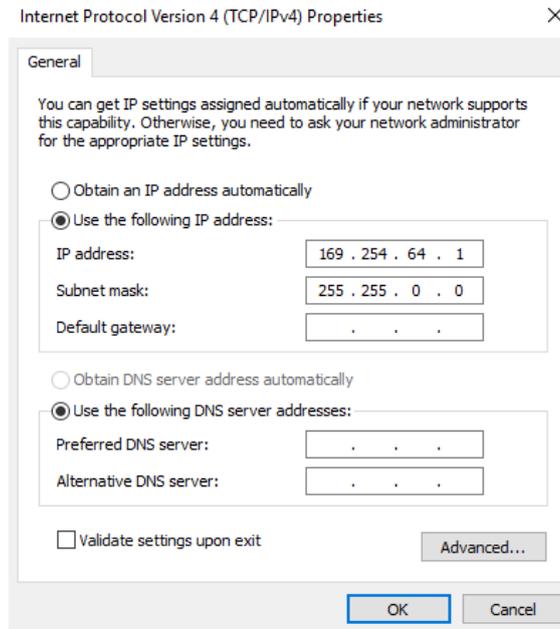
1. Turn off all possible software which is able to block sent packages from the camera to the PC or the other way around like **Firewalls** or **Antivirus** software. Since the cameras should be connected on a dedicated network there should be no hostile traffic on that network which allows a disabled firewall/antivirus program.
2. When your PC have several network interface cards make sure that all are in different subnets even wireless NICs.
3. After connecting your camera directly or over a switch to your PC you have to identify which network interface card is linked to the camera. Open the **Network Connections**, choose your camera connection and click on **Properties**.



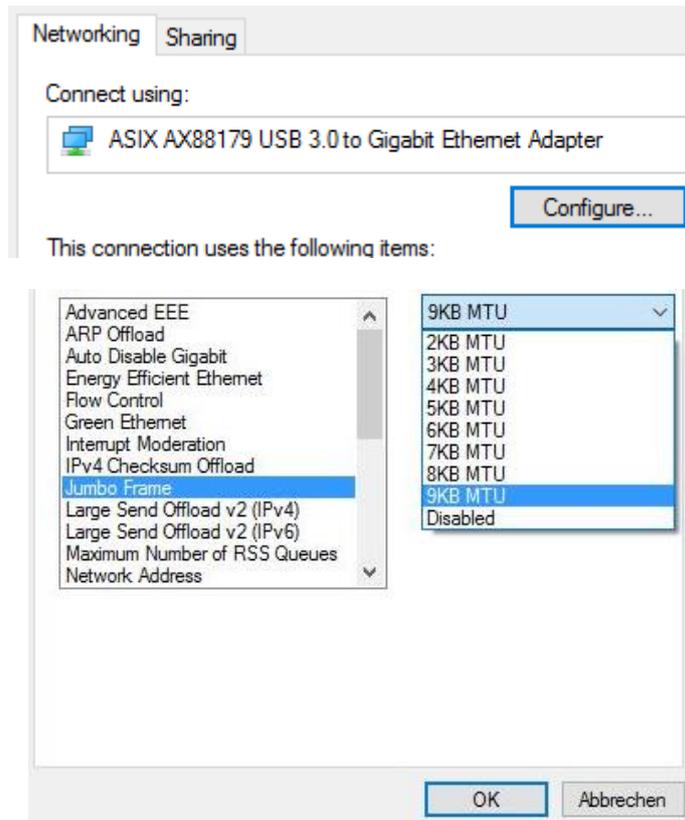
4. Disable all **Filter Drivers** and **Protocols**. For our cameras only the communication protocol “Internet Protocol Version 4 (TCP/IPv4)” is needed. For transferring the image data from the camera to the host you need at least one GigE camera filter driver.



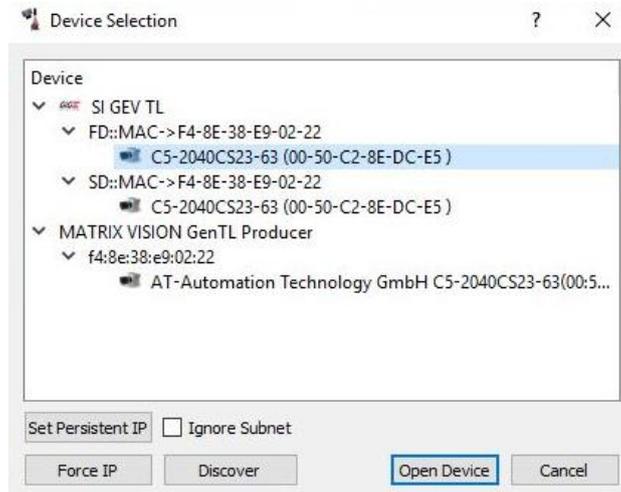
- Set the Internet Protocol Version 4 (TCP/IPv4) to a fix IP address and subnet mask. For example:



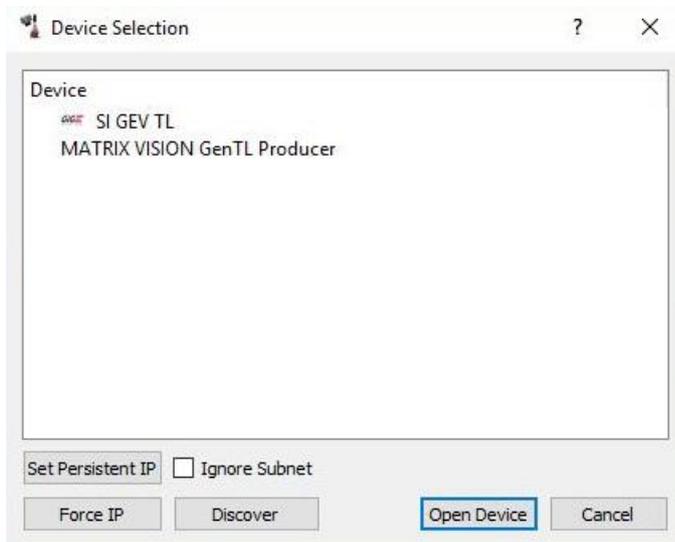
- Click on **Configure** to change the Ethernet Properties. Enable under the **Advanced** tab the **Jumbo Frames**. Some NICs are able to transfer up to 9KB.



7. Start the CX/3DExplorer. Check if your camera is powered on and is still connected. In the Device Selection you should now see all connected cameras. Choose your camera and open the device.



I do not see the camera in the CX/3DExplorer Device Selection. What can I do?



This problem can have various reasons:

The camera is not powered on.	Make sure that the camera power supply voltage is given (10-24V DC) and the LED "PWR" lights permanent green.
The camera connection to the PC failed.	Check if the camera is connected to the device via the Ethernet cable.

The network connection is not correct configured.	Check if the network settings are adjusted to the same IP address area. For example: PC IP: 169.254.64.1 Camera IP: 169.254.64.2 Subnet mask: 255.255.0.0
Firewall.	Verify that your Firewall allows the connection request from the camera.

See also the answer **How can I connect my camera to the PC?**

SOFTWARE

What software do you provide?

We have a full bundle of software and documentation in our CX Support Package. With the installation following parts will be installed.

- CXExplorer (AT Configuration Manager for CX cameras)
- 3DExplorer (AT Configuration Manager for CX-CS sensors)
- CX_SDK (AT software development kit for easy integration)
- CVB¹ Suite (CVB/GEV driver and runtime version for CVB Image manager SDK)
- Full documentation (Manuals, Application Notes, Release Notes, etc.)
- 3rd party examples (HALCON, CVB, LabView)
- Calculation tools for CX and CX-CS cameras

Where can I download the CX/3DExplorer and what is the newest version?

We recommend to install the latest CX Support Package (including the CXExplorer and 3DExplorer) to get always the newest available versions. You can get the CX Support Package over our information service (info@automationtechnology.de), our support or over your camera distributor.

On which operation system can I install the CX Support Package?

We support Windows in 32Bit and 64Bit. The CX Support Package installation will run on Windows 7 and higher.

Do I have to use the Transport Layer from Stemmer Imaging?

No you are not limited to the Stemmer Transport Layer. Our cameras are all GenICam and GigE compliant and therefore you can use every Transport Layer which work with these standard.

Which machine vision software solution can I use for my application?

Enable you an easy and comfortable work with our cameras, we aim for a support of all important software solutions in the field of machine vision. This means that you can

¹ CVB: Common Vision Blox (Stemmer Imaging)

use any machine vision software you are familiar or you want to work. A list of tested and supported software can be found here:

<https://www.automationtechnology.de/cms/en/3rd-party-solutions-2/>

Can I export my acquired image from the CX/3DExplorer to another software?

Yes you can export the images to another software.

Over **File -> Save Image As Tiff** you can save your image as a Tiff image and open it with any software which can handle this format.

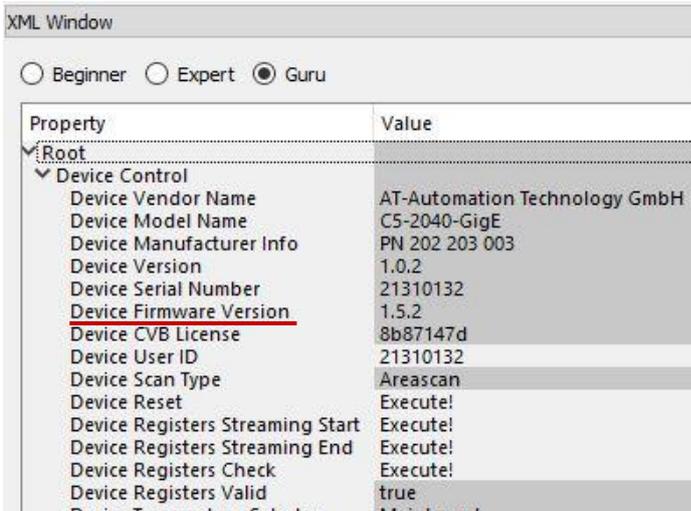
Furthermore over **File -> Export Image** you have the possibility to save and export your image as following: Binary File (*.bin), 3D Point Cloud (*.xyz) or STL-Format (*.stl).

What is the password for the camera web server?

The password is: **admin**.

How can I check which camera firmware I have and how do I do a firmware update?

To check your current camera firmware version you have two possibilities. Open your camera with the CX/3DExplorer and have a look into the **Device Control**. There you find the **Device Firmware Version** with the current firmware version.



The screenshot shows an XML Window with a tree view of properties. The 'Device Control' folder is expanded, showing various properties and their values. The 'Device Firmware Version' property is highlighted with a red underline.

Property	Value
Root	
Device Control	
Device Vendor Name	AT-Automation Technology GmbH
Device Model Name	C5-2040-GigE
Device Manufacturer Info	PN 202 203 003
Device Version	1.0.2
Device Serial Number	21310132
<u>Device Firmware Version</u>	1.5.2
Device CVB License	8b87147d
Device User ID	21310132
Device Scan Type	Areascan
Device Reset	Execute!
Device Registers Streaming Start	Execute!
Device Registers Streaming End	Execute!
Device Registers Check	Execute!
Device Registers Valid	true
Device Temperature Selector	Mainboard

The second way is to start your web browser and have a look into the camera web interface. There you find under **Device Info** all necessary camera information like the present firmware version.

Device Info

[Update](#) ↗

Model Name:	C5-2040-GigE	Serial Number:	21310132
Part Number:	PN 202 203 003	Manufacture Info:	AT-Automation Technology GmbH
Device Version:	1.0.2	<u>Firmware Version:</u>	<u>1.5.2</u>
MAC Address:	00-50-C2-8E-DD-05	IP Mode:	Persistent

Get in contact with our support or your distributor for a firmware update check. It always need an evaluation if a software update is possible for the camera.

IMAGE ACQUISITION AND IMPROVEMENT

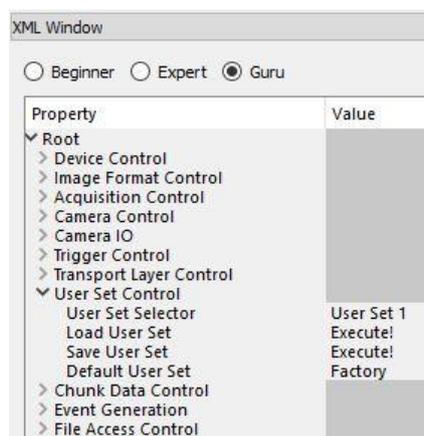
How can I change the camera mode?

Changing the camera mode can be easily done by using the Image or 3D wizard or directly over the XML path **Camera Control -> Mode and Algorithm Control -> Camera Mode**.

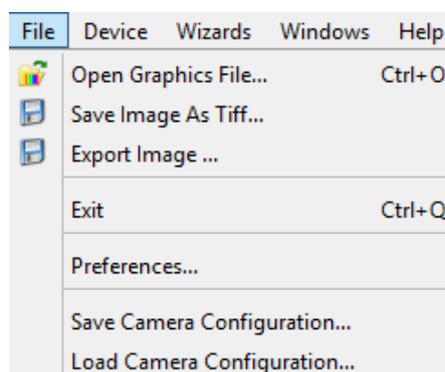
For further information have a look into the CX/3DExplorer-Quickstart manual which you can find under your defined installation path on your PC.

How can I save my camera settings?

You have the option to save your setting into the camera by choosing an User Set. **User Set Control -> User Set Selector -> User Set 1, 2 or 3** and then **Save User Set -> Execute!**



Another possibility is to save the current settings as a file on your device. **File -> Save Camera Configuration**.

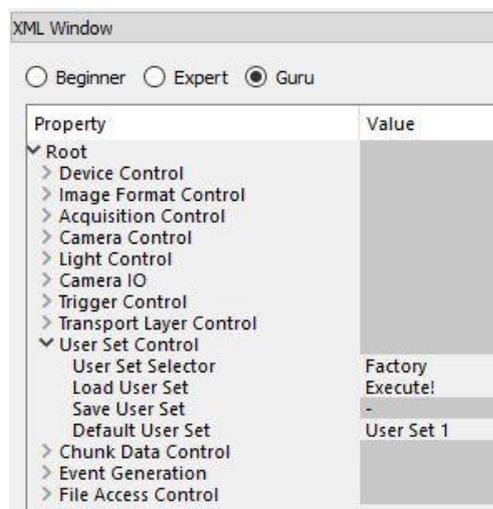


In which mode starts the camera after power on?

The camera starts by default in the factory setting. The factory setting varies depending on your camera model.

For our CX series the factory setting is the Image Mode (IMG) and for our CX-CS series the sensors start by default in the 3D Center of Gravity (COG) or in the 3D FIR Peak (PEAK) mode.

Nevertheless it is possible to store a user-defined start-up camera configuration on the camera by setting the **Default User Set** to your defined User Set 1, 2 or 3.



I have a water mark in the image. What can I do?

This problem should normally not happen. In most terms that occurs when you are using an old version of CX/3DExplorer or an old version from Stemmer Imaging Common Vision Blox. Download and install the newest versions.

Get in contact with our information service or your distributor to receive the download links.

After starting the image acquisition I only get black images

This problem can raise due different reasons.

The firewall blocks the UDP packets from the camera.	Turn off your firewall for that camera network port or give a firewall exception for all AT 3D cameras.
The camera "Trigger Mode" isn't adjust to Free-Run.	When you want to trigger your camera from external make sure that the trigger pulses reach the camera input.

	To check if the camera is still available change the setting temporarily back to Free-Run.
The camera "Sequencer Mode" isn't set to Free-Run.	<p>If you want that the camera is only active during a defined time make sure that these pulses reach the camera.</p> <p>To check if the camera is still available change the setting temporarily back to Free-Run.</p>

Switching from COG to FIRPeak result in black images during the acquisition.

If you use the COG mode and you use validation parameters make sure when you change to FIRPeak that you set the validation parameters back to default.

Mode and Algorithm Control	
Camera Mode	3D Center of Gravity (COG)
Profiles per Frame	10
Absolute Position	true
Subpixel Bits	6
First Zero Crossing	-
Minimum Threshold Validation	-
First Falling Edge	false
Position Validation Durin...	false
Position Validation at the En...	false
Valid Minimum Width	0
Valid Maximum Width	1023
Valid Minimum Sum of Intensity	0
Valid Maximum Sum of Intens...	65535
> AoiTracking	

Depending on your camera model the **Valid Maximum Width** can differ by default.

Which 3D algorithm is the best for my application?

There is never one best algorithm. It always depends on what your goal is. For some applications the 3D Maximum Intensity (MAX) or the 3D Threshold (TRSH) fits well, for other applications the FIR Peak (PEAK) algorithm is preferable to the Center of Gravity (COG) and vice versa. Easiest way to find the best algorithm is to test all four and evaluate the results and choose the best fitting algorithm.

I changed the camera from image mode to 3D mode over the XML register and get not expected 3D images.

It is always recommended for non-Guru users to change the camera mode only over the Image or 3D wizard to avoid problems caused by unchanged parameters.

The Image mode uses the Data Output Channel 0 (DC0) to transfer the acquired images. If the camera mode is changed to 3D mode over the XML and you want to get the height information you have to change to the Data Output Channel 2. Enable DC2 via **Camera Control -> Data Output Channels -> DC2 -> true**. When you don't need the DC0 in 3D mode then change DC0 to *false*. The information about the function of each Data Channel for the different algorithms can be found in the according manual.

Which parameters affect the profile speed and where can I adjust the speed?

The profile speed depends on various camera parameters:

- AOI Height
- Number of AOIs
- AOI Width
- Sensor Integration Time/Exposure Time
- Frame Overhead Time

To adjust the profile speed you have two options. First by the Image Wizard or the 3D Wizard in the left top corner of the CX/3DExplorer.



Second over the XML tree under **Camera Control -> Sensor Control -> Sensor Frame Interval**.

Property	Value
Root	
> Device Control	
> Image Format Control	
> Acquisition Control	
> Camera Control	
> AOIs	
> FIR Control	
> Mode and Algorithm Control	
> Sensor Control	
Sensor Frame Counter	1927
Sensor Readout Time	5854
Sensor Integration Time	1000
Sensor Frame Interval	5892
Sensor Frame Rate	169.722 Hz
NDR Number of Frames	2
NDR Mode	Off
NDR Exposure Time 1	4
NDR Exposure Time 2	4

Set the Sensor Frame Interval to 0 and the camera will automatically set the Frame Interval to its lowest possible value.

For our C5-1280 cameras and sensors by default the profile frequency is always automatically updated to its maximum speed. If you want to change it manually you

find it under **Acquisition Control -> AcquisitionLineRateEnable -> true**. Then you can change the frequency under **AcquisitionLineRate**.

The Frame Rate is lower than expected. What can I do?

Make sure that your network adapter settings and the camera Transport Layer are working proper and set correctly.

Your network interface card should adjust to Jumbo Frames to carry up to 9000 bytes of payload and also the size of the stream packet on camera side should change to 8192 (Jumbo Frame). **Transport Layer Control -> GigE Vision ->**

Packet Size	8192
Inter-Packet Delay	0

If your NIC can't support Jumbo Frames, have in mind that it is possible to use the camera not with its maximum Frame Rate.

When the camera is triggered from extern make sure that the trigger source is set to a correct value.

How should I adjust the Exposure Time?

In general the Exposure Time/Sensor Integration Time should always be smaller or equal to the Sensor Readout Time. If the Exposure Time is adjusted higher than the Readout Time the maximum Line Rate can't be reached.

My images are overexposed. What can I do?

When your image is overall overexposed reduce the camera exposure time or reduce the laser intensity.

Are only parts of the image overexposed you can use one of the most powerful feature of our camera series the HDR-3D (High Dynamic Range) functionality, which allows scanning materials and surfaces with inhomogeneous reflection properties by using the MultipleSlope function.

More information regarding the **MultipleSlope** function can be found in a separated application note.

Are there differences in the laser modes?

To avoid unnecessary power time of the laser and to extend thereby the life-time you should always use the laser in Exposure Active state. Furthermore can the hazard for eye injuries be reduced as there is only light when the camera captures images.

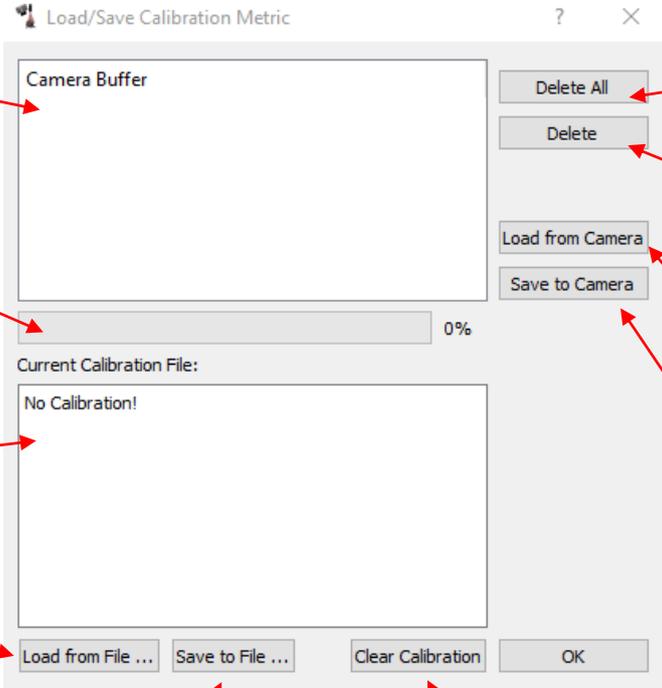
How fast can I trigger the camera from external?

The easiest way to check the maximum trigger rate of the camera is to set all parameters you need in Free-Run mode. The Acquisition Frame Rate for Image Mode and the Acquisition Line Rate in 3D Mode shows the maximum value for the external trigger signal the camera can handle.

Are the image data already calibrated?

The images are always non-calibrated after the acquisition but the CX/3DExplorer have the opportunity to load a calibration file to translate pixel values into metrical values.

Device -> Load / Save Calibration Metric



The screenshot shows the 'Load/Save Calibration Metric' dialog box with the following components and callouts:

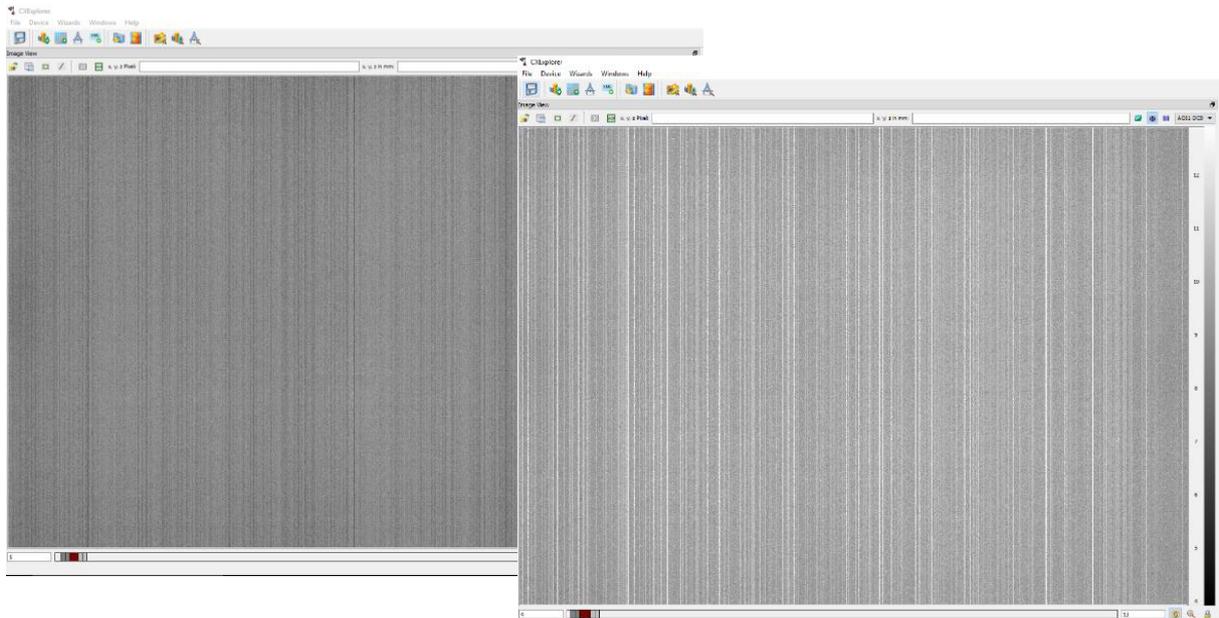
- Camera Buffer:** A list area for saved calibration files. Callout: "Here are all calibration files which are saved in the camera".
- Status Bar:** A progress bar showing camera memory usage (0%). Callout: "Status bar which shows how much camera memory is in use".
- Current Calibration File:** A text area showing the current file, currently "No Calibration!". Callout: "The current calibration file the CX/3DExplorer use".
- Buttons:**
 - Delete All:** Callout: "Delete all saved calibration files from the camera".
 - Delete:** Callout: "Delete the chosen calibration file from the camera".
 - Load from Camera:** Callout: "Load a calibration file from the camera".
 - Save to Camera:** Callout: "Save a calibration file into the camera".
 - Load from File ...:** Callout: "Load a calibration file from the PC".
 - Save to File ...:** Callout: "Save the calibration file to the PC".
 - Clear Calibration:** Callout: "Clear the current calibration file".
 - OK:** Standard confirmation button.

Furthermore you can use our CX_SDK to get programmatically calibrated point clouds.

What is a FPN (Fix Pattern Noise) and how can I fix it?

For 1600/2040 sensors:

By factory each camera has the same sensor setting. For some sensors that is not the best setting to run the sensor at the highest quality. The result can be black or white vertical lines which occur when pixel are brighter (hot pixel) or darker (cold pixel) then the common background signal.



Over the CX/3DEXplorer you have the access to easy change some sensor settings to homogenize the background signal.

Therefore take a look into the appropriate application note to improve the sensor image quality for the CX and CS 1600/2040 sensors.

For C5-1280 cameras and C5-1280CS sensor:

In the C5-1280/CS series is an even easier way to get rid of a Fix Pattern Noise. Over the node **Camera Control -> Commands** you find the node **CalibFPN**. Execute the Channel-FPN to automatically correct a FPN.

HARDWARE COMPONENTS AND SETTINGS

Which is the optimal device temperature while running the camera?

We are recommending a device temperature as low as possible to reduce dark current, noise and to reduce the signal-to-noise ratio. Furthermore a permanent high temperature reduces the life-time of your camera.

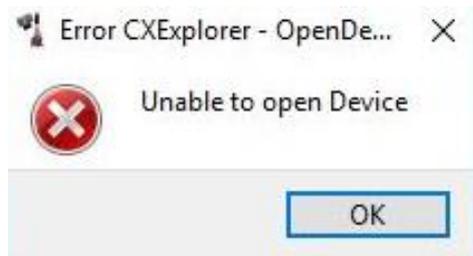
Therefore the housing temperature during operation should be in range from 0°C...+50°C (+32°F...+122°F) and the sensor chip temperature (on-board) during operation between 0°C...+65°C (+32°F...+149°F).

Have the sensors a bandpass filter?

All our CX-CS cameras have an integrated bandpass filter depending on the used laser. The benefit of these bandpass filters is to pass light only in a defined range around the laser specification.

ERROR MESSAGES

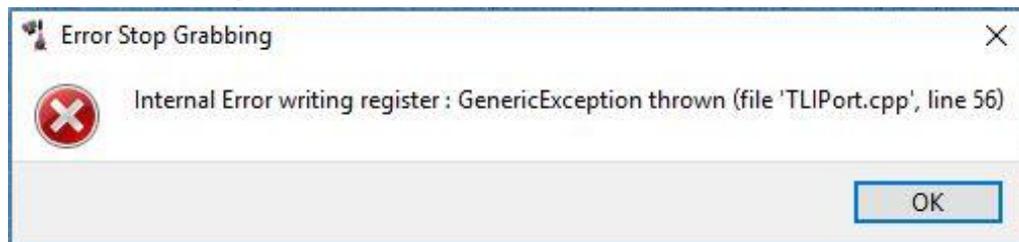
Unable to open Device



This error message can have different reasons. The chosen camera is already opened in another CX/3DExplorer window or is occupied by another application. It can also appear when the camera IP subnet is a different to the PC network adjustment.

Follow the instructions from the answer **How can I connect my camera to the PC?** for more information.

Stop Grabbing



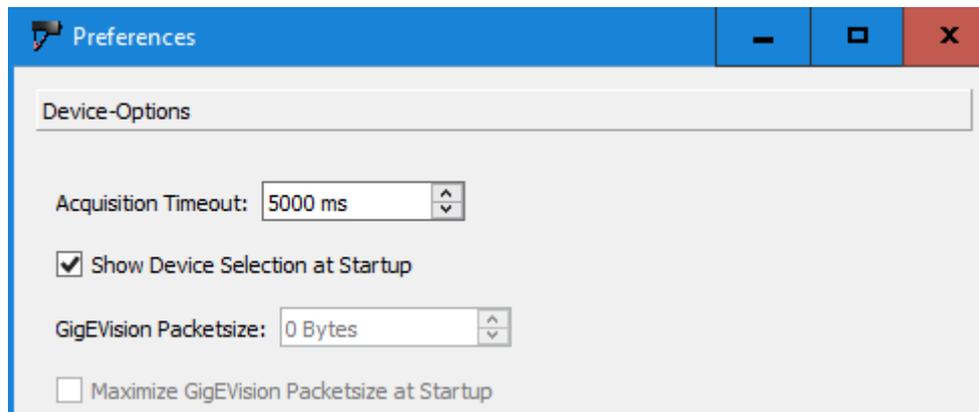
This error message mostly appears when the camera acquire images and then the connection to the camera get lost or when the camera power is off. After accepting this message close the CX/3DExplorer, fix the problem and reopen the Explorer again.

TimeOut



This error appears when the acquisition of one frame needs longer than the **Heartbeat Timeout** is adjust. By default this time is 3000ms. Reduce the Profiles per Frame or reduce the Sensor Frame Interval time for a faster profile acquisition. If the Sensor Frame Interval is already at the lowest possible value reduce your AOI size to acquire faster frames.

You can also increase the Heartbeat Timeout over **File -> Preferences -> Acquisition Timeout**.



DOCUMENT REVISION

Rev. Nr.	Date	Modification
1.0	30.03.2017	First release
1.1	15.08.2018	Add new default IP configuration. Correct and add new features