TECHNICAL INFORMATION

Supporting Material for Visionary-T Mini CX

3D machine vision

SICK
Sensor Intelligence.

Valid for products

Visionary-T Mini CX

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

Legal information

Original document

This document is an original document of SICK AG.

Content

1 Introduction and Download

1.1 Introduction

Information material and the necessary software are available to assist you in setting up the device. You will find all of these on sick.com.

In the following you will find an overview and explanations of the individual contents.

2 Contents

2.1 DOC

2.1.1 Product introduction

- Short overview about the device and its technical specifications.

2.1.2 SOPAS Installation & Embedding

- Documentation how to install SOPAS ET and how to establish a connection to Visionary-S with it

2.1.3 Device configuration user guide

- Detailed description of the Visionary-T Mini settings and filters that can be adjusted via the SOPAS ET GUI. Tips about how to configure your device dependent on your circumstances.

2.1.4 Firmware update guide

- Description of how to update the Visionary-T Mini device.

2.1.5 Single Frame / Trigger Mode Description

- Description of how to use the single frame and trigger mode of Visionary-T Mini CX.

2.1.1
Product introduction

SICK AG – Mobile Perception – 3D Snapshot

Visionary-T Mini CX
DISCLAIMER

- Visionary-T Mini is specified as a laser class 1 product (= poses no danger)
- Visionary-T Mini does not constitute personal protection equipment in accordance with the respective applicable safety standards for machines
- The Visionary-T Mini CX is a streaming device which provides high quality depth and intensity maps based on the time-of-flight principle
- The measurement of physical quantities is always affected by random and systematic errors. Some errors are creating false measurements for distances above 9m. If your application allows it, we therefore recommend that you always use the Visionary-T Mini CX with the activated distance filter <9m.

SICK Product portfolio
3D SNAPSHOT CAMERAS

Visionary-T Mini
3D Time of Flight

Visionary-S
Structured light Stereo

Visionary-B
Passive Stereo

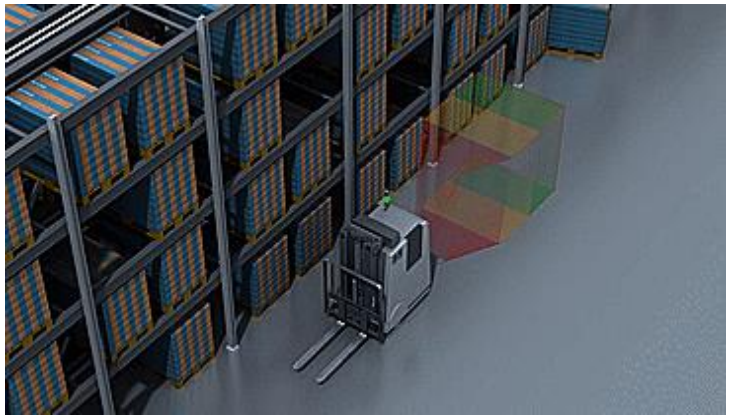
Visionary-T
3D Time of Flight

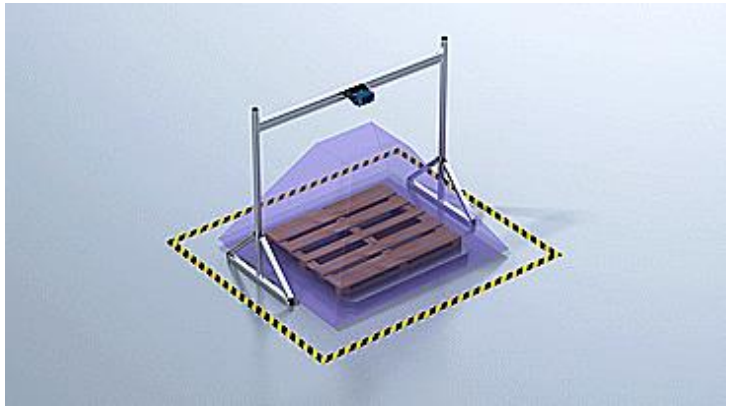
Visionary-T Mini CX
RELEASE FEATURES

- The new **Visionary-T Mini CX** convinces with a **compact design** and fits even for your applications in the smallest space.
- 3D snapshot technology enables 3D data with no moving parts and guarantees **high robustness against shock and vibrations**.
- State of the art technology and system design ensures your advantage with **unrivaled precision**.
- **Industrial design** (thermal, electrical, communication) for **reliable 24/7 availability**.
- Optimized for application **in motion** and with **highly dynamic** operating range (dark and bright objects).

Visionary-T Mini CX
TARGET APPLICATIONS

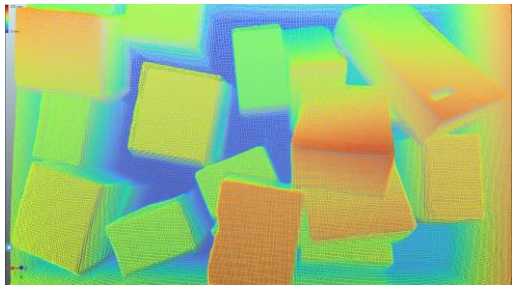
- 3D object detection for AGV/AGC, e.g. collision warning, object positioning, navigation
- Static and dynamic 3D dimensioning and level detection
- Robot applications e.g. palletizing / depalletizing
- Completeness check e.g. packaging machines

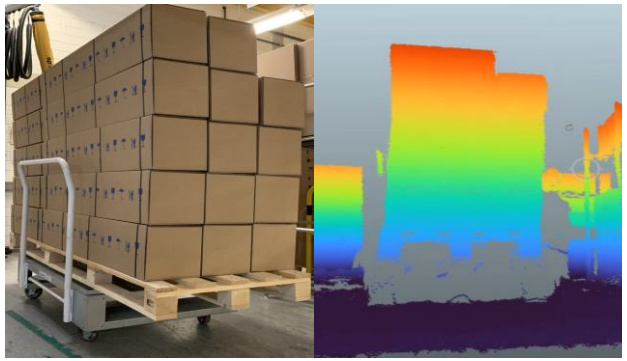


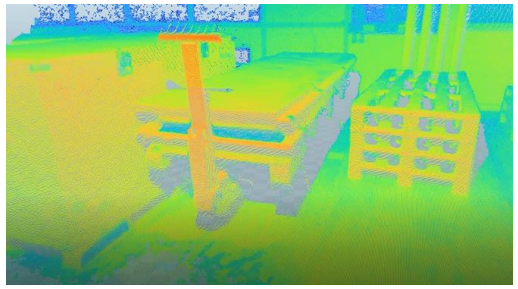


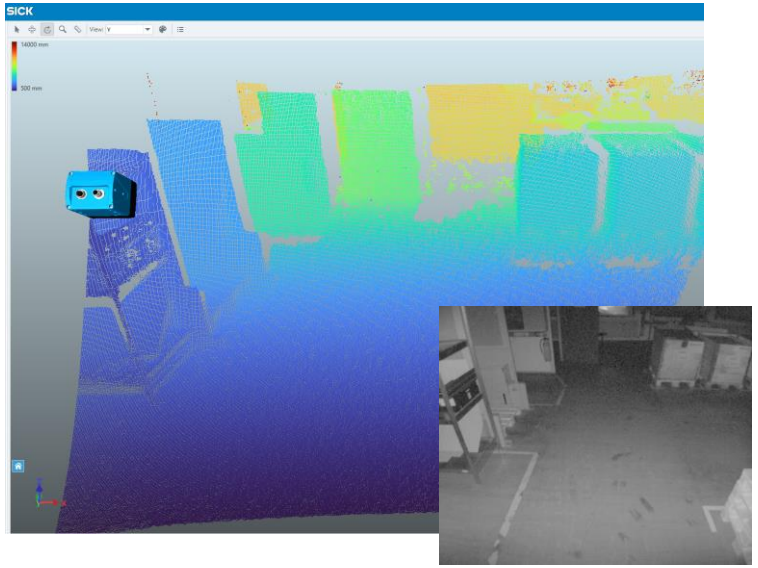
Visionary-T Mini CX
DATA EXAMPLES

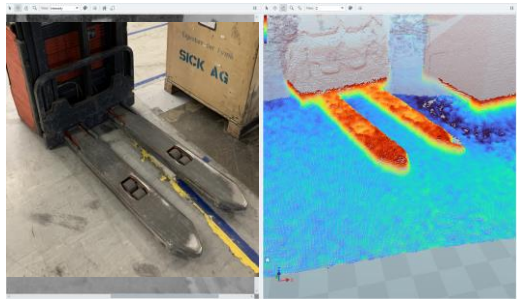
- Accurate vision for the third dimension
- High dynamic range for flexible usability
- High frame rate for dynamic applications
- Fast aquisition for reduced blur effects
- Dense resolution for object recognition

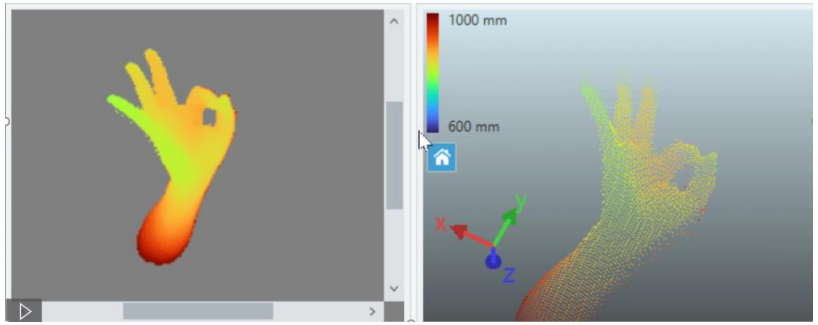












Visionary-T Mini CX
FEATURES AND BENEFITS

Main device features	Main benefits
Compact design 80 x 70 x 77 mm (w x h x d)	Easy to integrate in confined assembly space
IP65, IP67 enclosure rating and temperature range -10 °C ... 50 °C	Industrially robust camera for 24/7 use in harsh environment
3D snapshot camera based on 3D time-of-flight principle with resolution of 512 x 424 pixels	High quality calibrated depth data from the device
Up to 30 frames per second	Well suited for dynamic applications
High-power cutting-edge illumination technology	Ambient light robustness up to 50 kLux
Automatic camera coexistence mode	Simultaneous operation of multiple cameras in one scene without interference

Visionary-T Mini CX
FEATURES AND BENEFITS

Additional features	Main benefits
Pixel Binning within device	Higher data robustness by additional spatial filtering. Optimized bandwidth usage and reduced hardware requirements for the client.
Image cropping within device	Reduction of image size for given region of interest And optimized bandwidth usage.
Frame rate configuration	Optimized bandwidth usage and reduced hardware requirements for the client.
Embedded data filters	Efficiently optimize data quality for a specific use case without compromising device performance
Gigabit ethernet communication with TCP/IP and UDP support	Enables TCP/IP + UDP

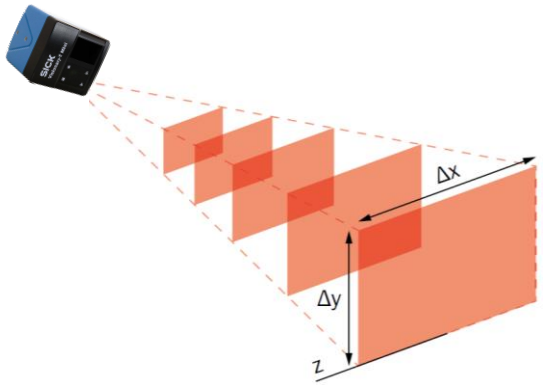
Visionary-T Mini CX

PRELIMINARY PARAMETER LIST*

Parameter*	Target spec*
Resolution	512 x 424 pixels
FOV (field of view)	~70° x 60°
Max. frame rate	30 fps
Illumination wavelength	850 nm (± 5 nm)
Radial depth measuring range	~0.1 – 16m
Optimized working range	~0.4 – 9m
Unambiguity range	18,75m
Precision	± 0,8 mm (<1.0m @ 90% remission)
Accuracy	± 5 mm (<3.0m @ 90% remission)
Ambient light robustness	50 klx
Operating voltage	24V -30%/+25%
Power consumption	≤12 W
Peak current	≤2.0 A
Eye safety (EN/IEC 80625-1)	Laser class 1
Protection rating	IP65, IP67
Ambient temperature range	-10 - 50°C
Dimensions	80 x 70 x 77 mm (w x h x d)
Weight	~520 g
Interfaces	TCP/IP, UDP, Gigabit Ethernet, 6 programmable I/Os
Data output (via Ethernet)	radial depth, intensity, statemap
Camera coexistence mode	Automatic

* All content may change without notice

Visionary-T Mini CX
WORKING RANGE



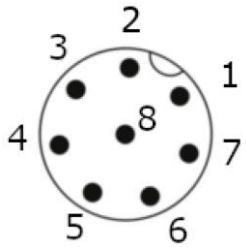
Working distance (radial)	Accuracy* (90% remission)	Precision* (90% remission)
0.2 m	...	...
0.5 m	± 5 mm	± 0.8 mm
1.0 m	± 5 mm	± 0.8 mm
2.0 m	± 5 mm	± 1.0 mm
4.0 m	± 7 mm	± 2.0 mm
7.0 m	± 10 mm	± 5.0 mm
9.0 m	± 15 mm	± 10.0 mm

Working distance (radial)	Accuracy* (10% remission)	Precision* (10% remission)
0.2 m	± 5 mm	± 0.8 mm
0.5 m	± 5 mm	± 0.8 mm
1.0 m	± 5 mm	± 1.5 mm
2.0 m	± 5 mm	± 4.0 mm
4.0 m	± 8 mm	± 12.0 mm
7.0 m	± 10 mm	± 10.0 mm
9.0 m	...	...

Working distance (absolute z)	Range - Δx	Range - Δy
0.2 m	0.30 m	0.20 m
0.5 m	0.70 m	0.60 m
1.0 m	1.40 m	1.15 m
2.0 m	2.80 m	2.30 m
4.0 m	5.60 m	4.60 m
7.0 m	9.80 m	8.00 m
9.0 m	12.60 m	10.35 m

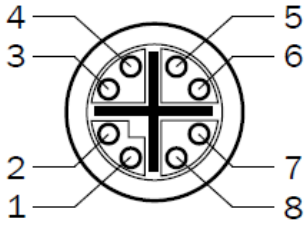
Visionary-T Mini CX
ACCESSORIES - CABLES

› System Plug (8-pin, M12, A-coded)



Pin	Signal	Description
1	+24V DC	Supply Voltage
2	INOUT3	Programmable digital I/O
3	GND	Reference Ground
4	INOUT4	Programmable digital I/O
5	INOUT1	Programmable digital I/O
6	INOUT5	Programmable digital I/O
7	INOUT6	Programmable digital I/O
8	INOUT2	Programmable digital I/O

› Gigabit Ethernet (8-pin, M12, X-coded)



Pin	Signal
1	TRD0_P
2	TRD0_N
3	TRD1_P
4	TRD1_N
5	TRD3_P
6	TRD3_N
7	TRD2_P
8	TRD2_N

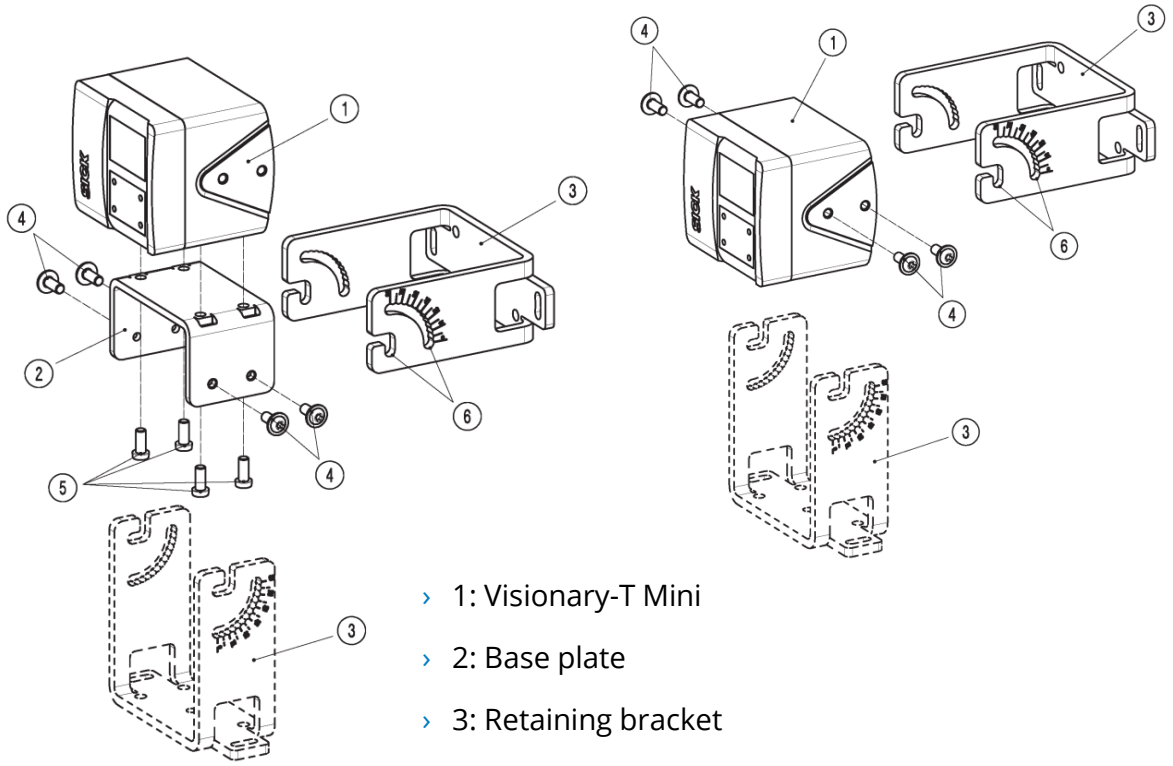
› Cables

Article number	Description
2106258	Ethernet cable 2m, M12 / RJ45, X-Coded, Straight
2106259	Ethernet cable 5m, M12 / RJ45, X-Coded, Straight
2106260	Ethernet cable 10m, M12 / RJ45, X-Coded, Straight
6020663	System cable 2m, M12, A-Coded, Straight
6020664	System cable 5m, M12, A-Coded, Straight
6048434	System cable 10m, M12, A-Coded, Straight
2094783	Ethernet cable 2m, M12 / RJ45, X-Coded, Angled
2094784	Ethernet cable 5m, M12 / RJ45, X-Coded, Angled
2094785	Ethernet cable 10m, M12 / RJ45, X-Coded, Angled
2096218	System cable 2m, M12, A-Coded, Angled
2096219	System cable 5m, M12, A-Coded, Angled
2114689	System cable 10m, M12, A-Coded, Angled

Visionary-T Mini CX
ACCESSORIES - MOUNTING KIT

Article number	Description
2124497	Mounting Kit – Visionary-T Mini

› The mounting kit includes the fixing screws and can be optionally used without the base plate



› 1: Visionary-T Mini
› 2: Base plate
› 3: Retaining bracket
› 4: Fixing screws with flange M5, Torx T25, 10mm
› 5: Fixing screws cheese head M5, Torx T25, 10mm
› 6: Fixing holes with angle scale

Thank you for your attention.

SICK AG - Mobile Perception – 3D Snapshot

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2.1.2
SOPAS Installation & Embedding

SICK AG – Mobile Perception – 3D Snapshot

Content

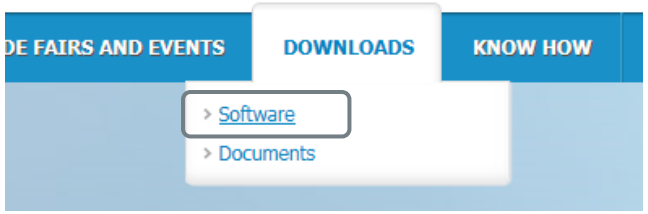
- **Prerequisites**
- **Install SOPAS ET**
- **Step by step** (online and offline)
- **Getting properly connected**
- Change IP address
- Device not found
- Change search settings
- **Install Device description** (SDD from device)
- Go online
- Device window
- **Install Device description** (SDD from SICK.com or Supporting material)
- Open offline device

Prerequisites
MINIMAL SYSTEM REQUIREMENTS

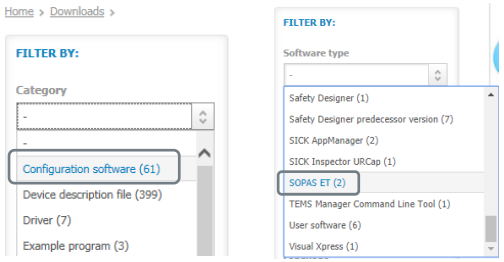
Minimal system requirements	
Processor:	Intel® Core™ i5 2,6 GHz
RAM:	4 GB RAM
Interface:	Hardware communication channels such as serial interfaces, USB or Ethernet, depending on the SICK device
Operating system:	Windows 10, Windows 7 (32 bit/64 bit), Windows 8 (32 bit/64 bit)
Graphic interface:	e.g. Intel® HD Graphics 3000 (or NVIDIA® NVS 3100M 512MB gDDR3) and OpenGL 2.0 Support
Monitor:	Min. 256 colors - recommended 65,536 colors (16 bit Hi color)
Screen resolution:	1024 x 768 px
Hard disk space:	450 MB
Ethernet:	>100 Mbit/s, 1Gbit/s or faster is recommended

Install SOPAS ET

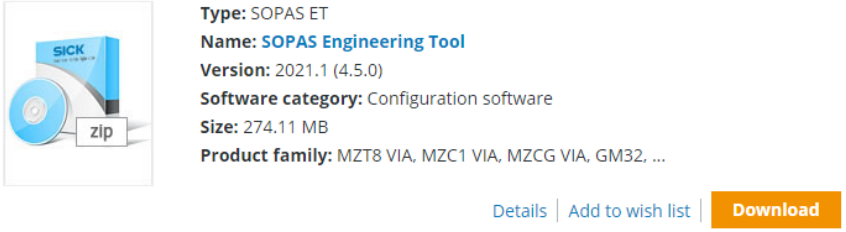
- SOPAS ET is included in the supporting material or available on www.sick.com
- Go to Downloads/Software



- Filter by *Category*: Configuration software & *Software type*: Sopas ET



- SOPAS Engineering Tool 2021.1
(or higher)
- Accept Terms & Conditions and download the software



STEP BY STEP
CHOOSE YOUR WAY TO INSTALL DEVICE

Two ways to embed a Visionary device into SOPAS

Online - requires a Visionary device

- Getting properly connected
- Install device description from device
- Go online and explore the GUI

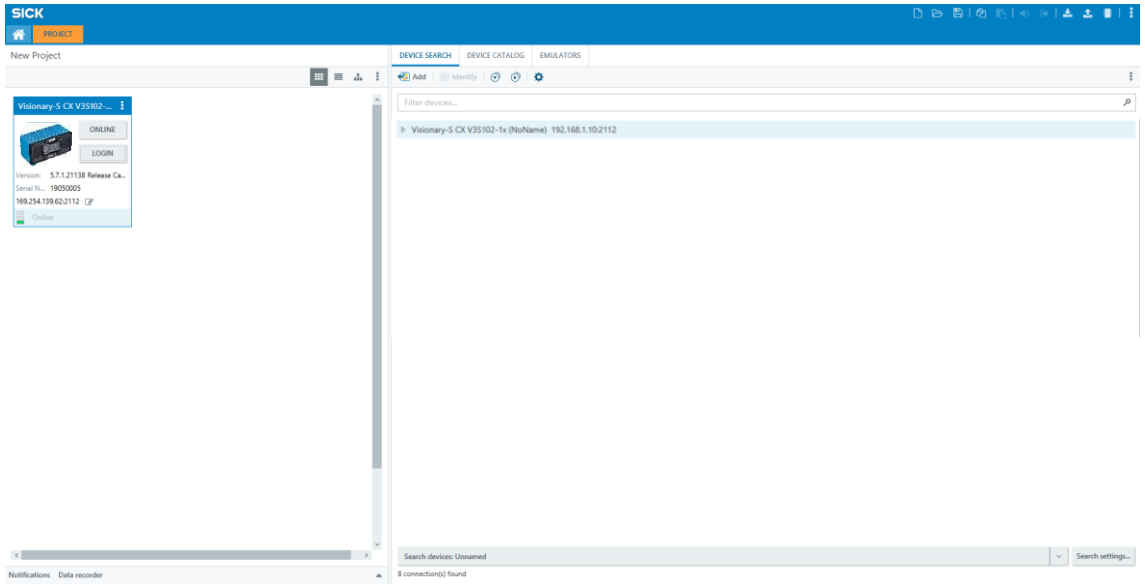
Offline - requires one or more SOPAS device description (sdd) file(s)

- Add SOPAS device description (sdd) from SICK.com or the Supporting material
- Open and explore the GUI in the offline mode (no data stream)

Getting properly connected

START SOPAS ET

- Connect your device via Ethernet to your local PC
- Connect the unit to the power supply and wait until it has booted up
- Start SOPAS ET
- The device should be found and added automatically to the project

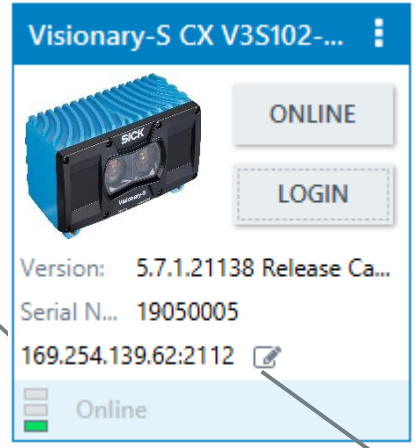


Getting properly connected
CHANGE IP ADDRESS

- If necessary, change the IP address of the device according your local network

- It’s also possible to change between static IP address or dynamic IP address via DHCP server

IP address of the device is displayed in the device tile.

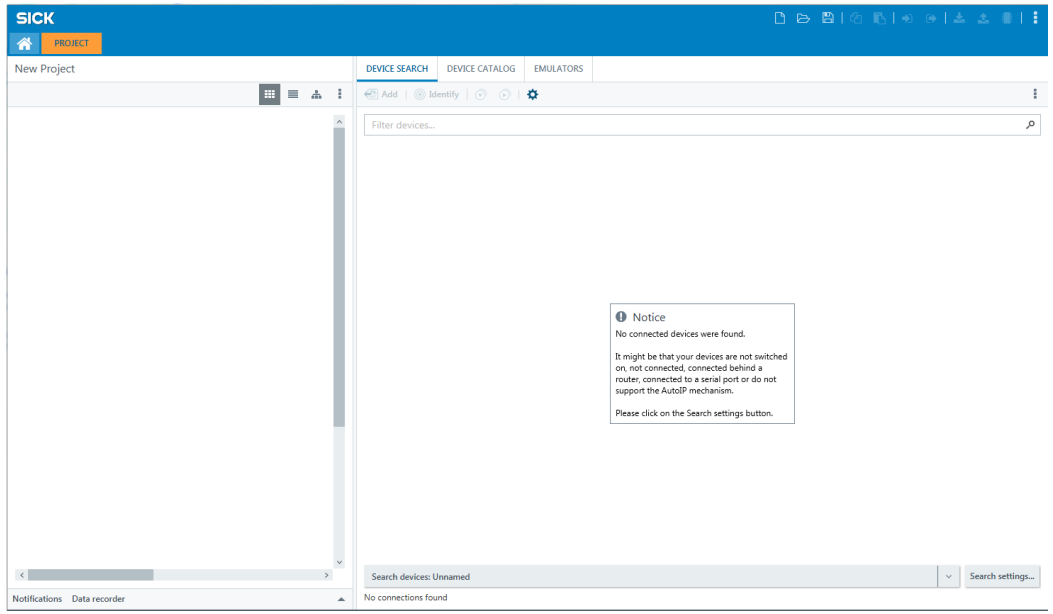


Clicking the pen allows to modify the IP address settings

Getting properly connected
DEVICE NOT FOUND

If the device was not found, check the following:

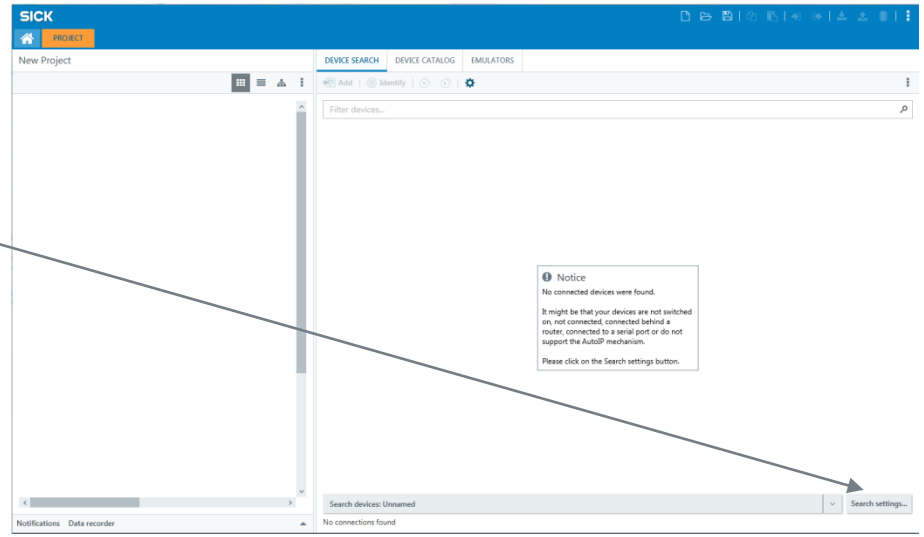
- First connect and power the device, after that start SOPAS ET.
- Check your local network settings.
- Default IP of the Visionary devices is 192.168.1.10



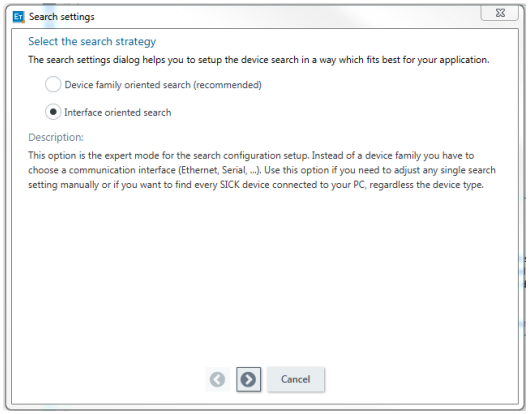
Getting properly connected
CHANGE SEARCH SETTINGS

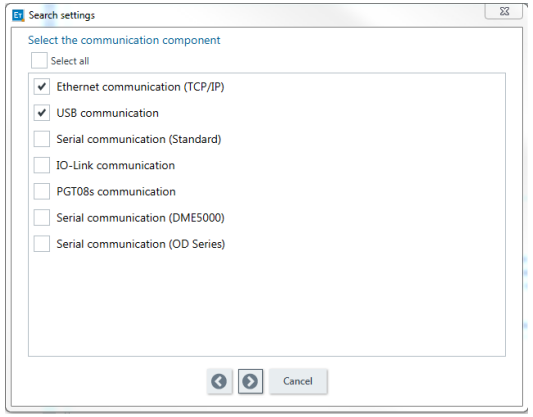
If the device was not found, check the following:

- Change search settings



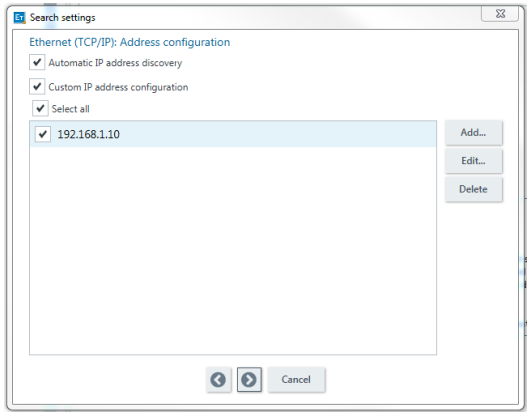
- Follow the standard SOPAS ET wizard.





Getting properly connected
CHANGE SEARCH SETTINGS

- Some local network settings or hardware may block the automatic IP address discovery scan which based on broadcast messages.
- Add the default IP **192.168.1.10** address to the search list.

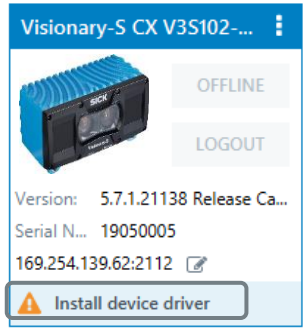


- If your device is not detected automatically, check your firewall settings and used hardware between your local host and the device.
- **Please make sure your firewall allows communication to the TCP-ports 2112, 2113, 2114**
- **In addition, the camera uses the UDP-port 30718 for AUTO-IP-Scan.**
  For this purpose, *Broadcast* must be enabled
- Duplicate IP addresses, firewall settings or used network components may also block the change of the IP address.

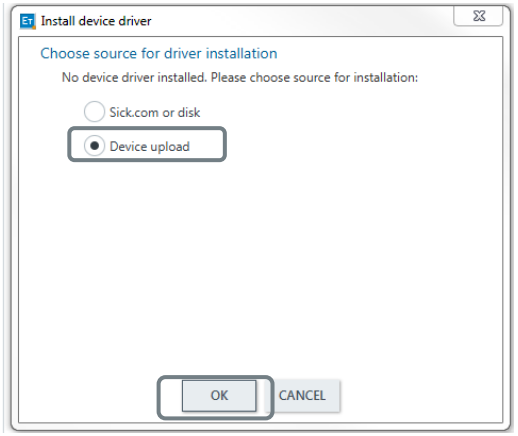
Install SOPAS Device description
(SDD) FROM DEVICE

After a successful connection, the driver might be missing.

- Click on *Install device driver*

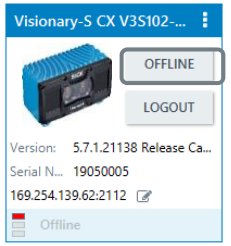


- Choose *Device upload*

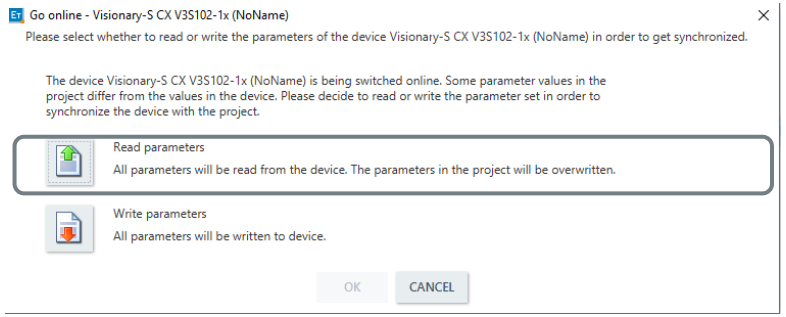


Go Online
(IF NOT AUTOMATICALLY DONE)

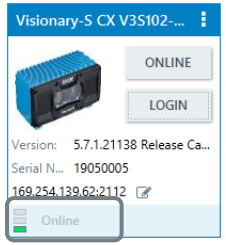
- Click *Offline* to go online



- Choose *Read parameters*



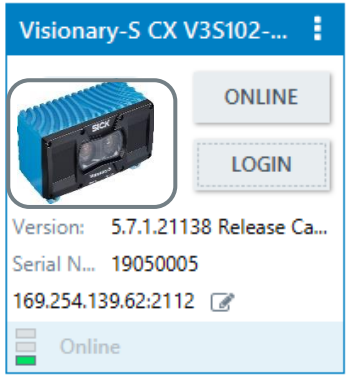
- Success!



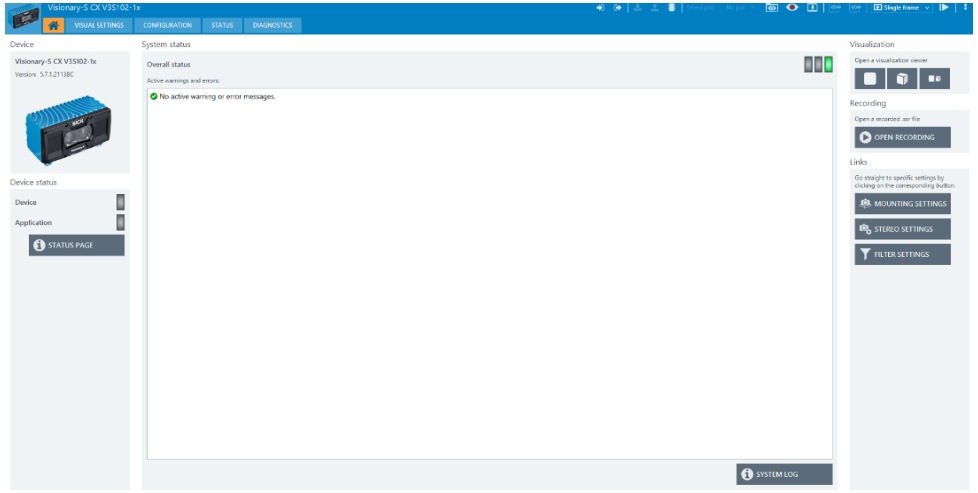
Device Window

OPEN DEVICE WINDOW

- Double click on the device tile to open the device window



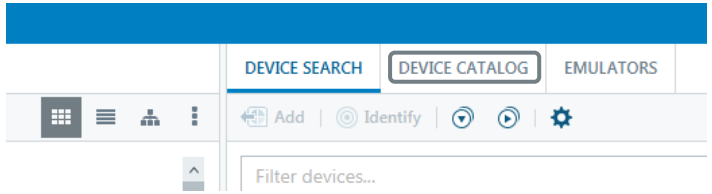
- Continue with GUI Configuration presentation for more details and examples



Install Device description

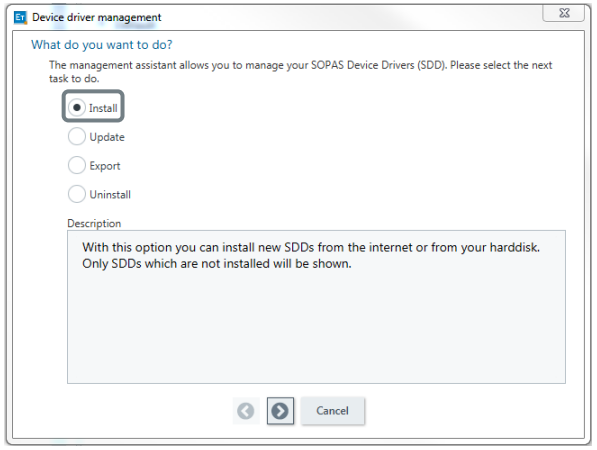
SDD FROM SICK.COM OR DISK

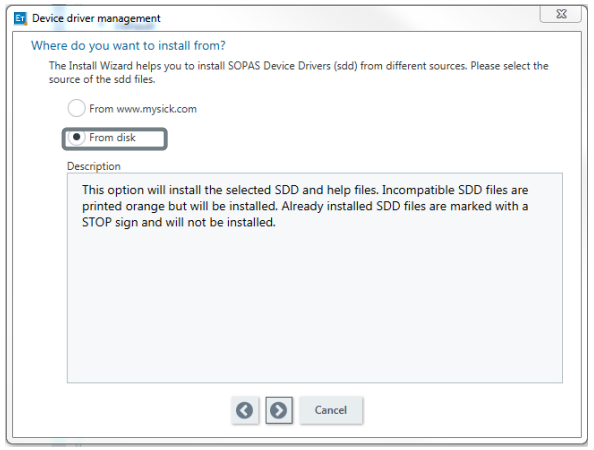
- Open *Device catalog*



- Start the device driver management

- Choose *Install →From disk*

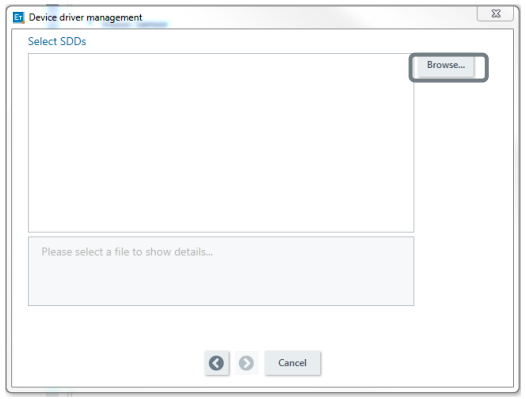




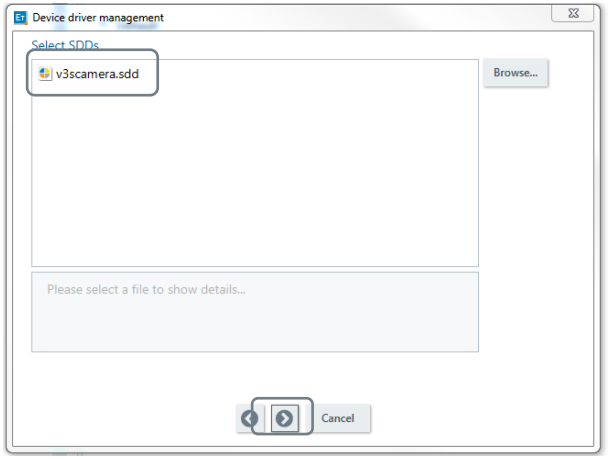
Install Device driver

SDD FROM SICK.COM OR DISK

- Search and find *V3SCamera.sdd*
  The SDD is included in the Supporting material



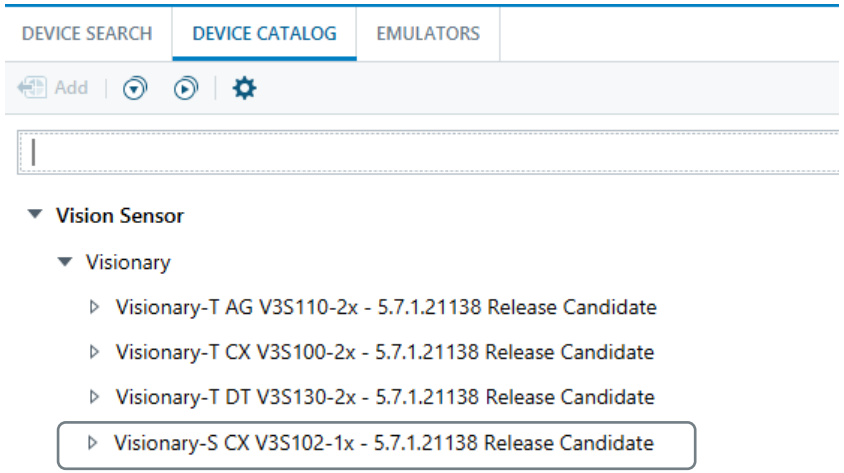
- Confirm selection



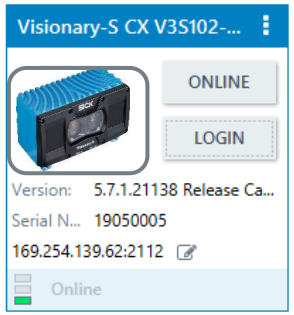
Open offline device

OPEN DEVICE CATALOG

- Double click on your Visionary Version
  - If more than one versions available, choose the latest one.



- Double click on the device tile to open the device window (no data stream)
- Continue with GUI-Configuration presentation for more details and examples



Thank you for your attention.

SICK AG - Mobile Perception – 3D Snapshot

SICK
Sensor Intelligence.

2.1.3
Device configuration user guide

SICK AG – Mobile Perception – 3D Snapshot

Visionary-T Mini CX
SOPAS ET INTRODUCTION

- The new **Visionary-T Mini CX** can be configured with the SICK engineering tool **SOPAS ET**
- The device configuration page for the Visionary-T Mini CX comes with a 2D and 3D live view for the data stream
- The user can easily see the effects of his configuration
- Configuration setups can be exported and imported via SOPAS ET
- You can save your configuration directly on your device via SOPAS ET so that the settings are available again the next time you switch it on
- SOPAS ET allows to record image data of Visionary-T Mini CX in .SSR format which can be further processed or played back via the SSR player

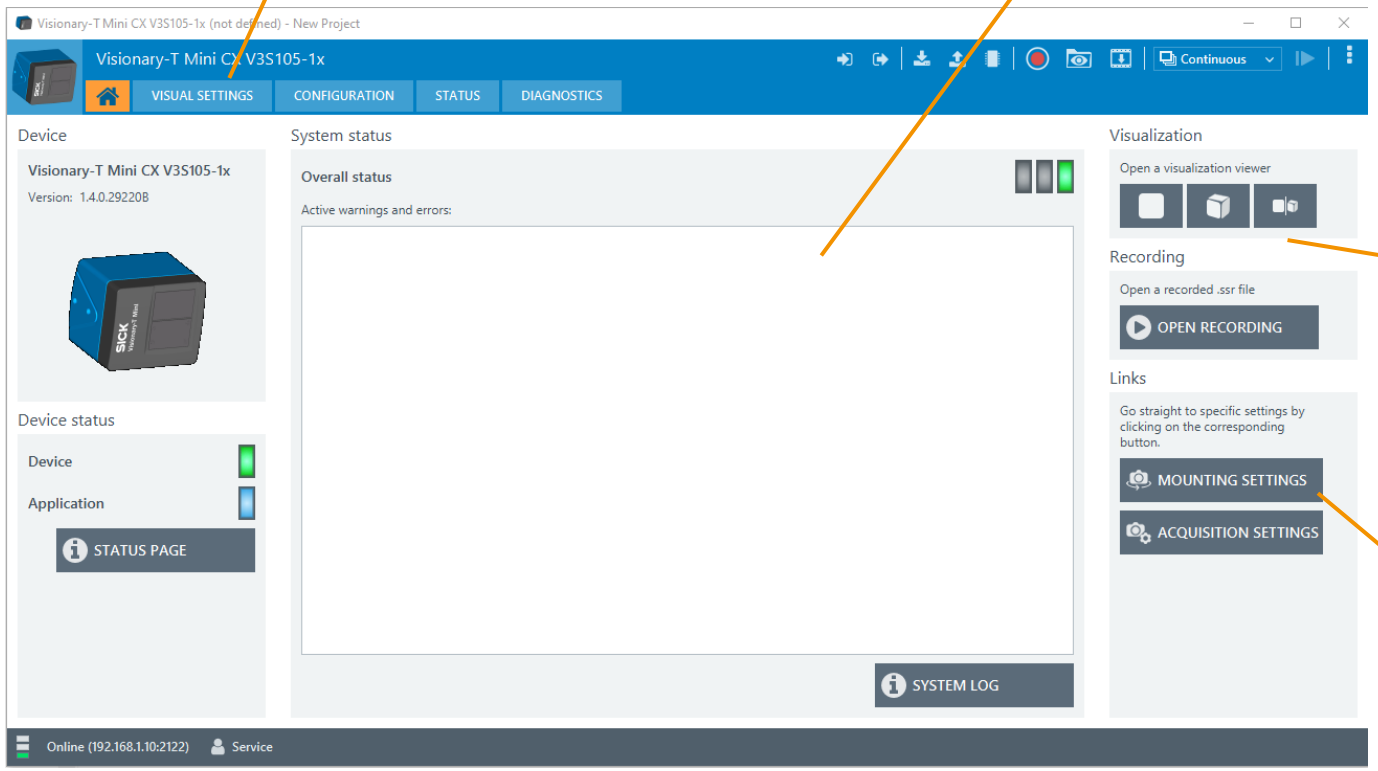
Further details on SOPAS ET can be found under:

https://www.sick.com/de/en/p/p367244

Visionary-T Mini CX Device Page
OVERVIEW

Use the buttons in the workflow steps for quick navigation

Check if the system works without any errors



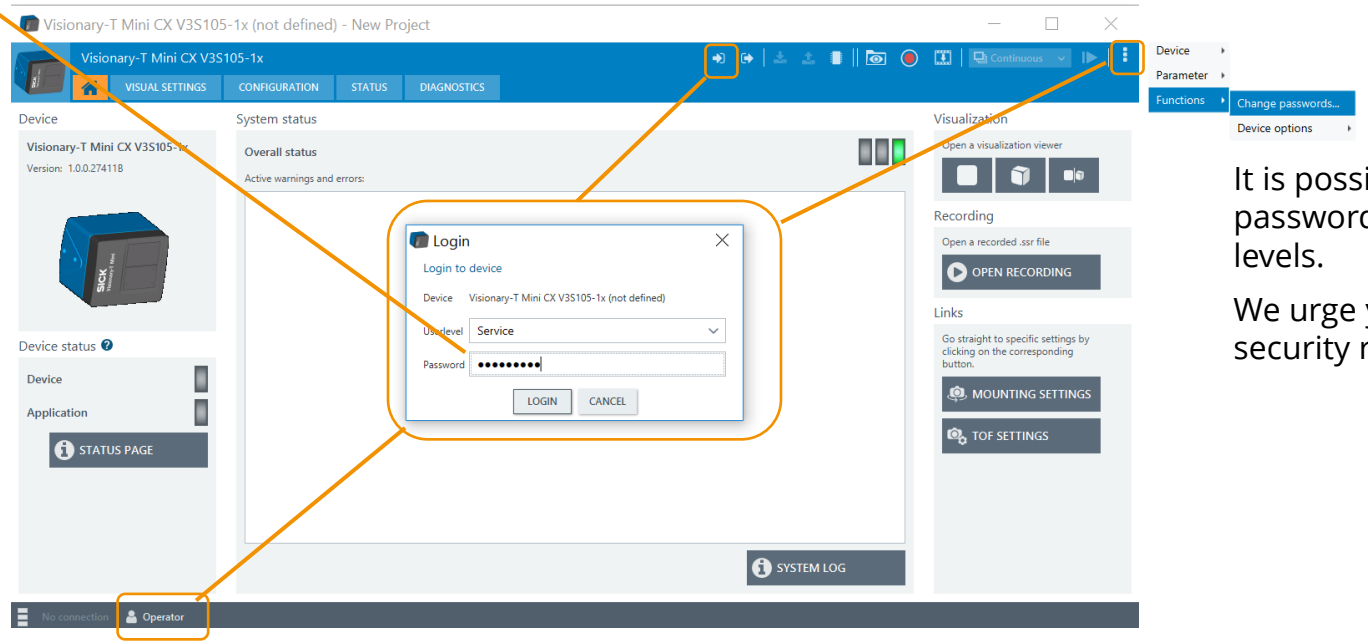
Start the visualization with one of the viewers

Use the links to navigate quickly to important device settings

Visionary-T Device Page
LOGIN

› To change different parameters, you must log in on “Authorized Client” or “Service” user level with the corresponding password:

Userlevel	Password
Authorized Client	CLIENT
Service	CUST_SERV



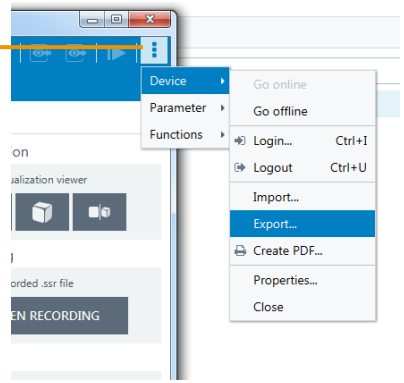
It is possible to change the passwords for different user levels.

We urge you to do so for security reasons!

Visionary-T Mini CX
SAVE AND EXPORT CONFIGURATION

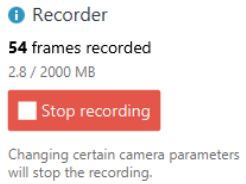
- To save the configurations permanently, **first** press the "Write parameters to device" button. In the **second** step, press then the „Save parameters permanently“ button.
  - Note: If you do not do this, the configurations will be lost when the device is switched off.

- All device settings can be exported by the “Device” menu as .SOPAS file
- The export can be used to restore the settings or to multiplicate it on several other devices.

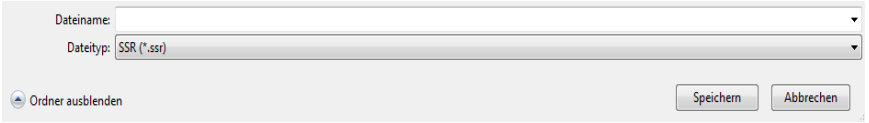


Visionary-T Mini CX
RECORD - STORE*, SSR FILE ON LOCAL DISK

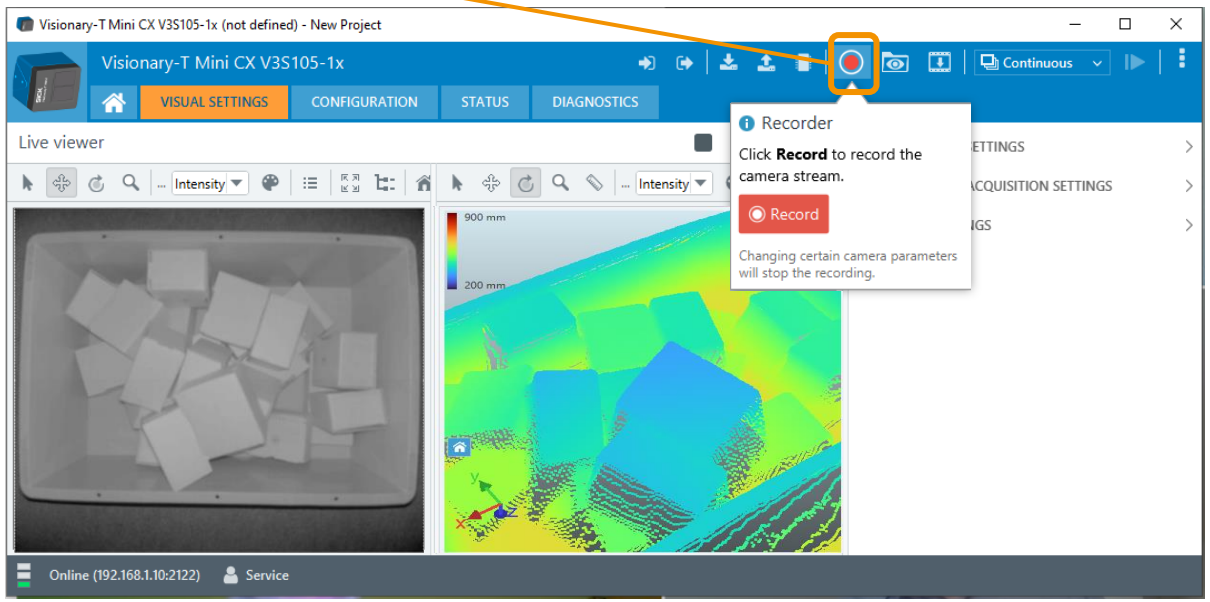
- Press *Start recording* and confirm with the Record button
- Active recording is shown by this symbol REC in the upper right image corner and the *Record* button turns to *Stop recording*



- Press *Stop recording*
  The file saving dialog opens automatically



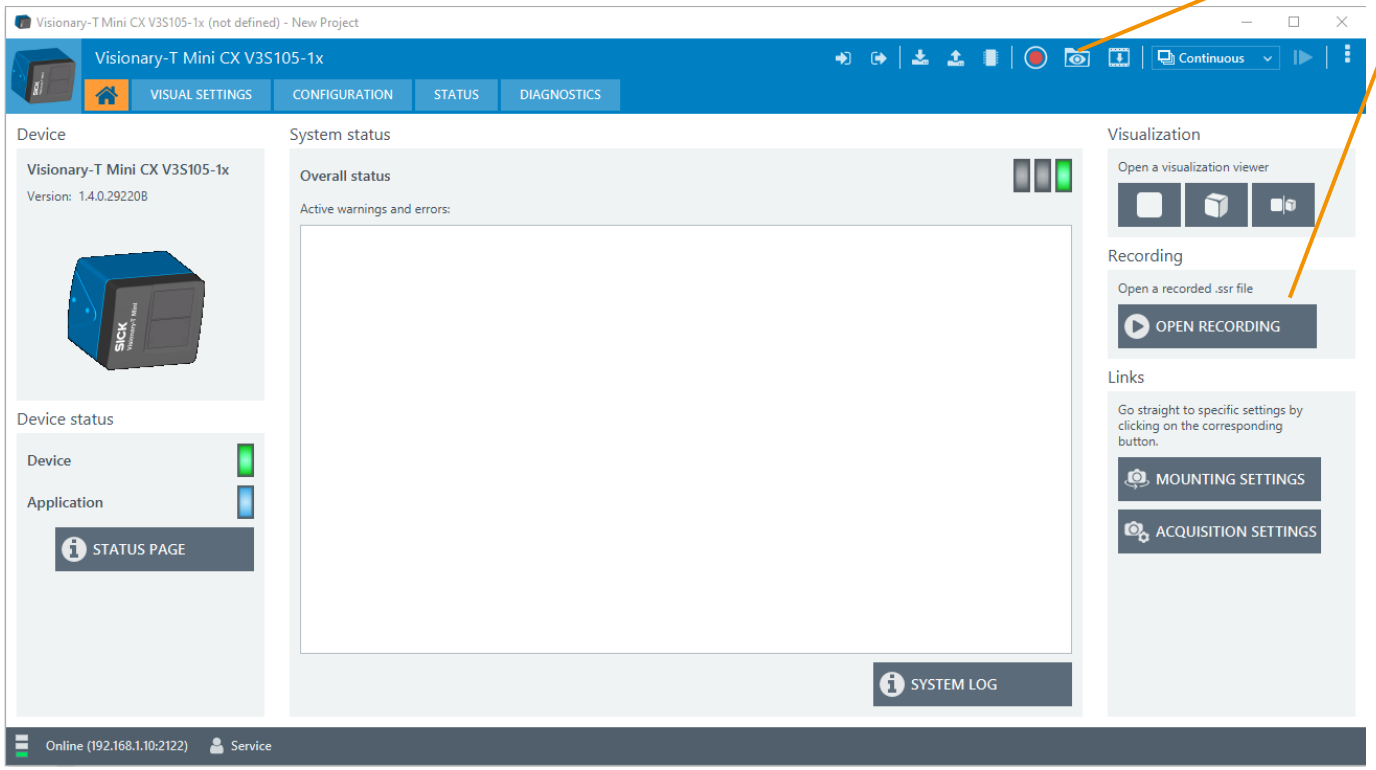
- Select your directory, name the SSR file and save it
- The recording stops automatically, when the file size is about to exceed 2GB.
  - Note: Saving can take some time for bigger file sizes
- Be aware of your computer performance when playing the .ssr files!

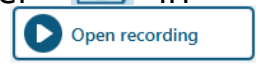


Visionary-T Mini CX
REPLAY - LOAD, *.SSR FILE FROM LOCAL DISK

Available in the device window toolbar

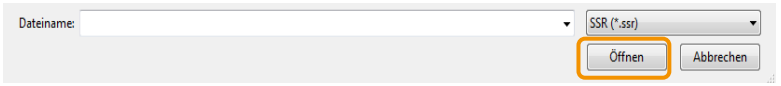
Note that to increase the performance of the playback window the live viewer is automatically set to *Pause*



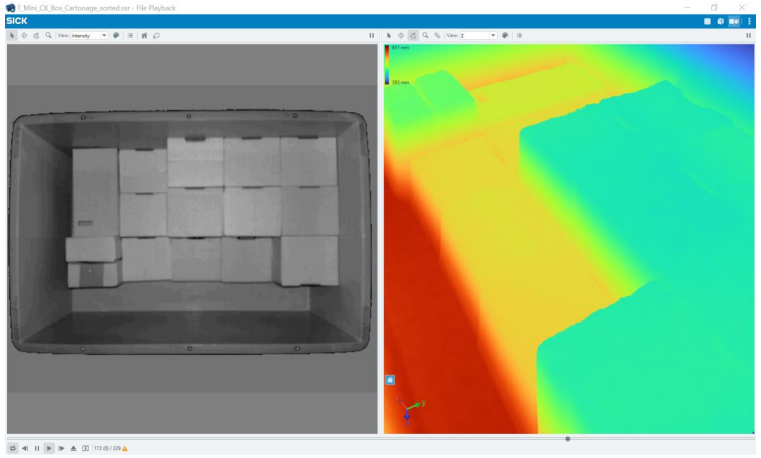
Press *Open recording file* either  in the device window toolbar or 

on the homepage

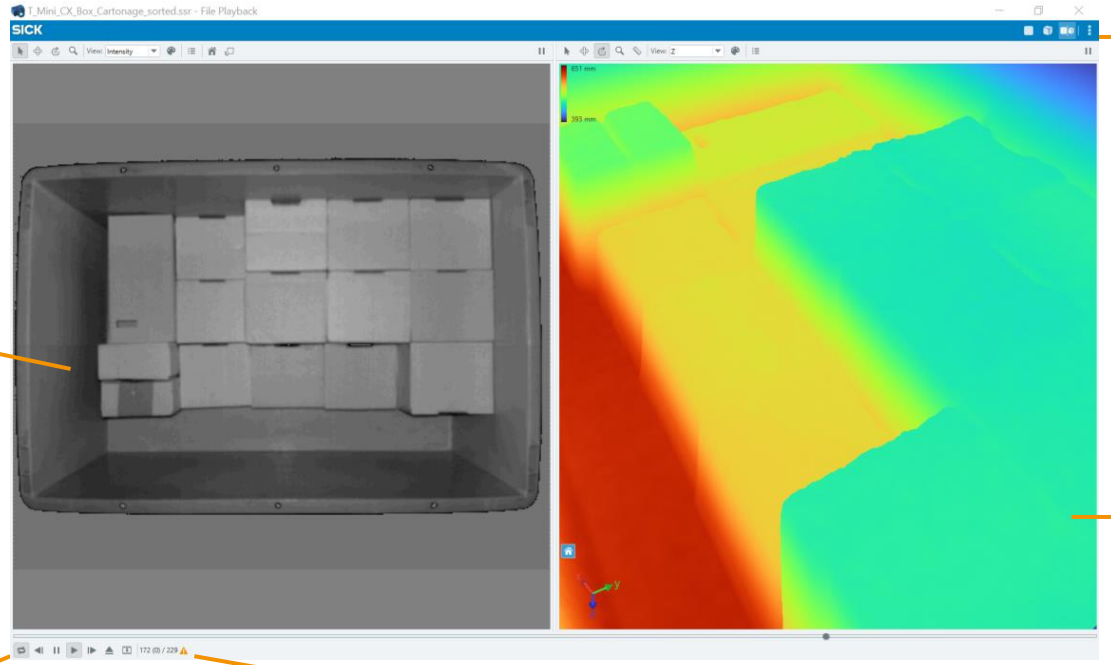
Select your .SSR and choose *open*



A file playback window opens and offers (almost) the same options as a 2D or 3D live viewer



Visionary-T Mini CX
REPLAY - FILE PLAYBACK



The File Playback window will always open in in 2D/3D split view. You can switch to sole 2D or 3D

2D view

3D view

Replay mode.
Single or in a loop

Frame counter

Play

Pause

Single Step. Forward or backward

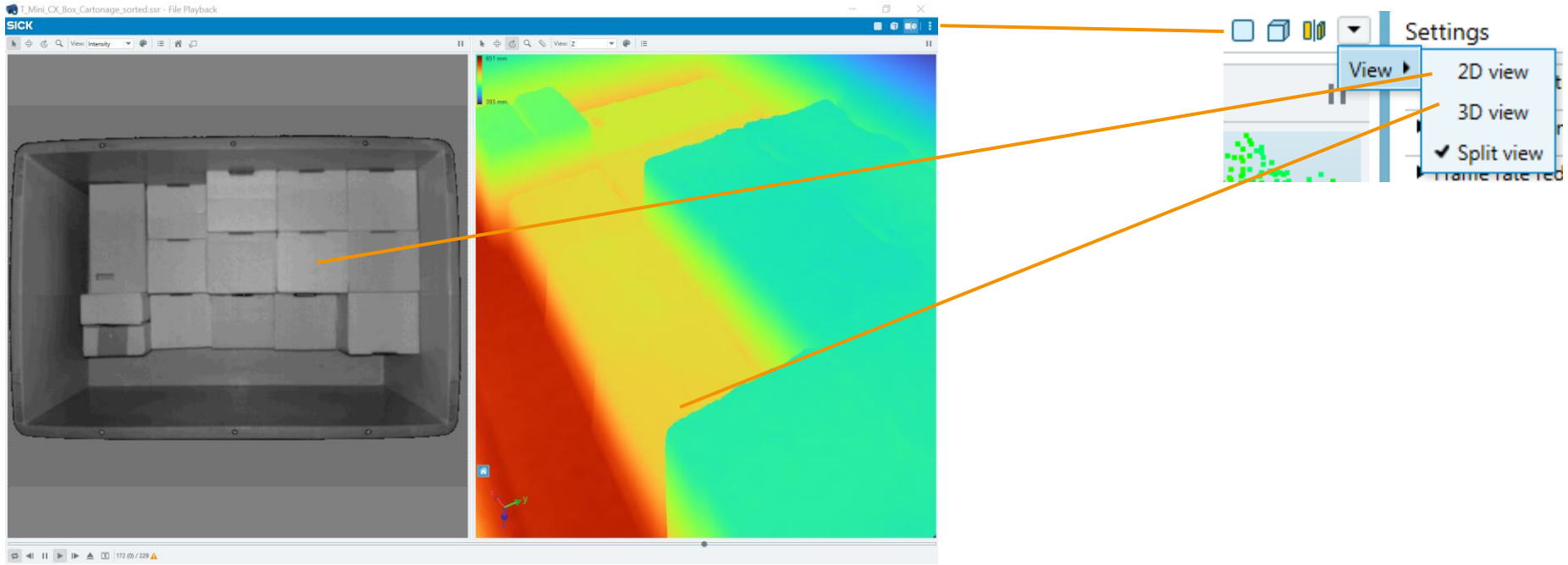
Open file. Open another *.ssr file

Export current frame as 3D pointcloud *.pcd/*.ply file

Visionary-T Mini CX
VISUALIZATION

SICK
Sensor Intelligence.

› Use the SOPAS ET feature on the upper right corner to switch between the 2D -, 3D-viewer or both at the same time.

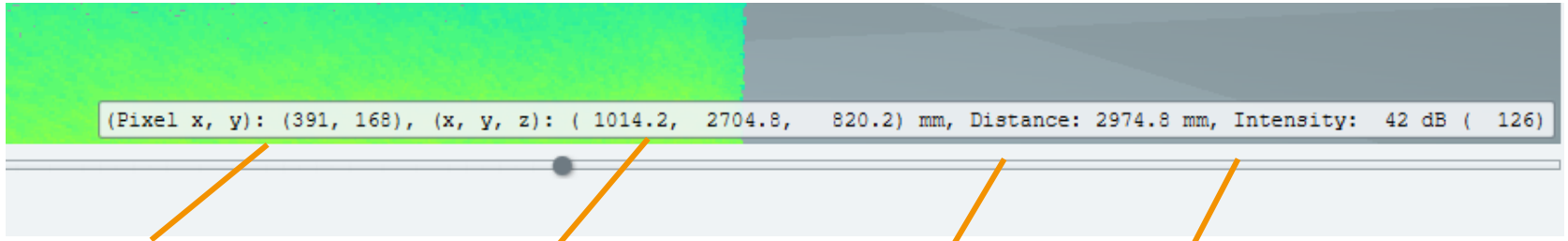


› This scene shows a container with small boxes. On the left you can see the 2D image and on right the 3D point cloud view of this scene. Both views contain the same information

› The refresh rate of the visualization depends on the computer performance

Visionary-T Mini CX
MEASUREMENT BAR - OVERVIEW

- Available in 2D and 3D Viewer
- Use selection tool to enable the measurement feature
- You may use the pause mode to freeze the data
- The measurement bar is visible when the mouse pointer is close to the data points
- Hovering with the mouse pointer over a specific point gives additional information about the data



Pixel index information
(only available in 2D
viewer)

X,Y,Z in [mm]
Data in world coordinates.
See device page mounting for
more information

Radial distance in [mm].
Distance value

Intensity in [dB]
Grade of the received light. Depends
on the distance and reflectivity.

Visionary-T Mini CX
2D VIEWER

Selection tool. Hovering over the image shows the measurement bar

Move. Available by pressing shift key as well

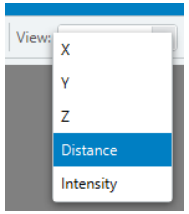
Rotate. Available by pressing ctrl key as well

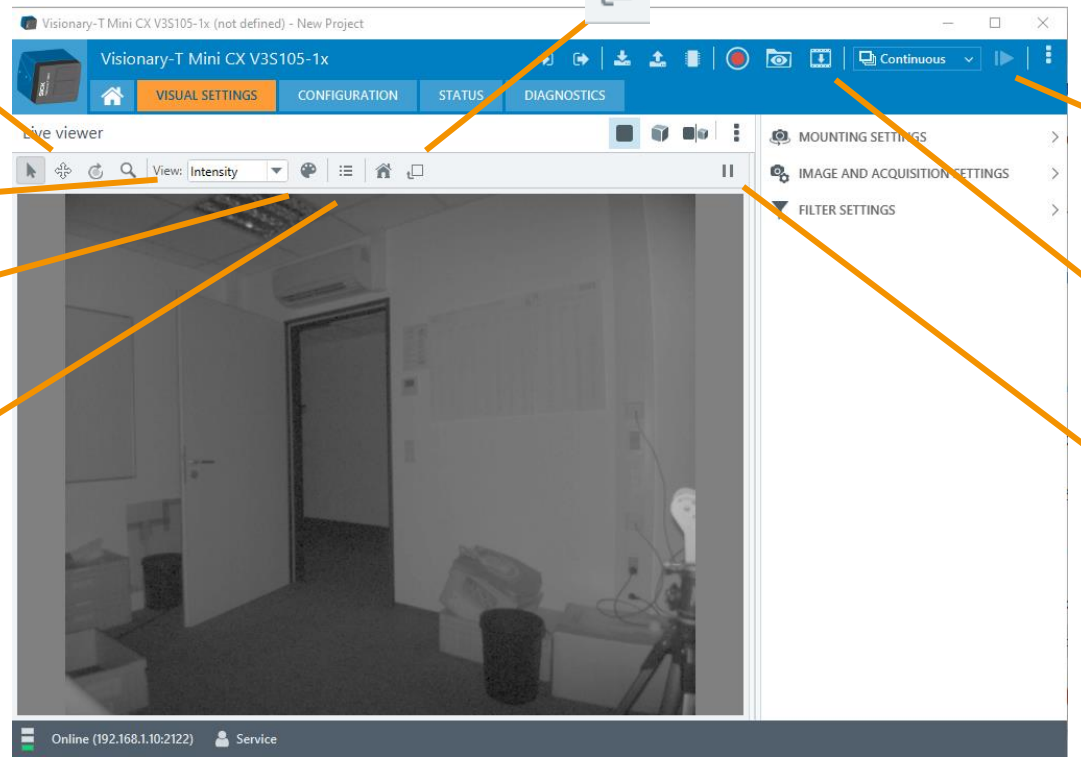
Zoom. Available by mouse wheel as well

Home. Reset zoom and position settings

Rotate view 90° clockwise

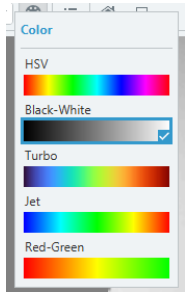
View map selection





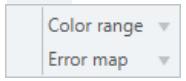
Trigger next frame
(only active in single frame mode)

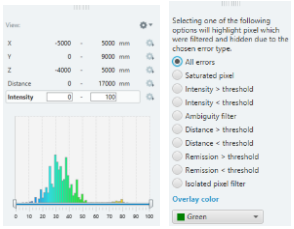
Color map selection



Save current frame as
3D point cloud *.pcd / *.ply file

Further options

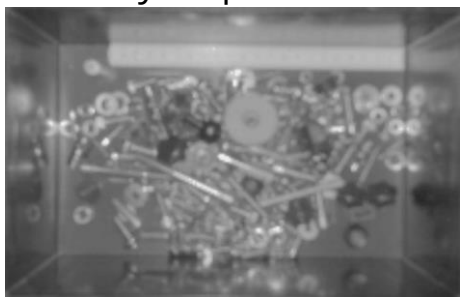


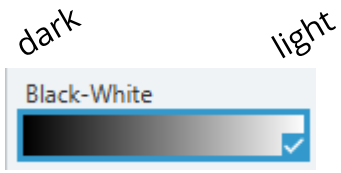


Pause. Freeze current image

Visionary-T Mini CX
2D VIEWER – VIEW / MAP OPTIONS

Intensity map

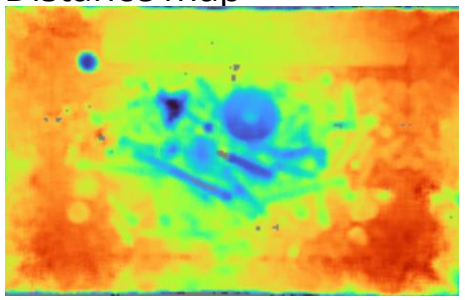




Helpful for visual identification of the scene

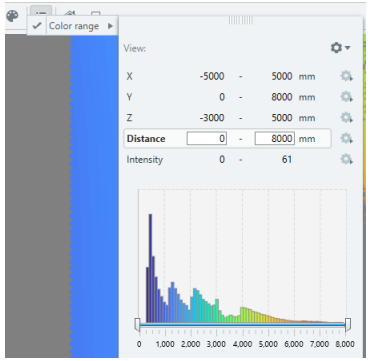
It is a monochrome image, note that the scene reflectivity of near IR light is captured

Distance map



Each point visualizes one radial distance value

The point cloud maps X Y Z are calculated based on the available camera calibration and the mounting settings and can also be visualized in the 2D viewer.

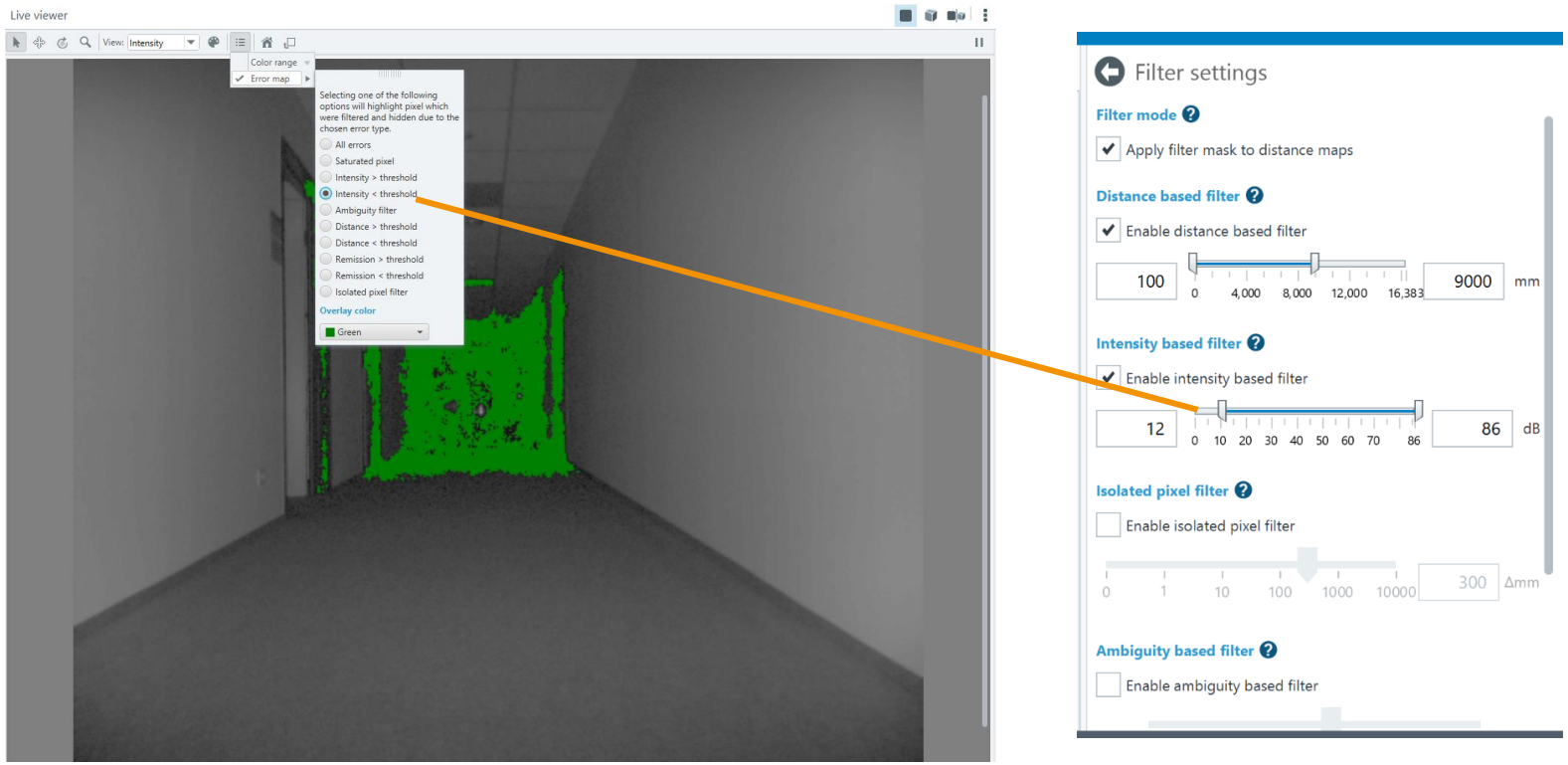


Visionary-T Mini CX
2D VIEWER – STATE MAP 1/2

Various filter configurations or circumstances within the scene can lead to a loss in data values.

Please keep in mind that the intensity map will never be affected by the data filters unless the image is cropped.
The state map visualization helps to understand whether the data is missing due to a configured filter or due to other circumstances e.g. saturation effects.

Find the reason for this loss by highlighting omitted pixels in a defined color (default: green):

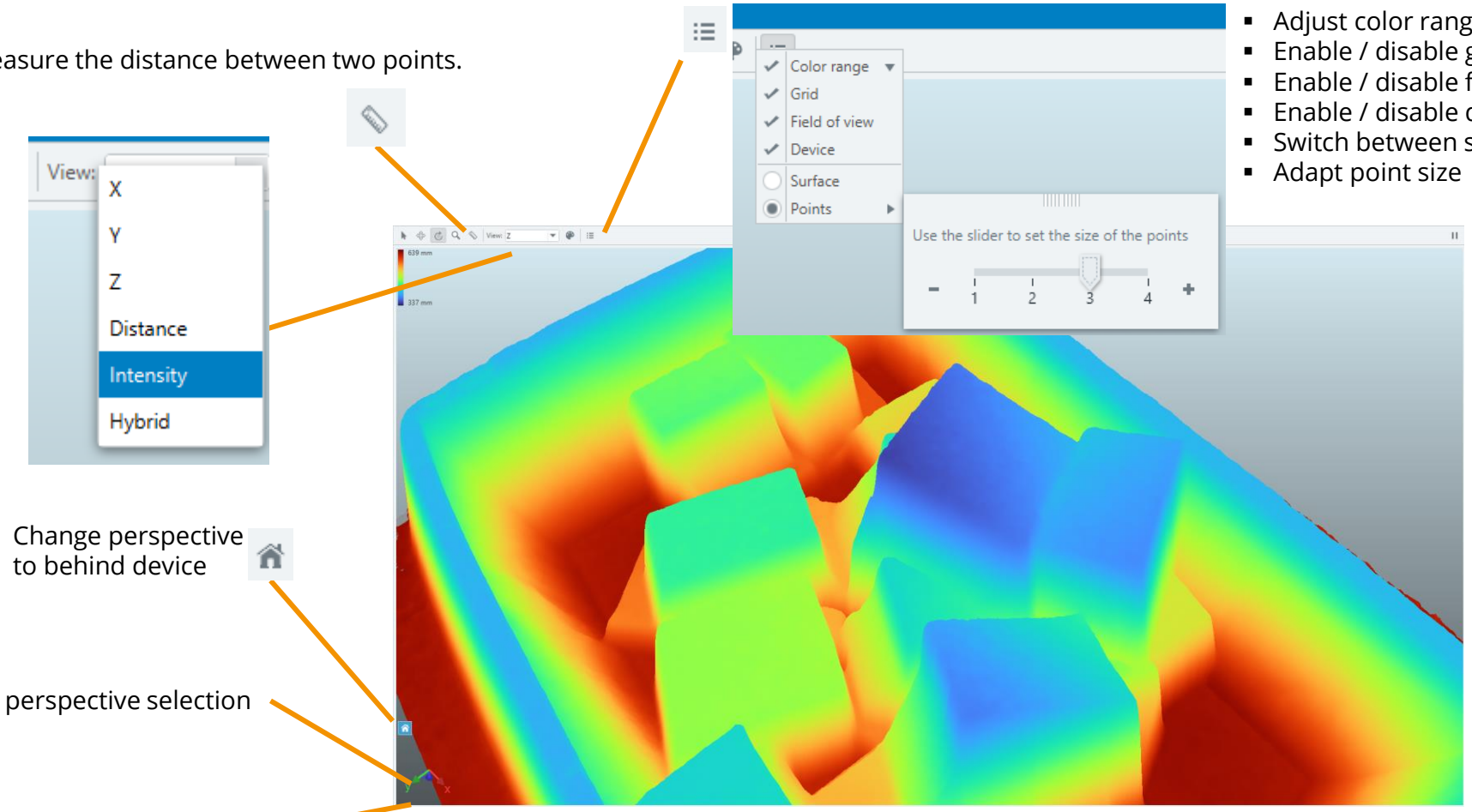


Visionary-T Mini CX
2D VIEWER – STATE MAP 2/2

- **All errors**: all pixels which are without depth data are highlighted
- **Saturated pixel** highlights pixels that are saturated due to overexposure
- **Intensity > threshold** highlights the filtered pixels based on the specified upper threshold for intensity
- **Intensity < threshold** highlights the filtered pixels based on the specified lower threshold for intensity
- **Ambiguity filter** highlights pixels which are filtered due to the settings of this filter
- **Distance > threshold** highlights the filtered pixels based on the specified upper threshold for distance
- **Distance < threshold** highlights the filtered pixels based on the specified lower threshold for distance
- **Remission > threshold** highlights the filtered pixels based on the specified upper threshold for the object remission properties
- **Remission < threshold** highlights the filtered pixels based on the specified lower threshold for the object remission properties
- **Isolated pixel filter** highlights pixels which are filtered due to the settings of this filter

Visualization
3D VIEWER

Ruler. Measure the distance between two points.



Change perspective to behind device

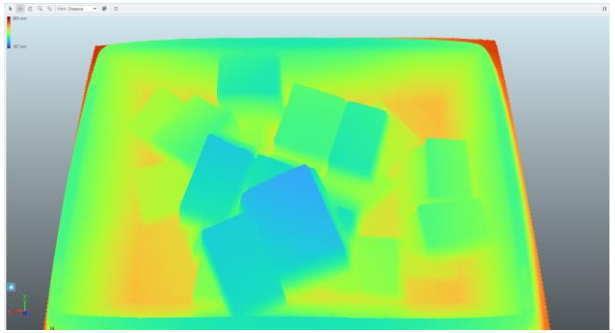
Quick perspective selection

X, Y, Z orientation of the current perspective

- Adjust color range
- Enable / disable grid visualization
- Enable / disable field of view overlay
- Enable / disable device in the scene
- Switch between surface and point representation
- Adapt point size

Visionary-T Mini CX
3D VIEWER – VISUALISATION OPTIONS

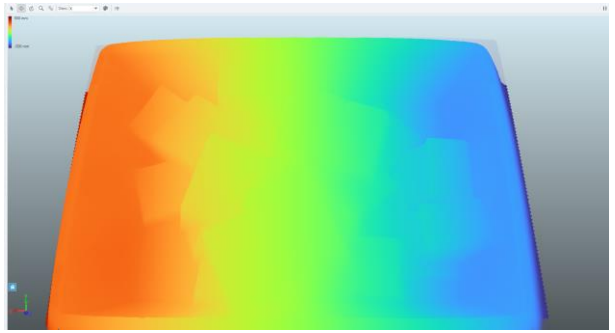
Radial distance values



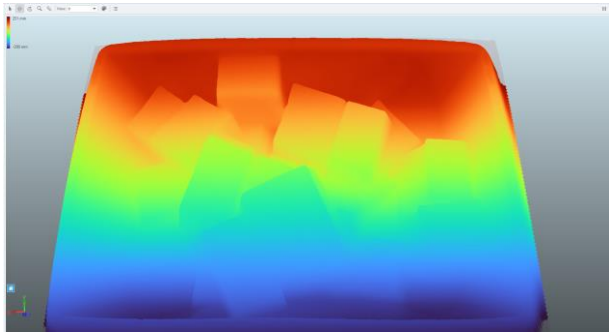
Intensity values

- The Visionary-T Mini CX measures the radial distance and the intensity for each pixel.
- The 3D visualization always renders the point cloud according to the given mounting settings and the intrinsic camera calibration which are saved on the device during factory calibration (see settings menu)

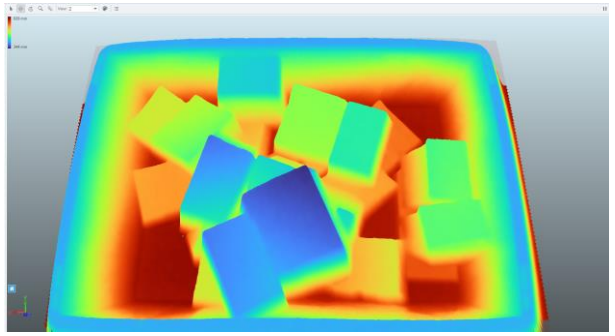
X Map



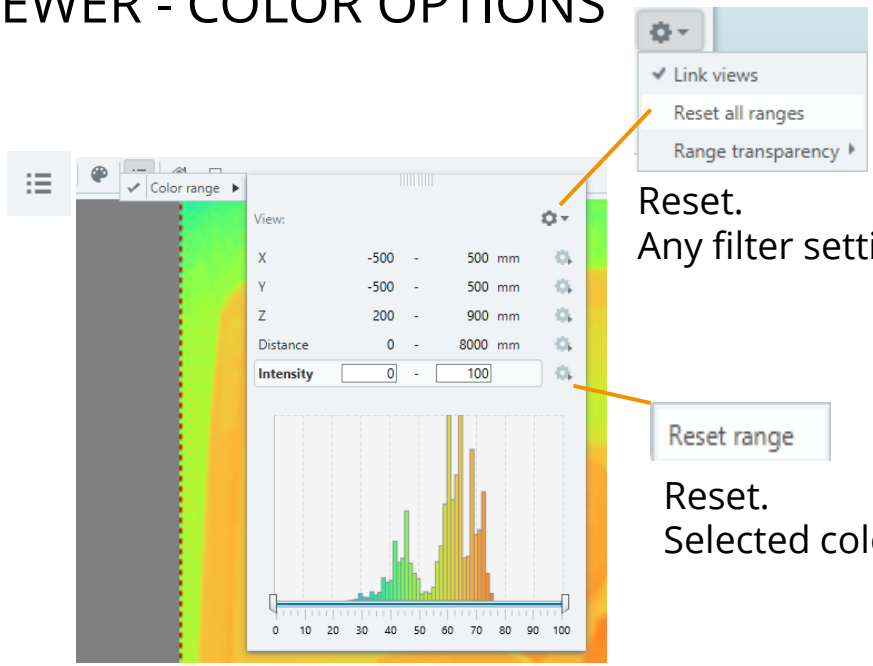
Y Map



Z Map

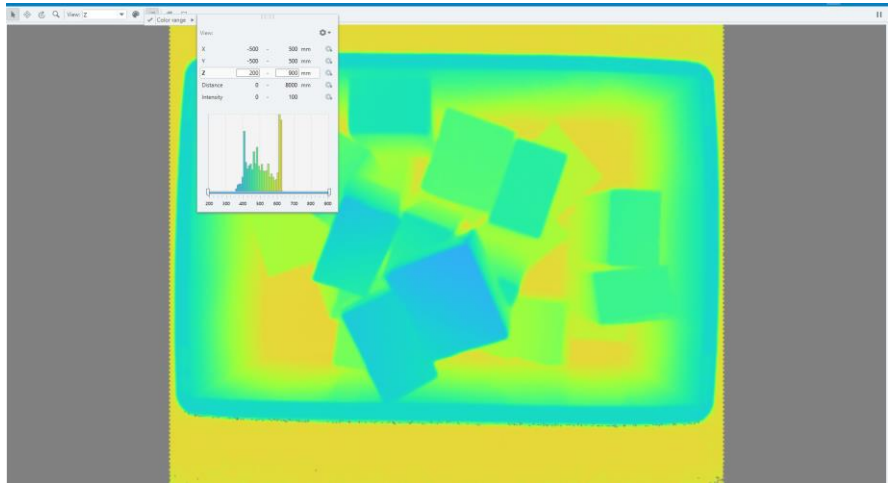


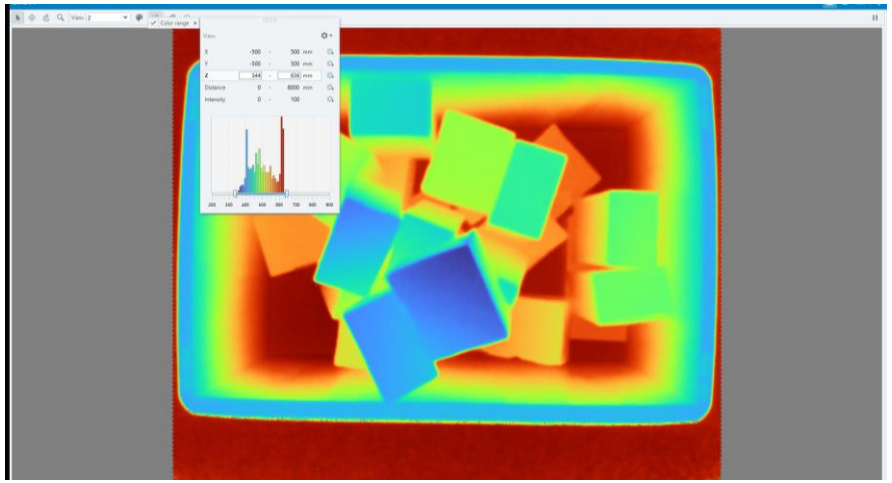
Visionary-T Mini CX
2D/3D VIEWER - COLOR OPTIONS



Reset.
Any filter settings

Reset.
Selected color settings

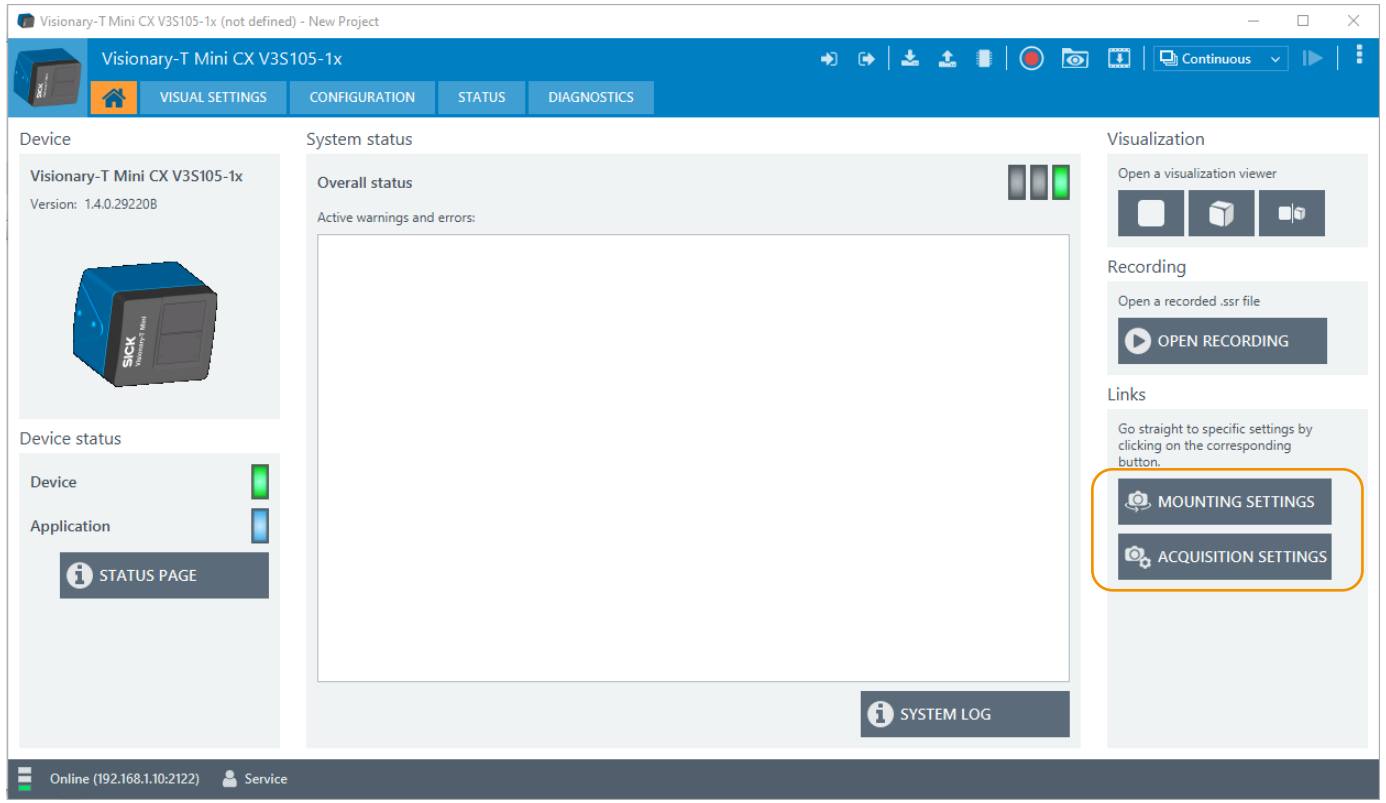


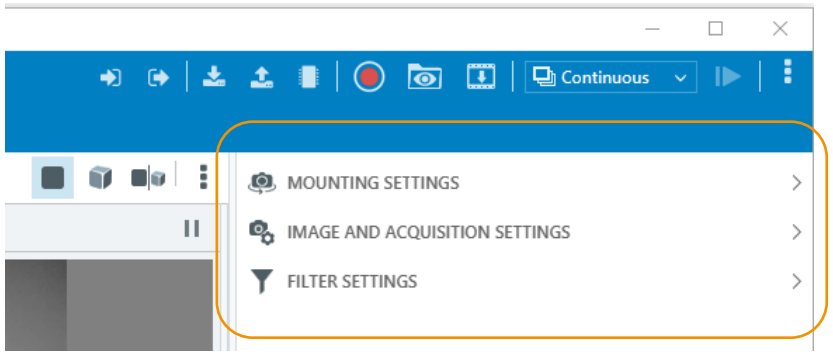


- The color range settings allow to tune the color distribution range
- Color range settings are available for each data source
- Points out of range will be grayed out
- A histogram is shown to support data analyses and to easily select the range of interest
- Some limits of the color range settings will be calculated during opening the 3D viewer. If the scene changes completely, close and open the 3D viewer to recalculate the limits
- Example (Z map coloring): adjustment of the color range increase the contrast in the visualization

Visionary-T Mini CX
SETTINGS

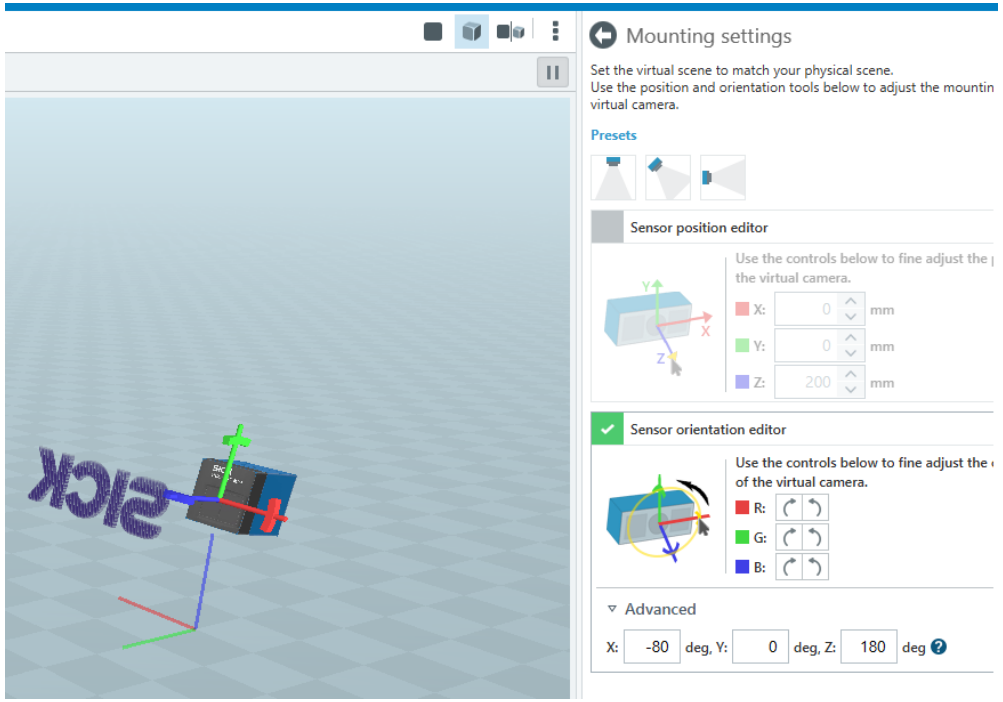
- You can enter the settings menu by using one of the quick links on the homepage
- You can also navigate the settings menu on the right side within the Visual settings





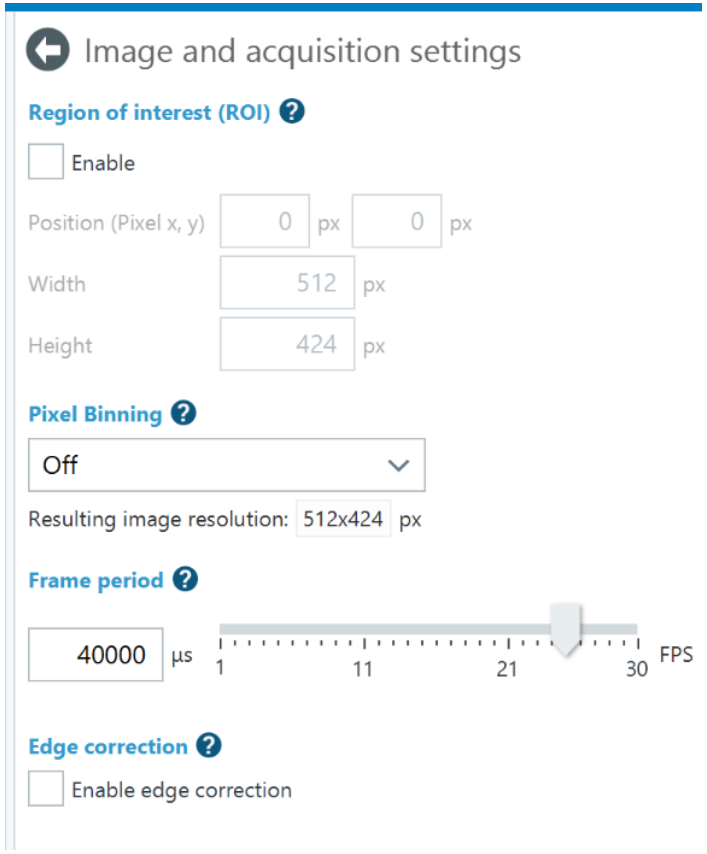
Visionary-T Mini CX
MOUNTING SETTINGS

- You can align the device location and orientation with the world coordinates within the mounting settings menu
- Visionary-T Mini CX has 6 parameters (here depicted)
- The mounting settings are stored inside of the device
- The values are used for visualization and are available via the programming interface for further calculations



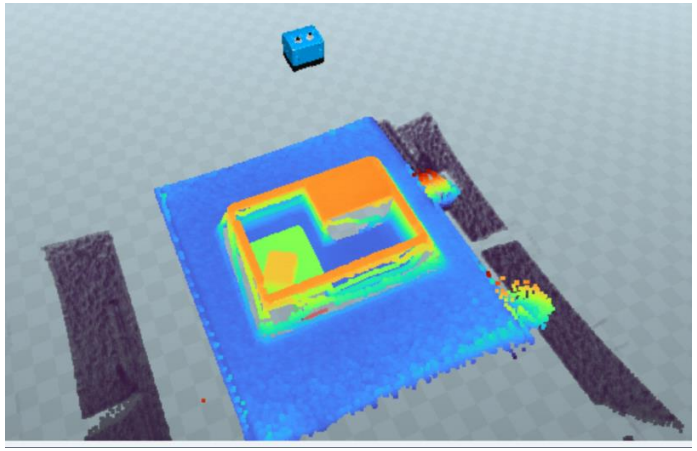
Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

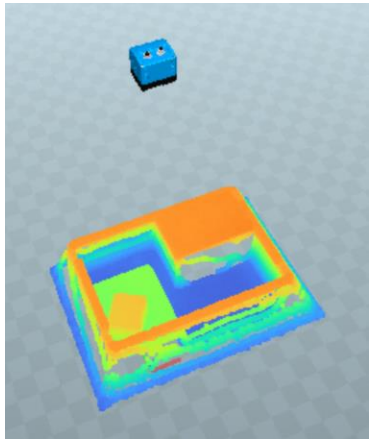
- The image and acquistion settings can be used to optimize the Visionary-T Mini regarding to
  - Bandwidth limitations (ROI, Pixel Binning, Frame rate)
  - Temperature limitations (Frame rate)
  - Data robustness (Pixel Binning, ROI)
  - Frame rate (Frame period)
  - Data quality (Edge correction)

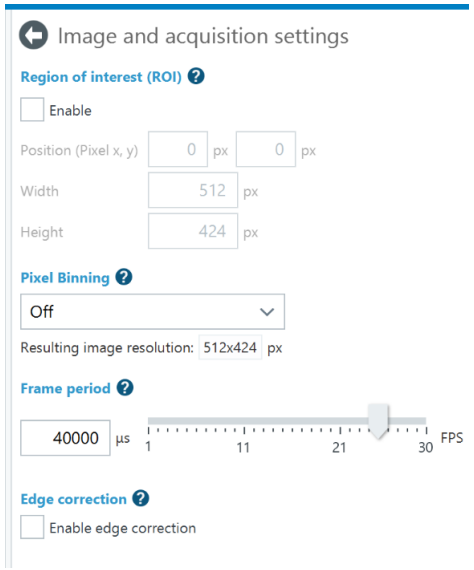


Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

- Region of interest (in this case the box in the center of the image)
  - Use this feature to crop your image size and to remove all unnecessary data outside your region of interest
  - This feature will reduce the output resolution and can be used to save bandwidth
  - The allowed width is always a multiple of **4** and the minimum allowed height is at least **3**
  - It can only be combined with the pixel binning feature when the width of your cropping mask is a multiple of **8** (2x2 pixel binning) or **16** (4x4 pixel binning) and the height a multiple of **2** (2x2 pixel binning) or **4** (4x4 pixel binning)

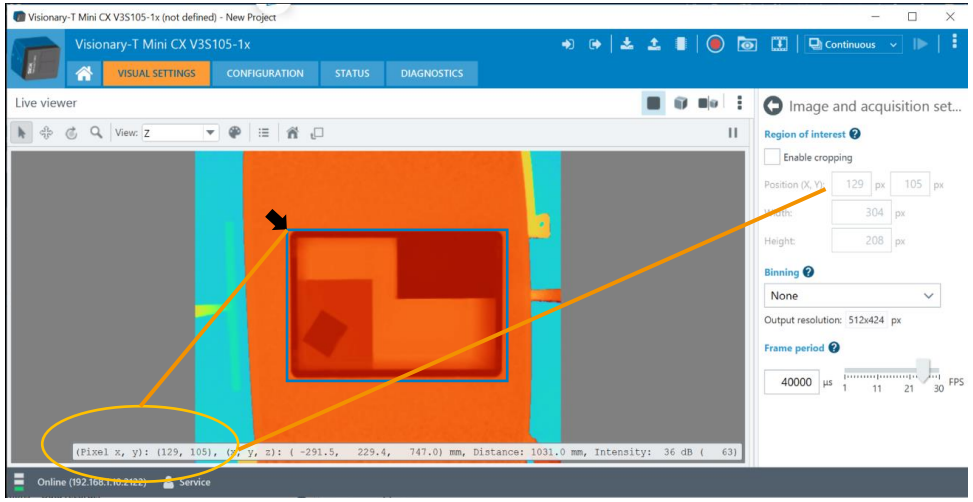


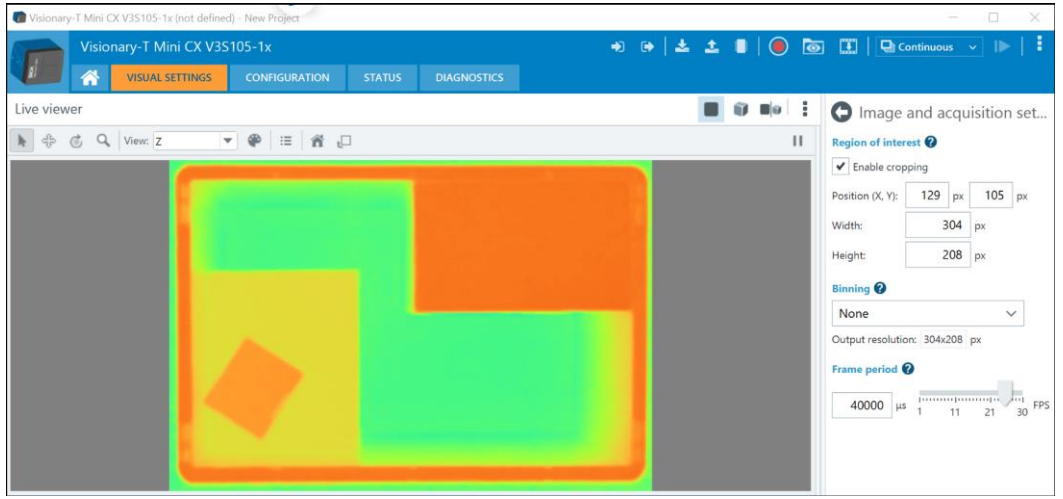




Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

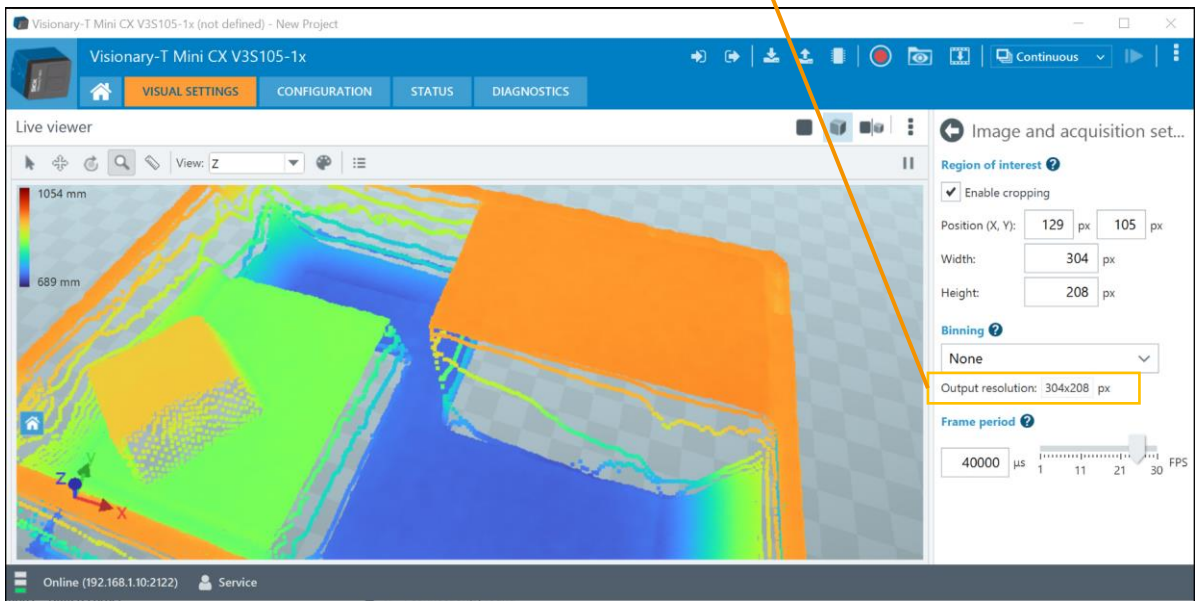
- Region of interest (in this case the box in the center of the image)
  - 1. Use the 2D viewer to identify the position of the upper left corner of your region of interest
  - 2. Enable cropping and enter first the width and the height values
  - 3. Move the cropping window by entering the position

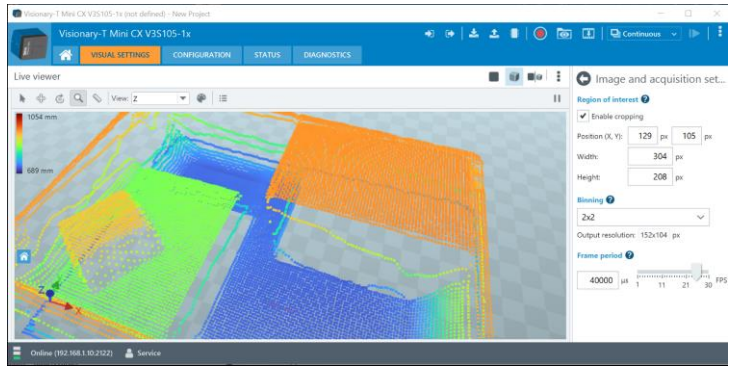


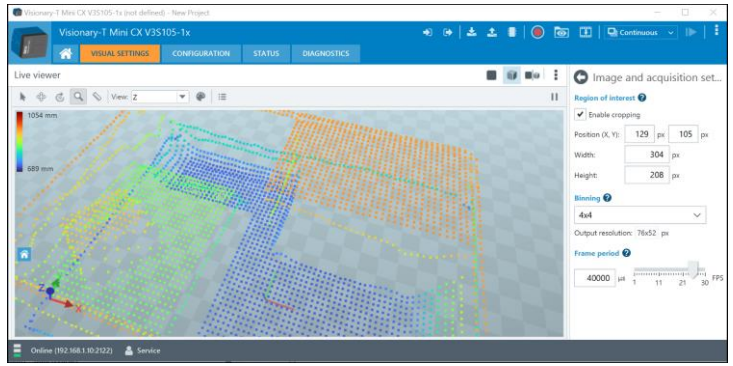


Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

- Pixel binning
  - This feature combines the nearest neighbor pixels to one value and ensures more robust data
  - The binning will either halve or quarter your output resolution and can be used for bandwidth optimization
  - It can only be combined with the ROI feature when the width and height of your cropping mask is divisible by **8** (2x2 pixel binning) or **16** (4x4 pixel binning)
  - The resulting output resolution is shown here







Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

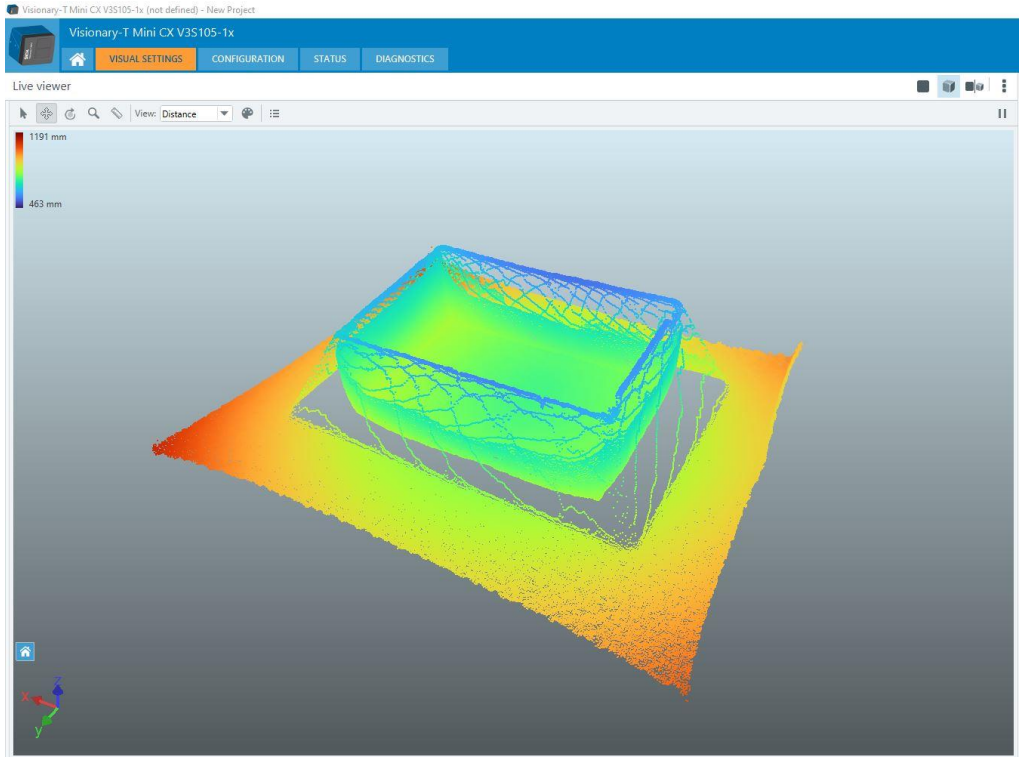
- Frame period
  - You can easily define your streaming frame rate by the frame period
  - Keep in mind that you set this value in µSeconds e.g., 30fps = 33333µs or 1fps = 1000000µs
  - Just enter the frame period directly or use the slider to define the FPS

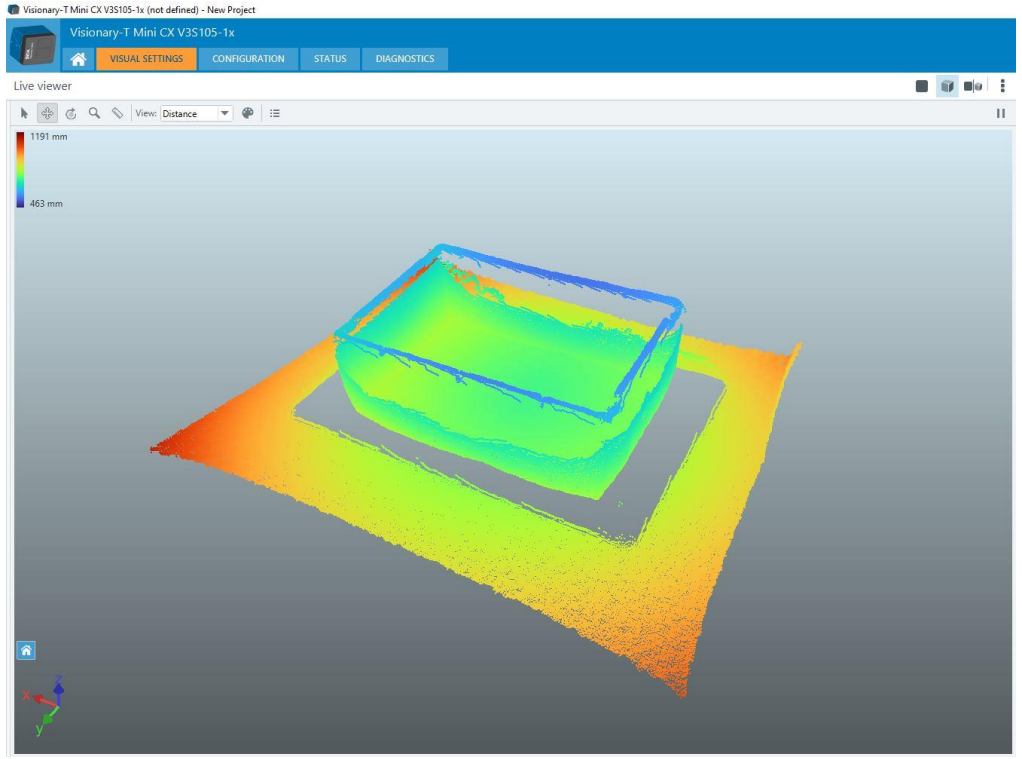
Frame period (µs)	Frame rate (FPS)
33333	30
40000	25
50000	20
66666	15
100000	10
200000	5
1000000	1

- **Please note:**
  - Lower frame rates will reduce the system temperature of the Visionary-T Mini
  - It will also reduce the power consumption
  - Keep the frame rate high for time critical applications

Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

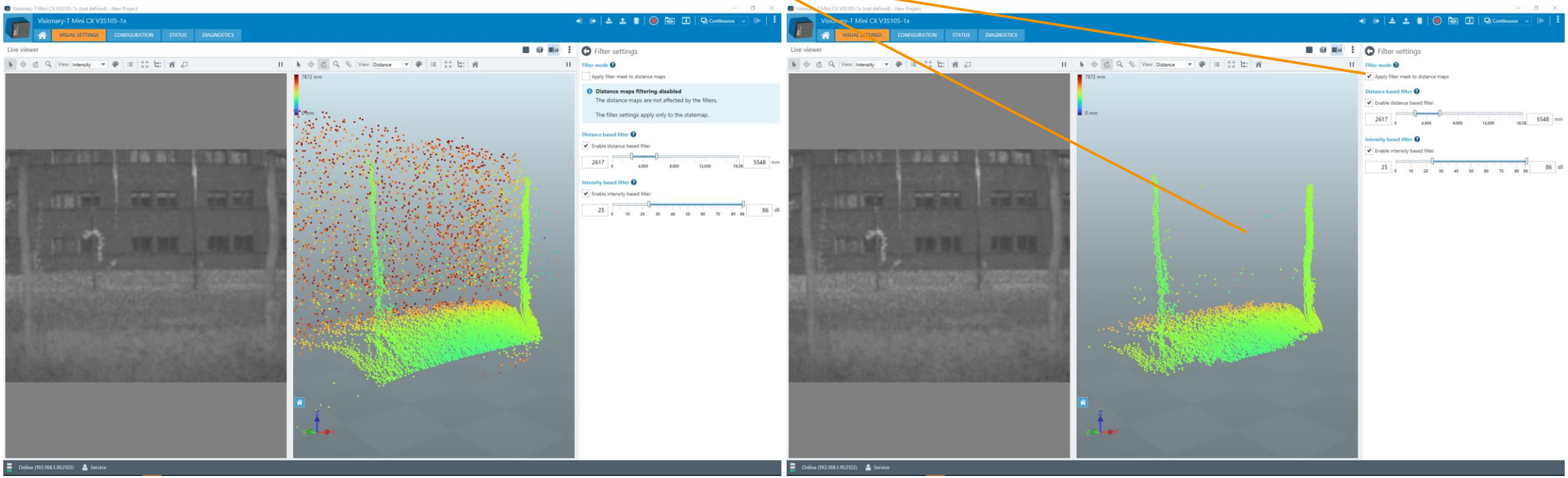
- Use the edge correction function to correct measurement errors on the edges of objects
- This function helps to improve the sharpness of edges
- Note that the filter **changes the values** of individual pixels





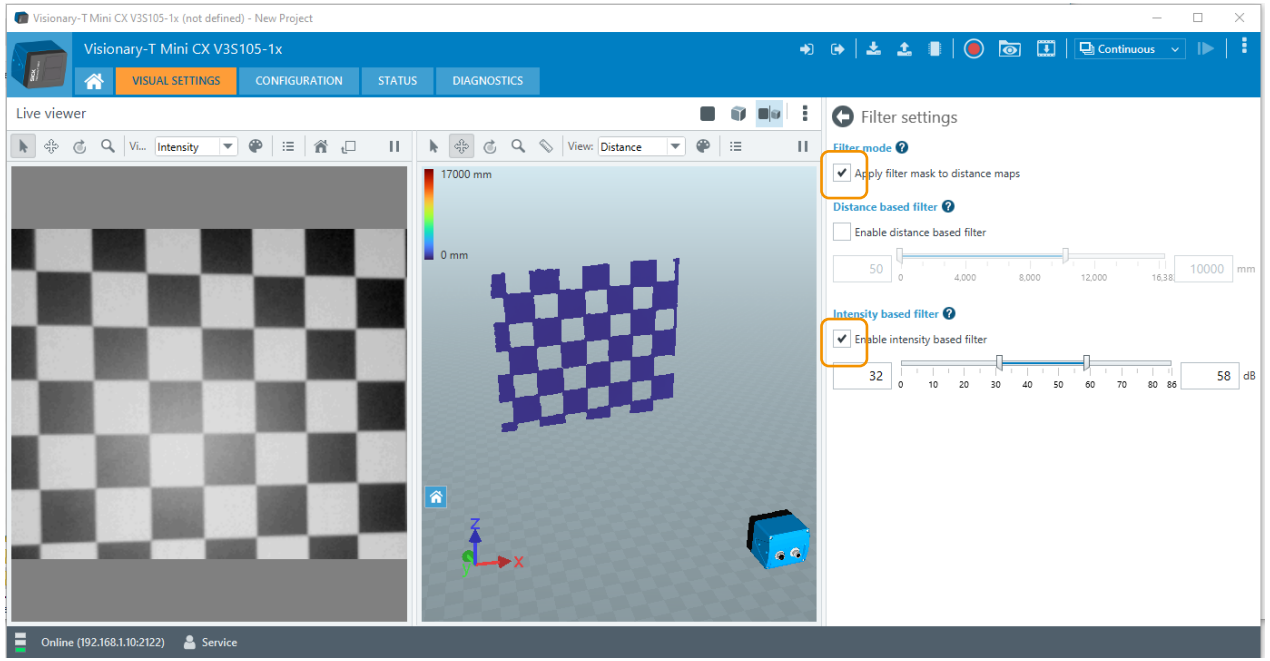
Visionary-T Mini CX
FILTER SETTINGS

- The available filters are very useful to remove noise
- It is also very useful to extract objects from the scene
- The filters **never** affect the intensity map
- The filters only affect the distance maps if the filter mask is applied



Visionary-T Mini CX
FILTER SETTINGS

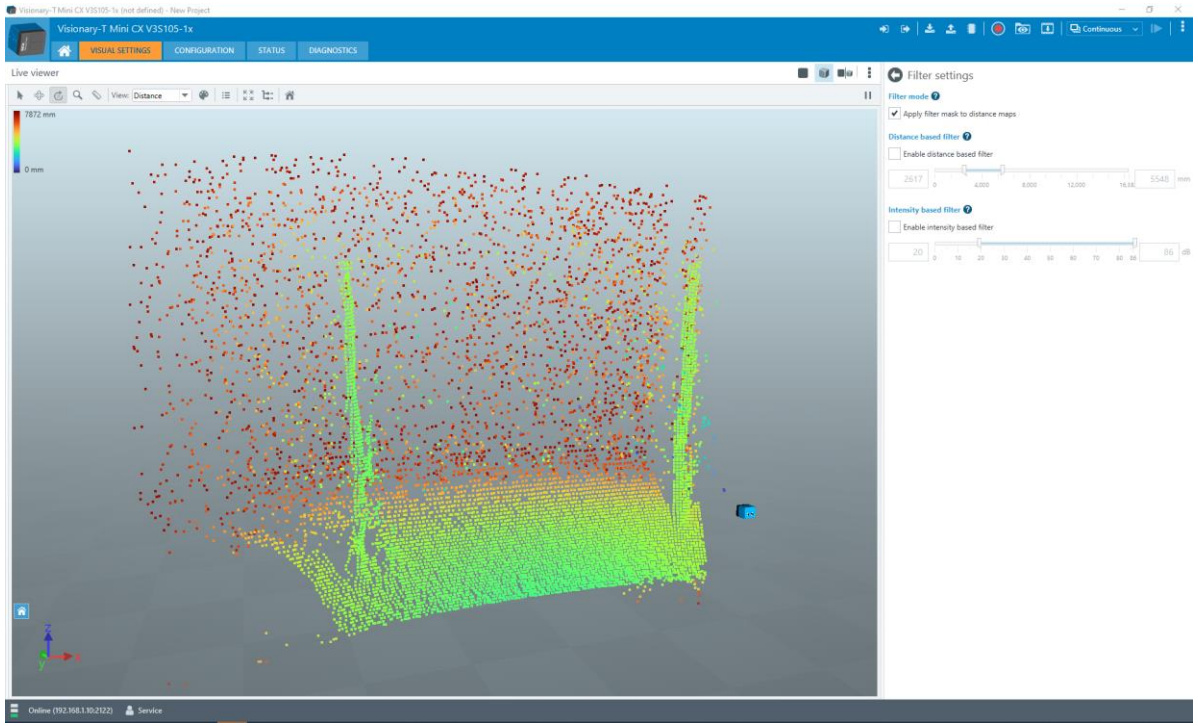
› You can apply all filter configurations at once with the “Apply filter mask to distance maps” checkbox

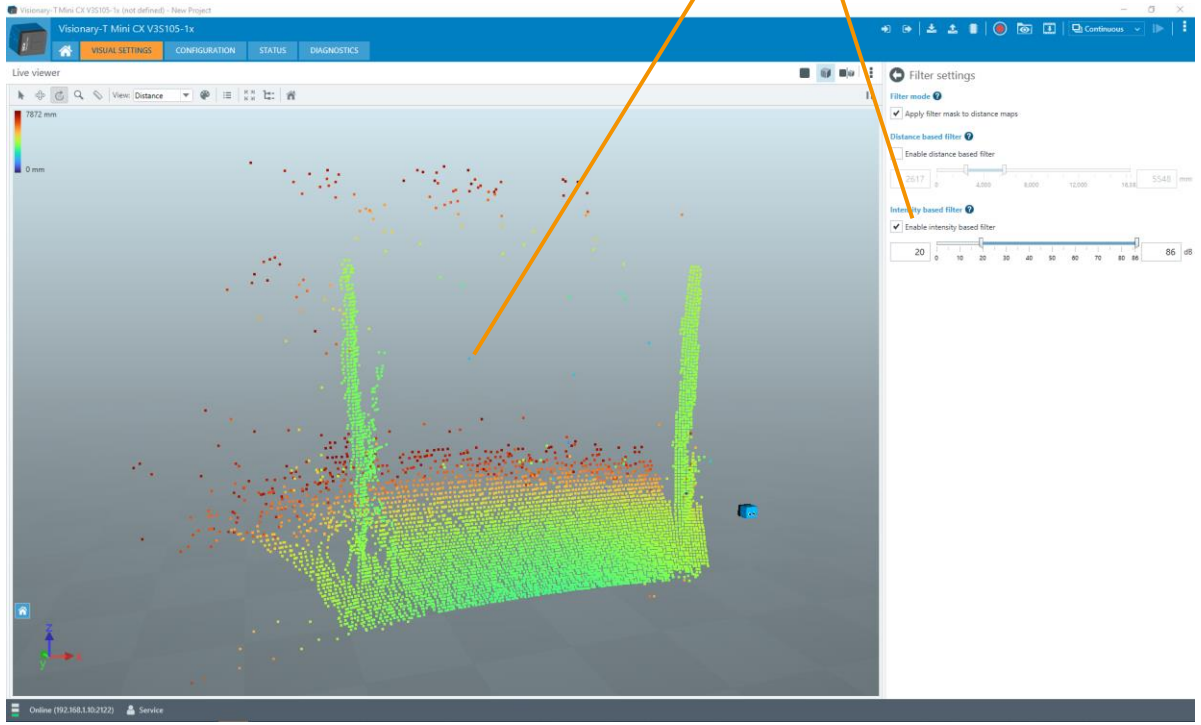


› This example shows how to filter out high intensity pixels e.g. the white squares from your distance data

Visionary-T Mini CX
FILTER SETTINGS – INTENSITY BASED FILTER

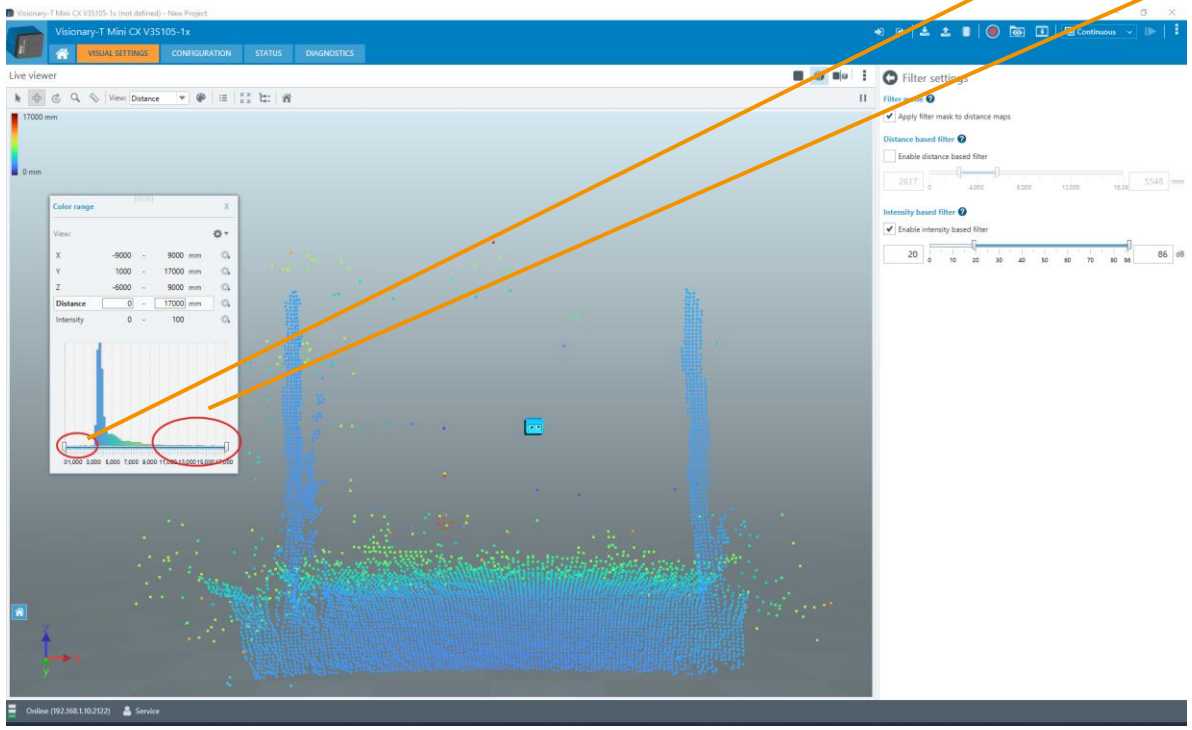
- Low infrared remission of the scene is one of the main cause of distance noise
- Activate the intensity filter to reduce the distance noise by filtering lower intensity values e.g., <20dB
- Please keep in mind that this filter will affect also your max. operating range

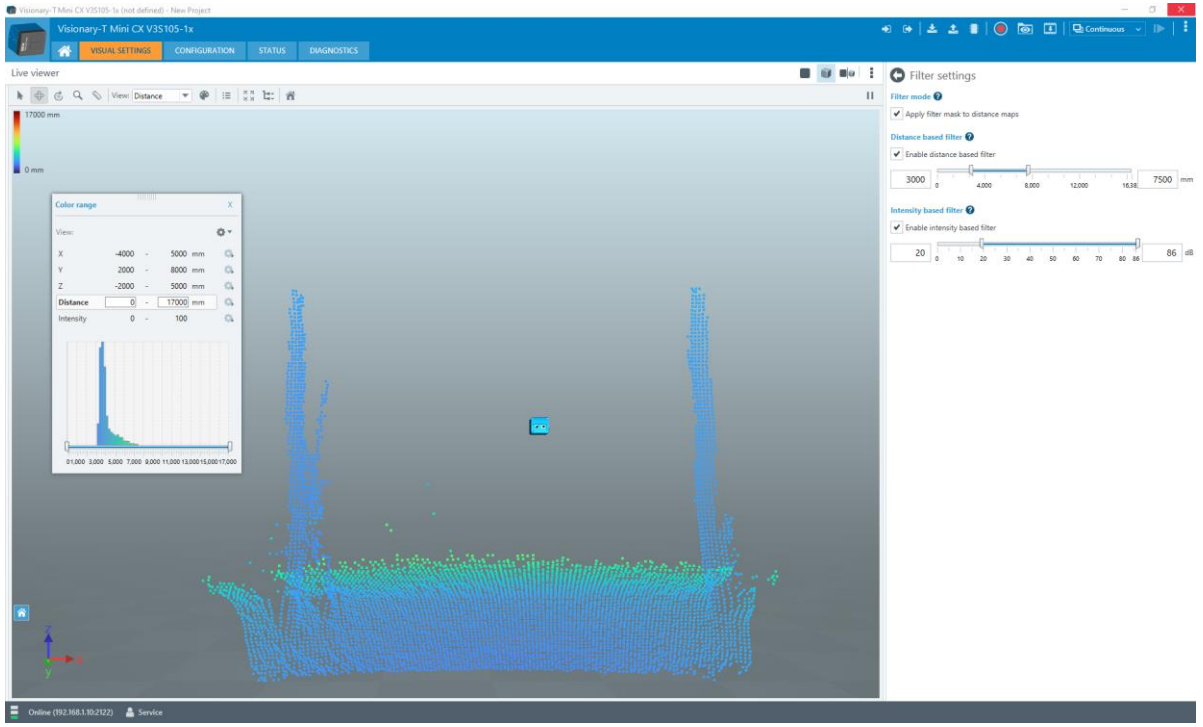




Visionary-T Mini CX
FILTER SETTINGS – DISTANCE BASED FILTER

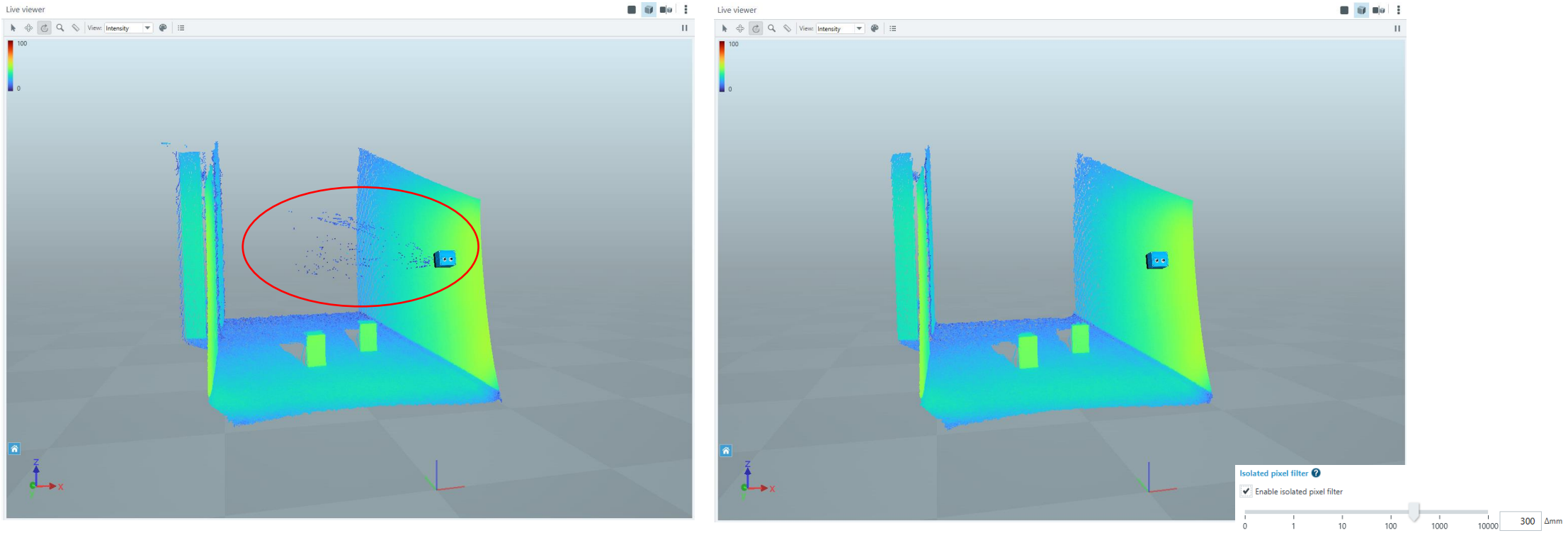
- Use the distance filter to remove data additional noise or to define your operating distance range
- The example below has noise distribution for distances <3m and >7,5m
- Activate the distance filter to remove this noise





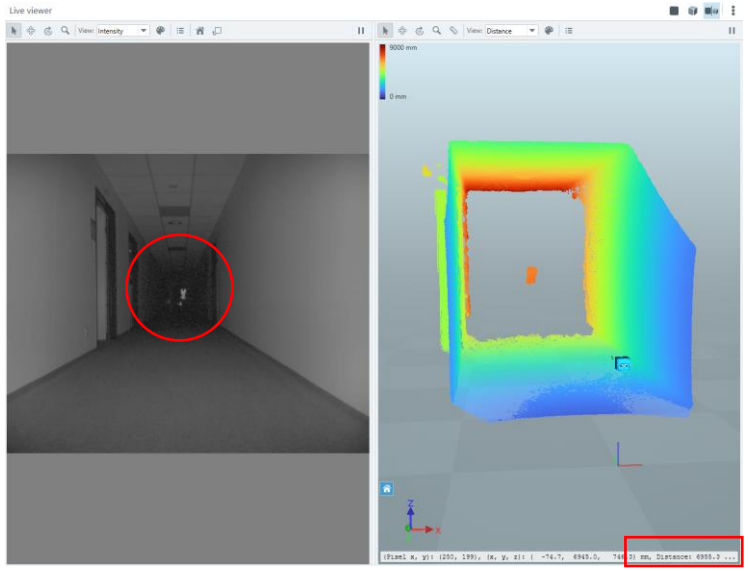
Visionary-T Mini CX
FILTER SETTINGS – ISOLATED PIXEL FILTER

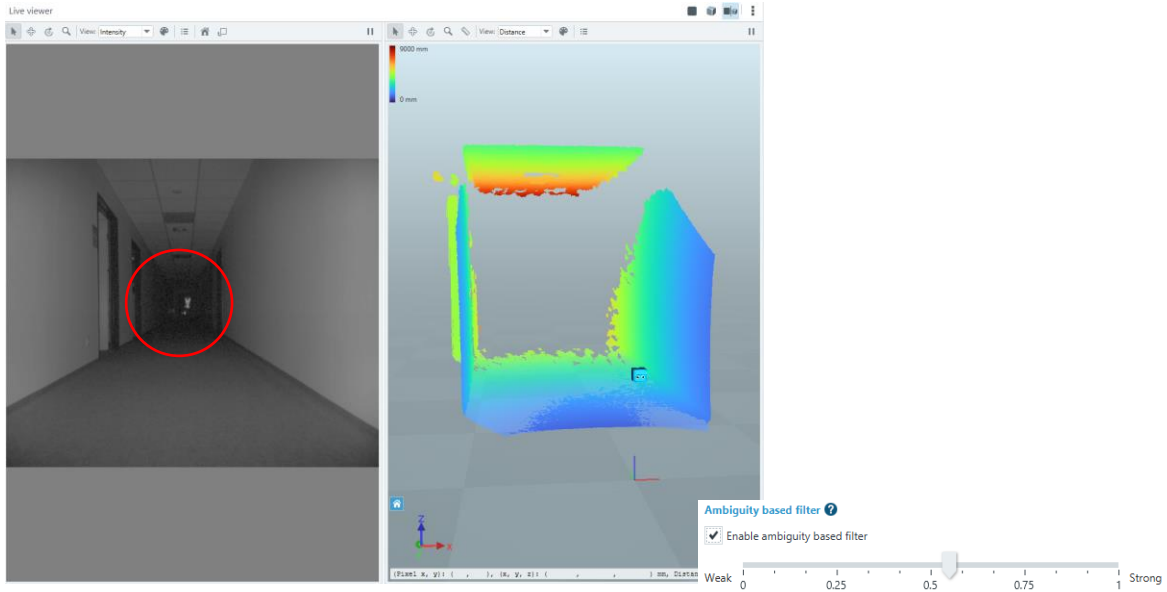
- Use the isolated pixel filter to correct single distance outlier pixels
- Define the maximum permissible distance deviation of the pixel to its neighbors.
- Note that the filter **changes the values** of individual pixels and **depends on the data quality of the neighboring pixels**



Visionary-T Mini CX
FILTER SETTINGS – AMBIGUITY BASED FILTER

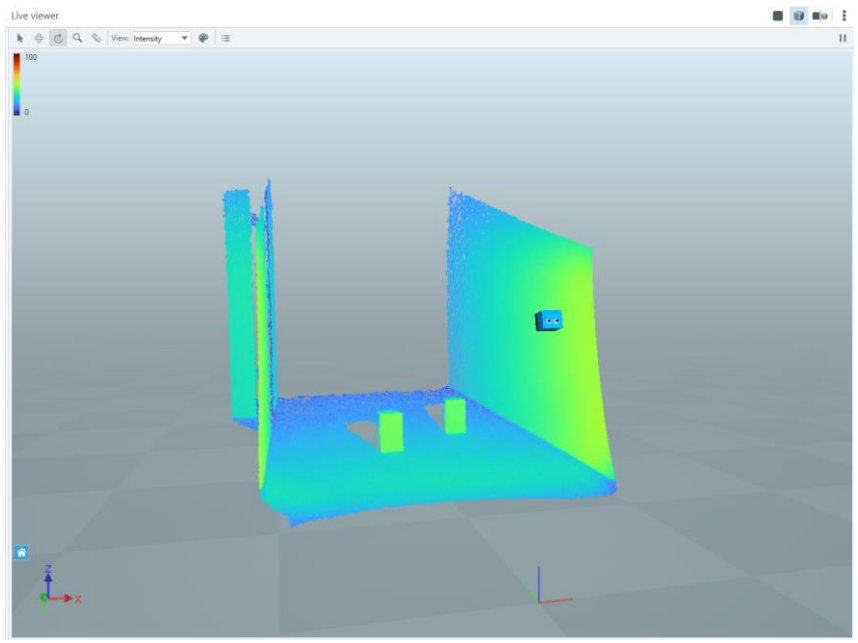
- Use the ambiguity based filter to remove ambiguities in the FOV
- You can use this to remove reflectors which are located outside the ambiguity range. They generate usually a very high intensity even for higher distances and are therefore only manageable by the ambiguity based filter
- In the example below a reflector object is placed outside the ambiguity range which leads to a wrong measurement at around 6m
    - Activate the ambiguity-based filter to avoid such false detections

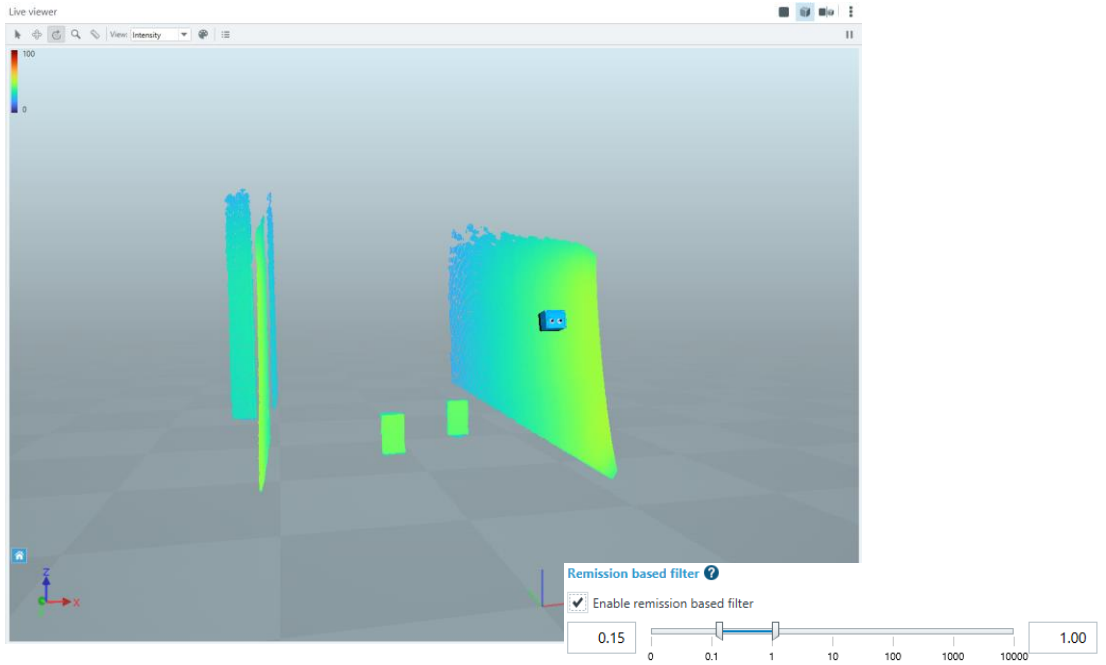




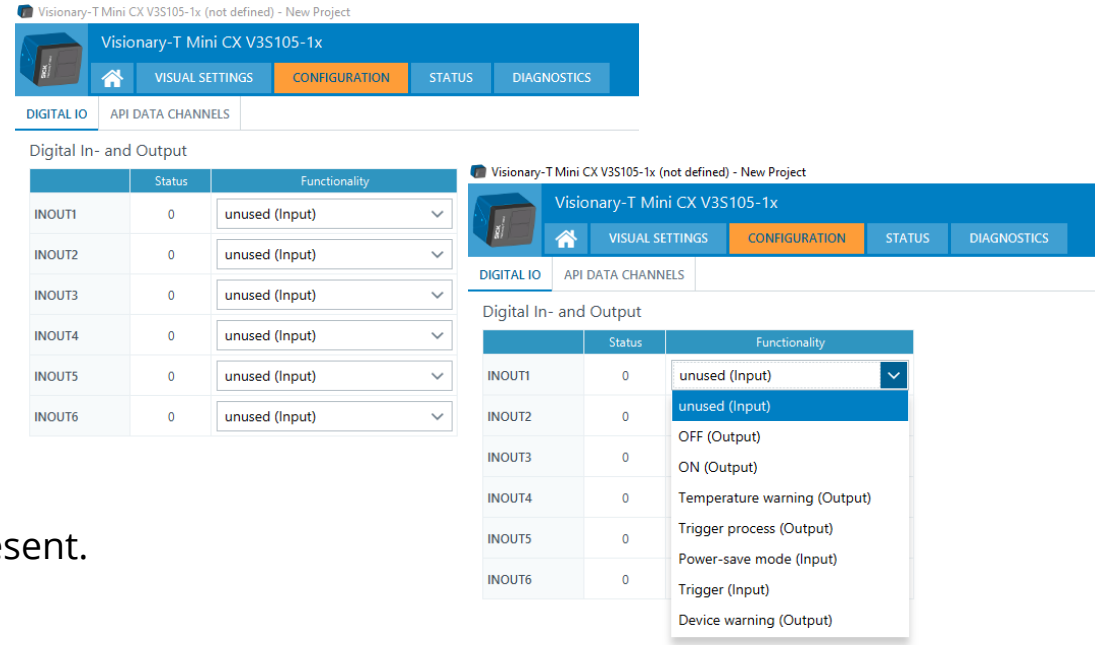
Visionary-T Mini CX
FILTER SETTINGS – REMISSION BASED FILTER

- Use the remission based filter to remove data outside a defined object remission range
- The remission values are calculated from the measured distance and intensity and referring to the scene properties
- Scaling: White paper has a remission value of ~1
- You can use this filter to extract objects with specific object remission properties e.g. below example shows how the floor is filtered



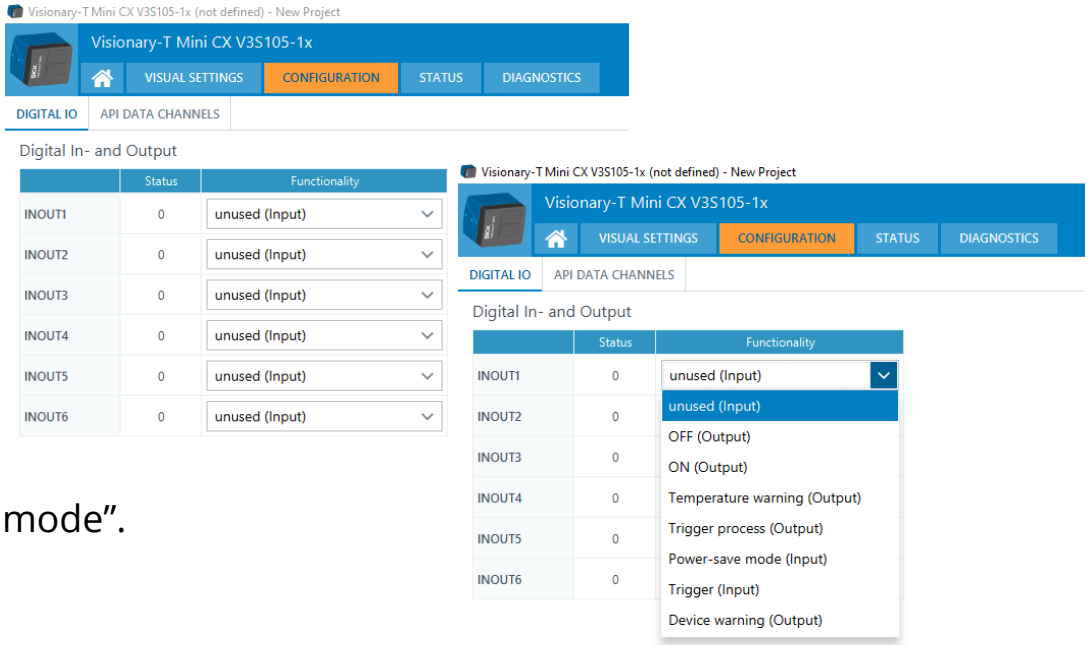


Visionary-T Mini CX
CONFIGURATION – DIGITAL IO 1/2



- The Visionary-T Mini offers programmable digital in- and outputs
- You can manage them in this table
- Following functions are available:
  - OFF (Output):
    - Sets the output to a controlled OFF state
  - ON (Output):
    - Sets the output to permanent ON state.
      This signal can be used to see if the device is powered on and present.
  - Temperature warning (Output):
    - Active when the device system temperature is within configured temperature warning range.
      See Diagnostics → Temperature

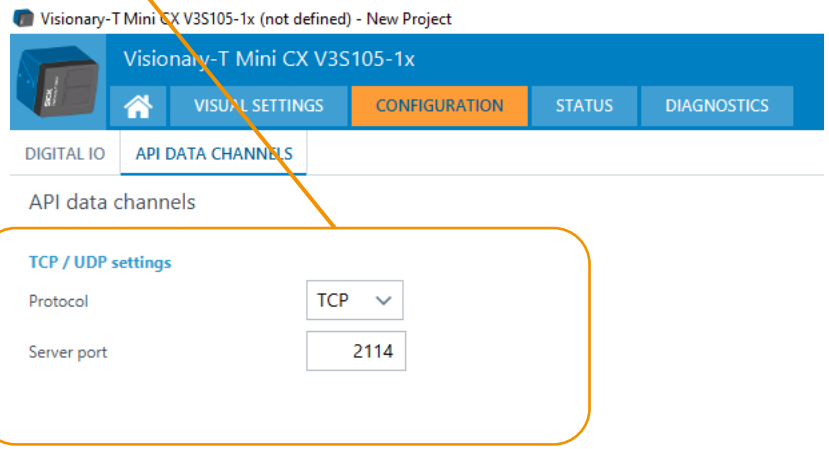
Visionary-T Mini CX
CONFIGURATION – DIGITAL IO 2/2

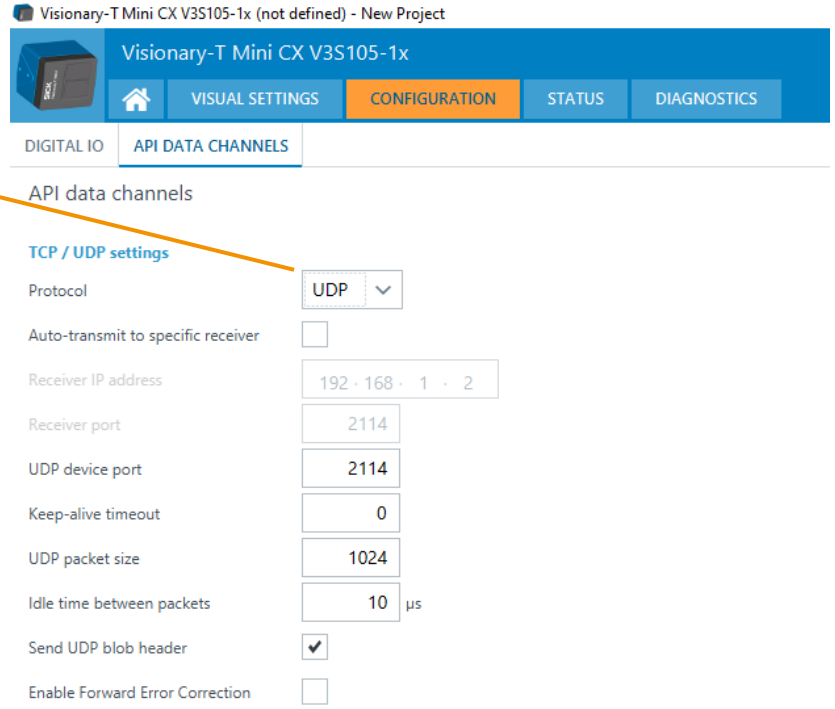


- Further functions are available:
  - Power-save mode (Input):
    - Activates the power-save mode of the device.
      The device does not capture images and the illumination will be turned off as long the input signal is true e.g. high.
  - Trigger (Input):
    - Trigger a single frame transfer when the device is in “Single frame mode”.
      See details within the trigger description.
  - Trigger process (Output):
    - Sets the output to high during the processing of the input trigger signal.
      You can use this signal for synchronization purposes.
      See details within the trigger description.
  - Device warning (Output):
    - Active when the device detects any device warning. See status page

Visionary-T Mini CX
CONFIGURATION – API DATA CHANNELS

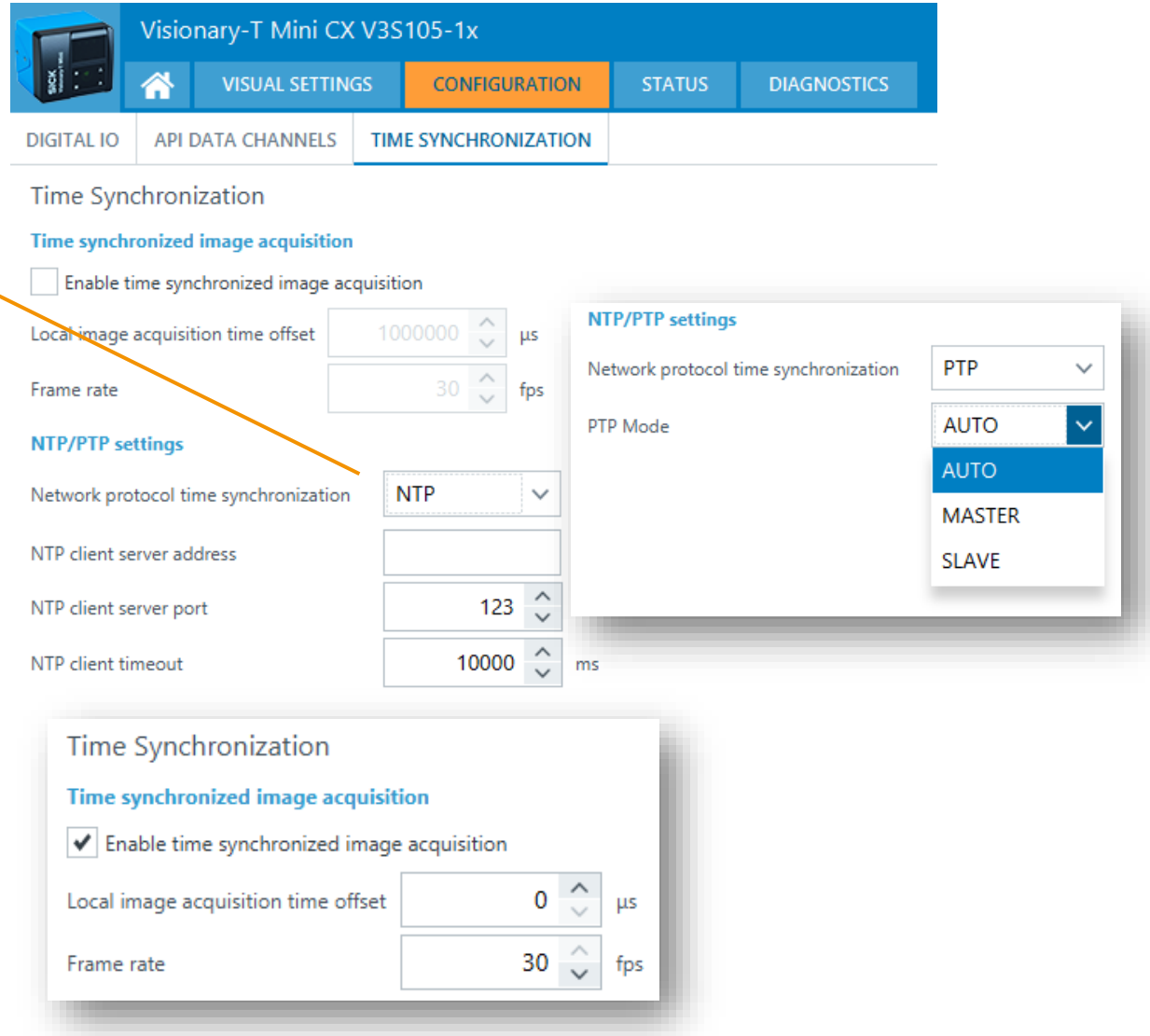
- The Visionary-T Mini supports TCP and UDP protocol
- You can change the Protocol by this dropdown menu
- Default configuration is TCP and Server port 2114





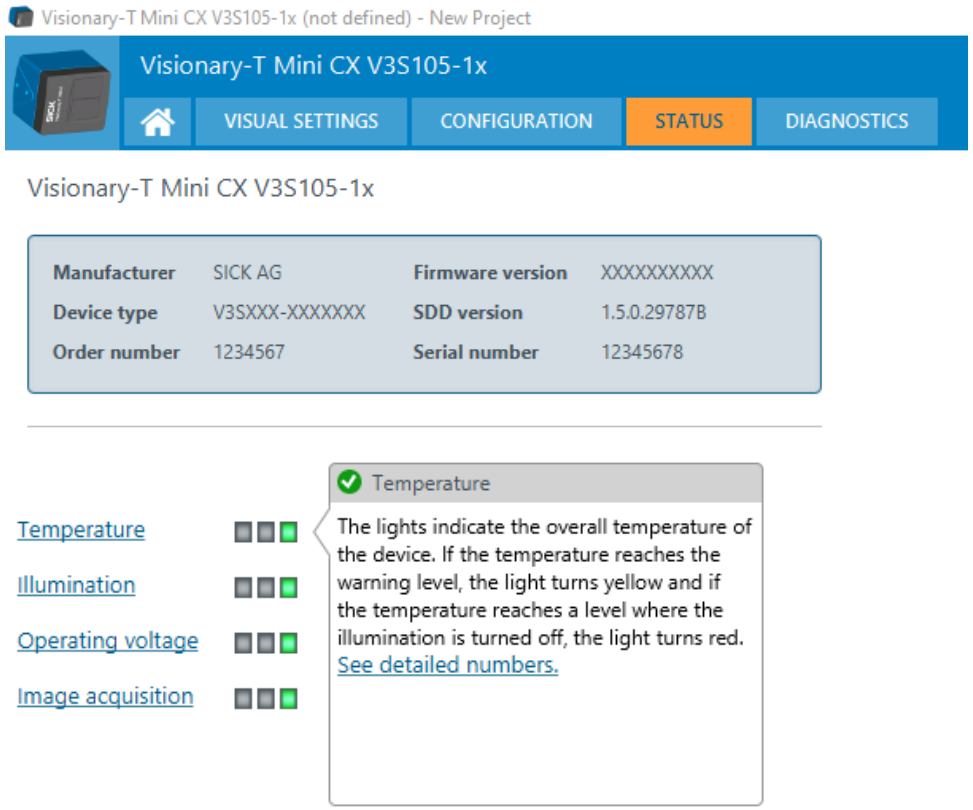
Visionary-T Mini CX
CONFIGURATION – TIME SYNCHRONISATION

- The Visionary-T Mini CX supports the synchronization of its clock via NTP or PTP network protocol. This clock defines the timestamp of the acquired images.
- You can change the protocol in the dropdown menu
- PTP allows to operate the camera in different modes
  - MASTER: This camera sets the master clock
  - SLAVE: The camera's clock will be adjusted to a master clock, e.g. the host PC
  - AUTO: The mode will be automatically defined. E.g. it will be SLAVE if there is a master-only clock in the network
- Further, the image acquisition between several cameras can be synchronized. An offset can be specified such that the image acquisition of the local camera is delayed with respect to the master clock.
  In order to avoid simultaneous illumination of the scene by several cameras, note that the image acquisition time is ~10 ms.
- To adjust the window between two subsequent image acquisitions, the frame rate can be defined



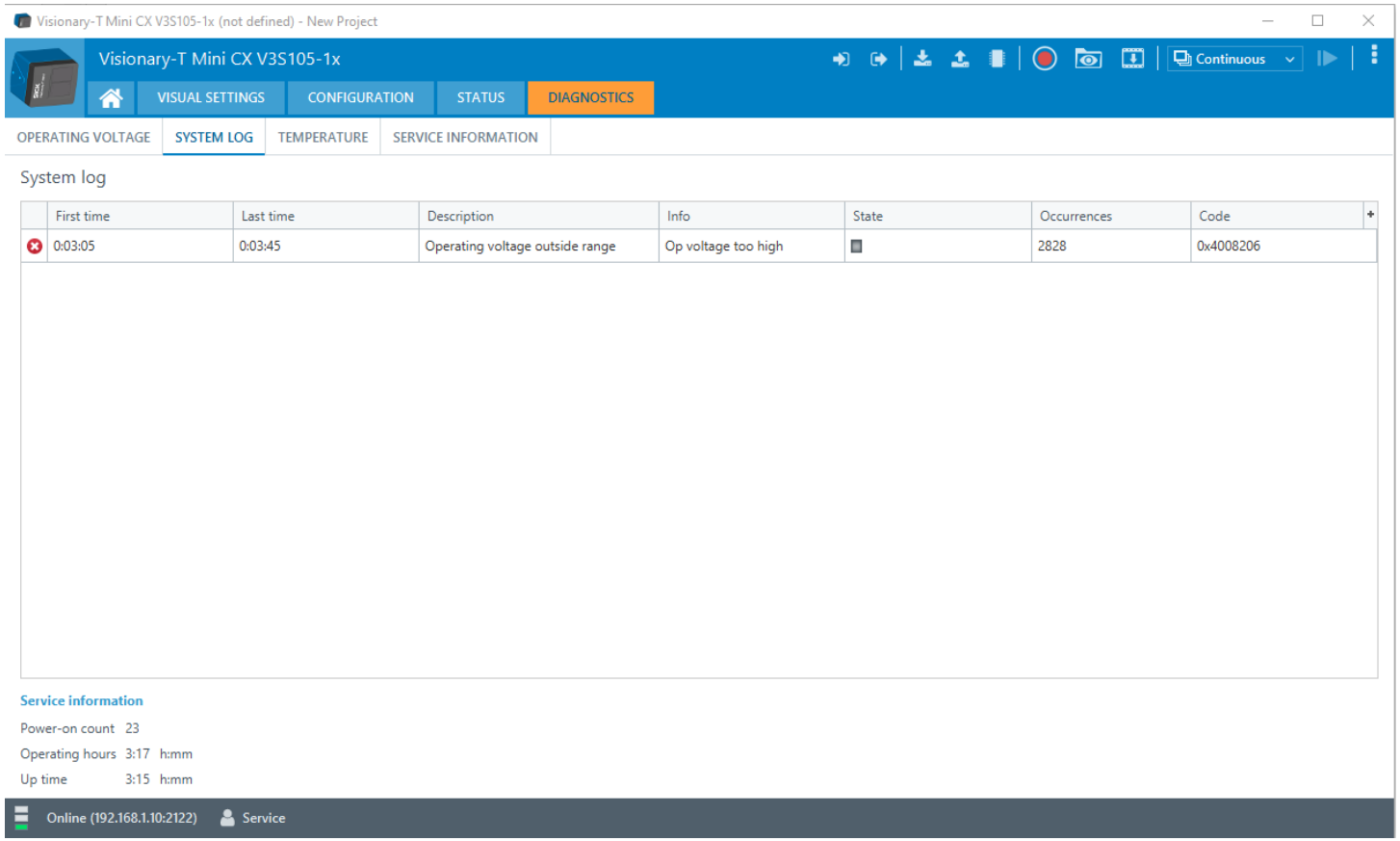
Visionary-T Mini CX
STATUS

- You can find all the device status information
- System warning is available for
  - Temperature
  - Illumination
  - Operating voltage
  - Image acquisition



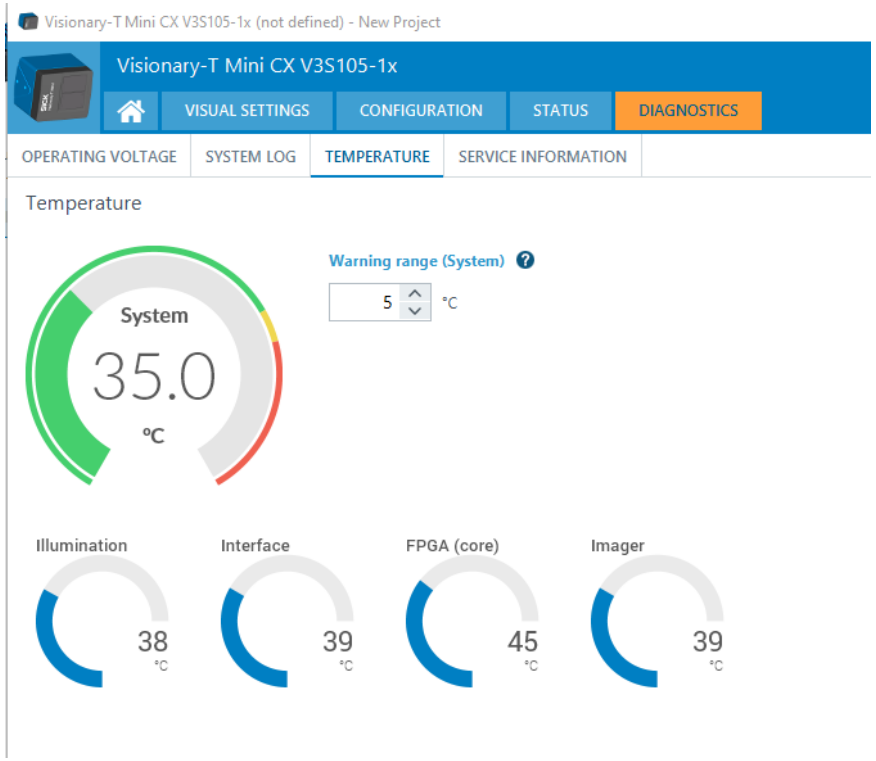
Visionary-T Mini CX
DIAGNOSTICS – SYSTEM LOG

- The system log will list the errors
- Note: The system log can also be accessed via Webserver (URL = IP address of device).



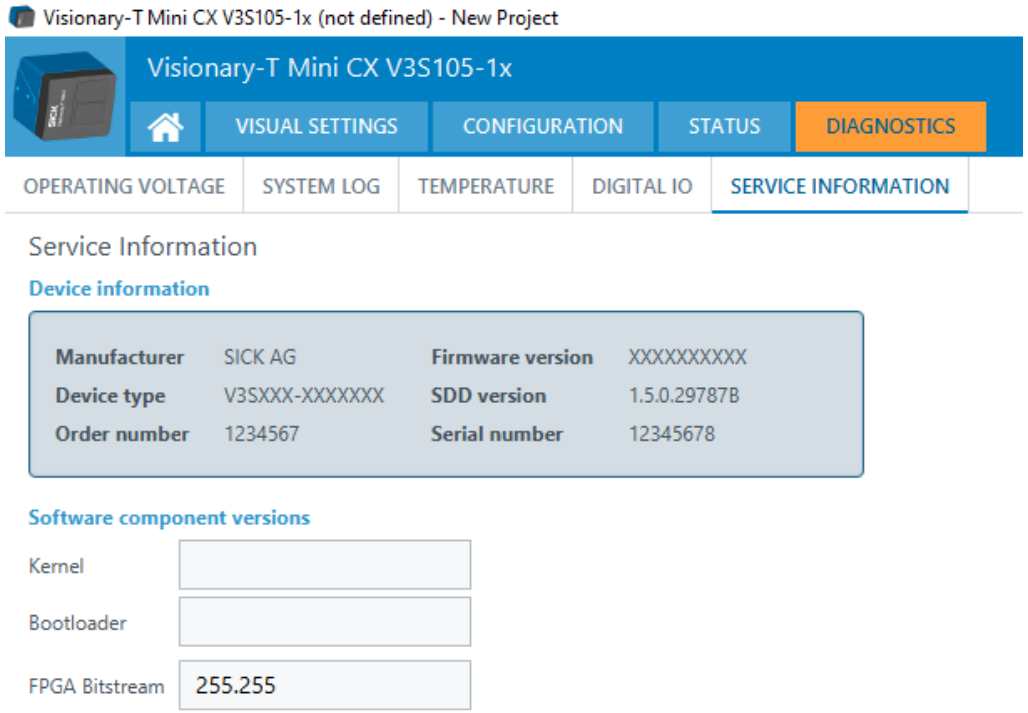
Visionary-T Mini CX
DIAGNOSTICS - TEMPERATURE

- The temperature page will show you the current system temperature
- The warning range defines the temperature distance which is left until the critical system temperature is reached
- The critical system temperature is 75°C
- The Visionary-T Mini will shut down when the critical system temperature is reached



Visionary-T Mini CX
DIAGNOSTICS –SERVICE INFORMATION

- Here is the summary of the information which is relevant for service activities
- Please share this information with your SICK contact person in case of troubleshooting



Thank you for your attention.

SICK AG - Mobile Perception – 3D Snapshot

2.1.4
Firmware update guide

SICK AG – Mobile Perception – 3D Snapshot

Content

Introduction

- This document will guide you through the firmware update process.

- We highly recommend to use the latest firmware versions for your Visionary device in order to enable the latest device features.

- Make sure to save your device configuration as *.sopas file before you update your Visionary device.
  - For that, simply import/export the *.sopas file to/from the device via SOPAS
  - NOTE: When re-importing *.sopas after a firmware update please refer to the separate documentation for this case

- Disclaimer:
  - The device configuration may be lost after an update.
  - The graphical user interface may change after an update.
  - The latest firmware may support only the latest SOPAS ET version.

Preparation

- Install the latest version of SOPAS ET, e.g. 2021.1 or higher
  - SOPAS ET is available on www.sick.com

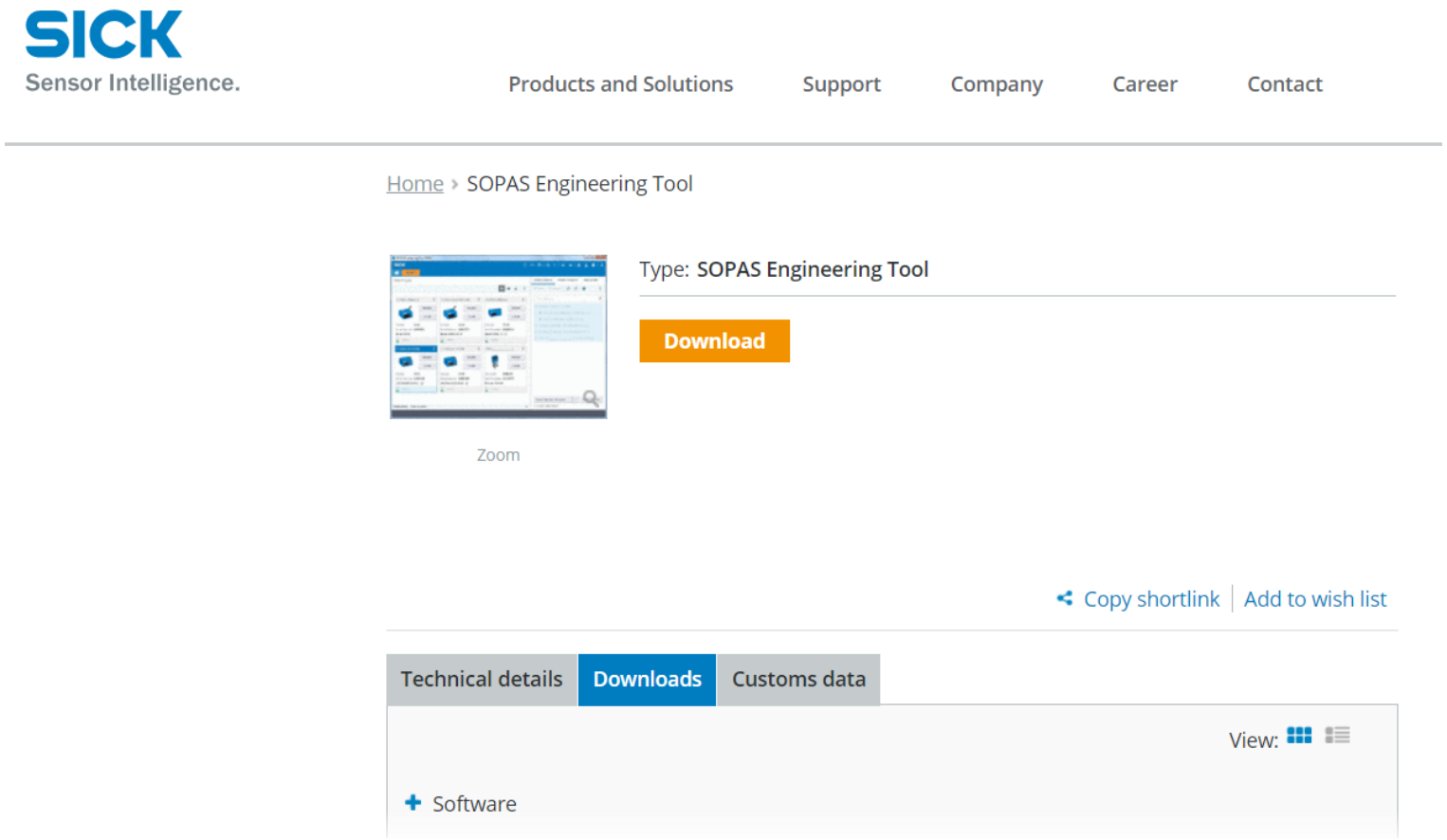
- Be sure that your power connection works properly and is well connected to the device

- Connect the Visionary device with your PC:
  - Connection via Ethernet
  - Connection proved e.g. by receiving 3D data

- Download the latest device firmware (.spk) from sick.com
  - › https://www.sick.com/de/de/p/p677442

Install SOPAS ET

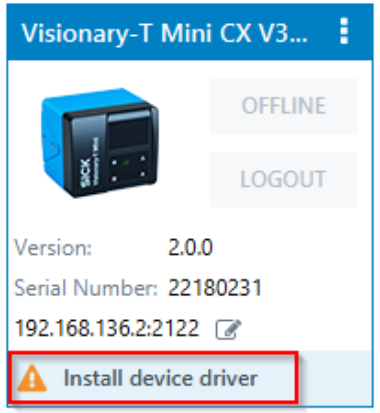
- SOPAS ET is available on https://www.sick.com/SOPAS_ET



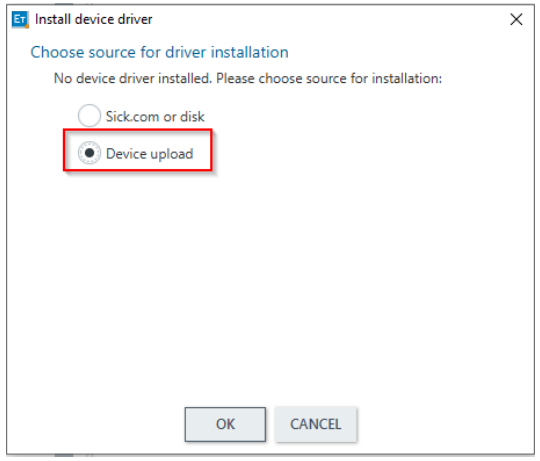
Install SDD
(IF NOT ALREADY DONE)

- After a successful connection the driver might be missing.

- Click on *Install device driver*

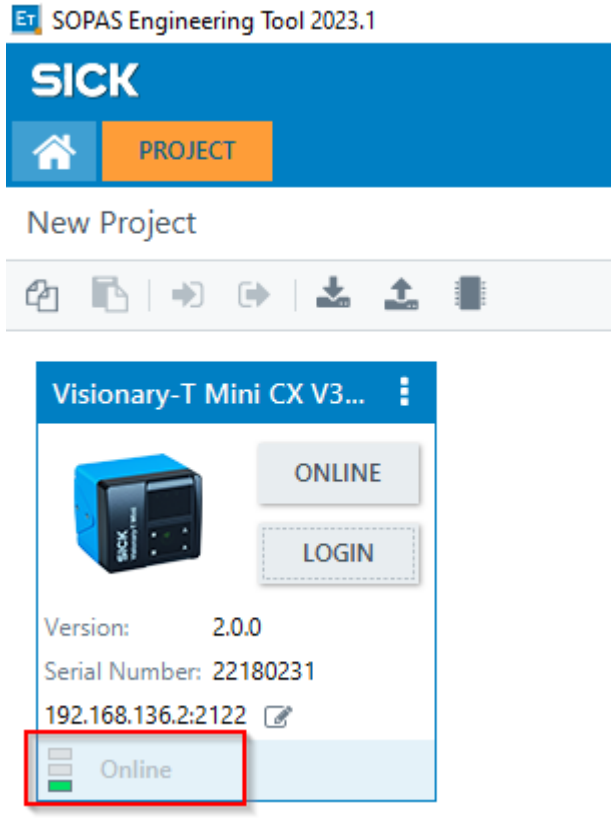


- Choose *Device upload*



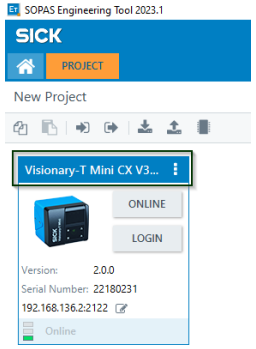
Start

- Precondition: Device is online.
- If not, please check:
  - Physical connection
  - IP address
  - SDD version
    (uninstall and upload form device again)
  - Always start device first, then SOPAS ET
    (to ensure that the communication interface is active)

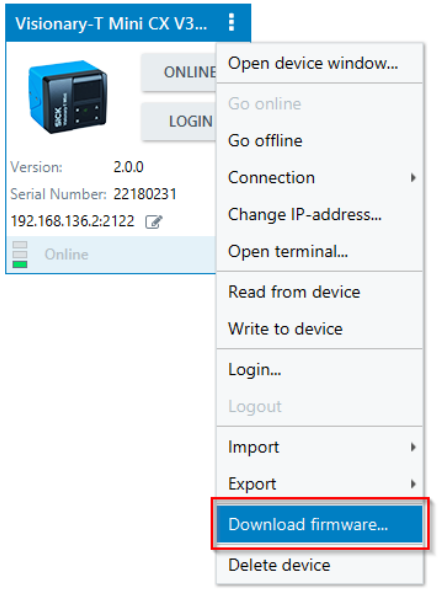


Update
SELECT FILES

- Device must be highlighted:

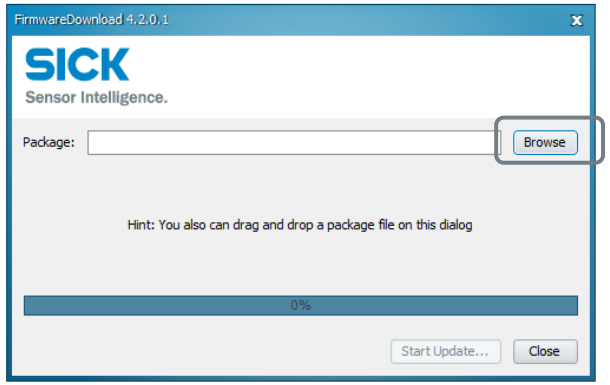


- Select Download firmware:

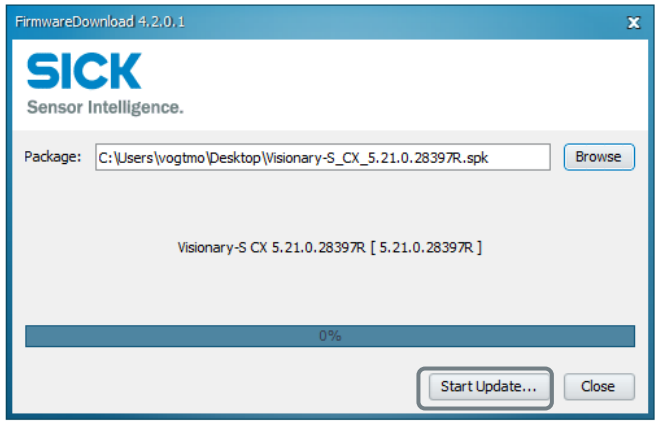


Update
SELECT FILES

- Select a *.spk file

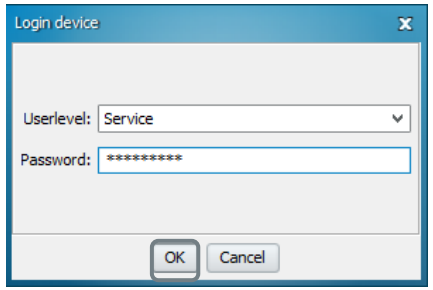


- Start Update

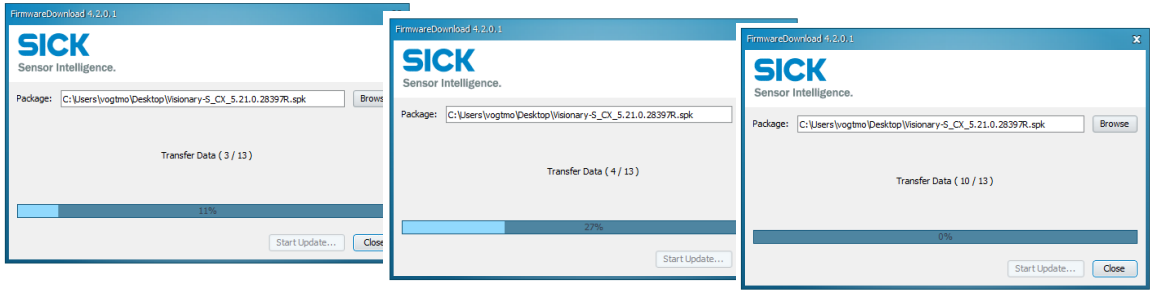


Update
SELECT FILES

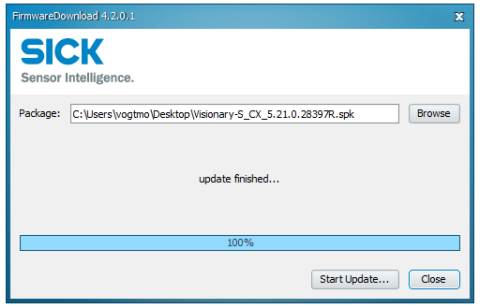
- Confirm **Service** level with password
- Password: **CUST_SERV**



- Wait …

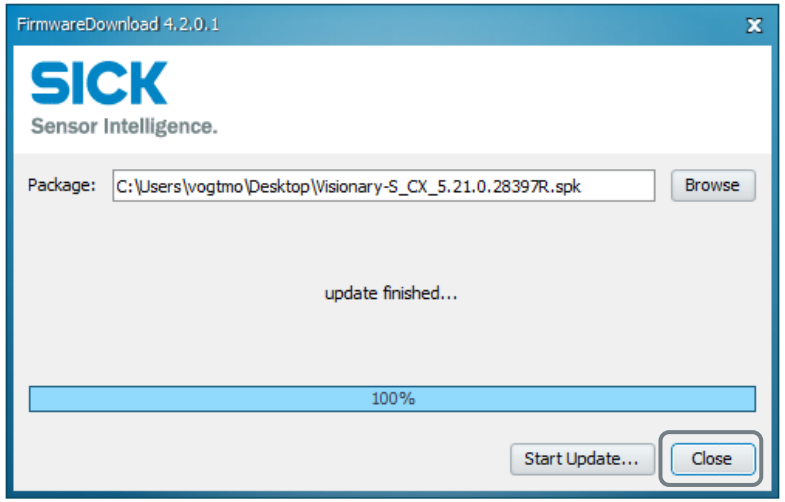


- … until download succeeds

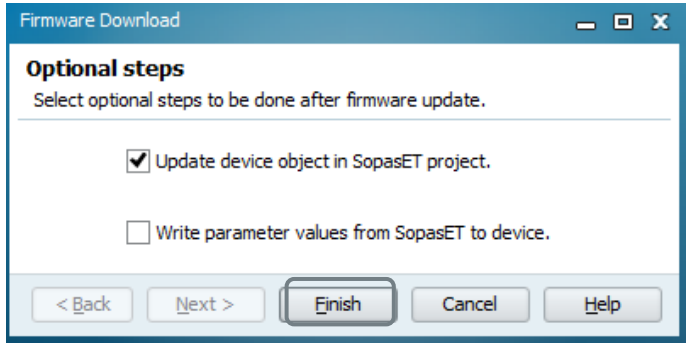


Update
FINISH UPDATE

- Close *Firmware Download* dialog

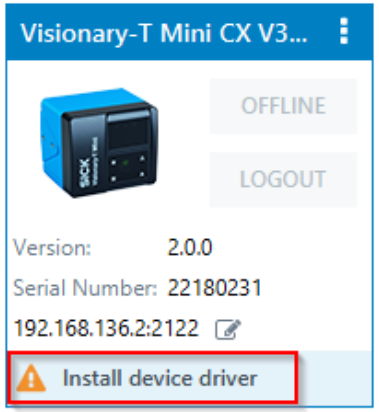


- Choose *Finish*

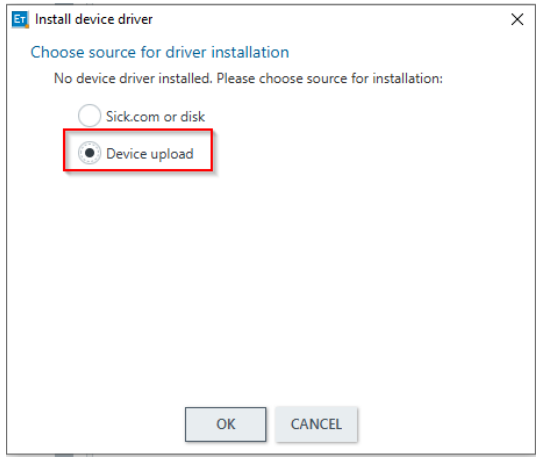


Update
INSTALL NEW DEVICE DESCRIPTION

- After a successful connection the driver might be missing.
- Click on *Install device driver*

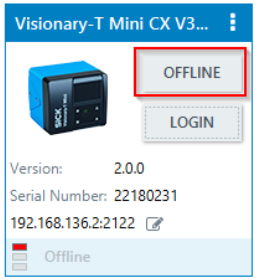


- Choose *Device upload*

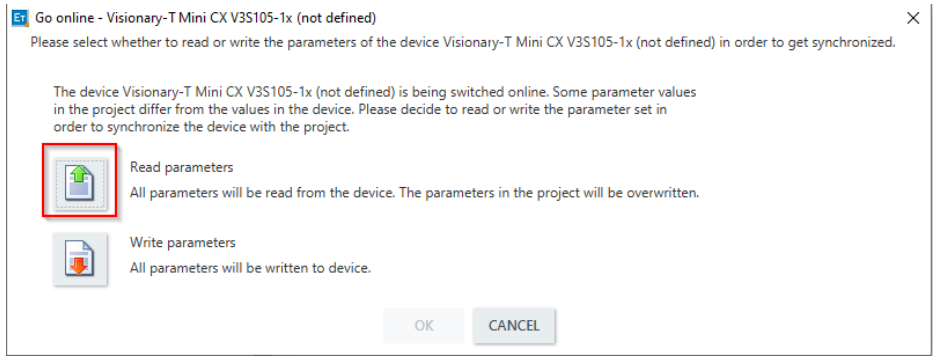


Go Online

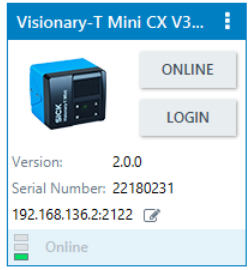
- Click *Offline* to go online



- Choose *Read parameters*



- Success!



Thank you for your attention.

SICK AG – Mobile Perception – 3D Snapshot

2.1.5
Single frame / Trigger mode description

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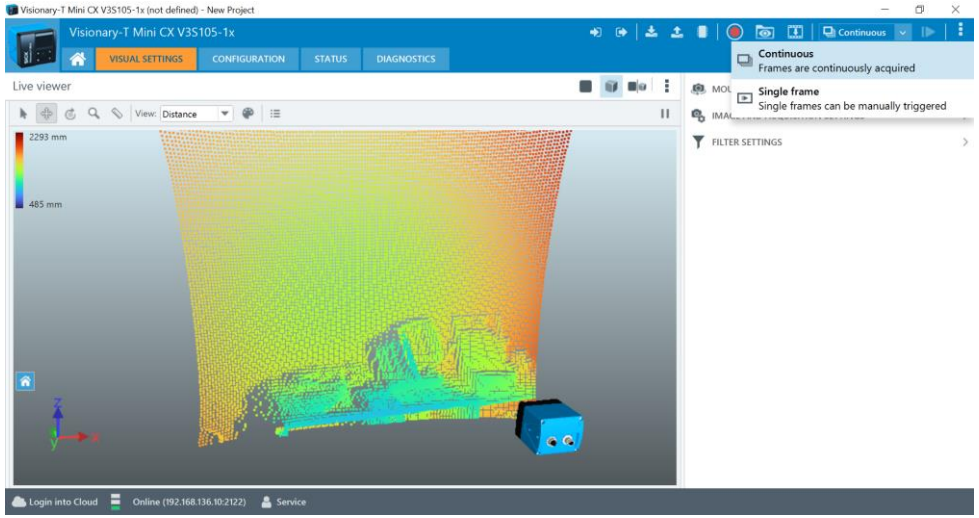
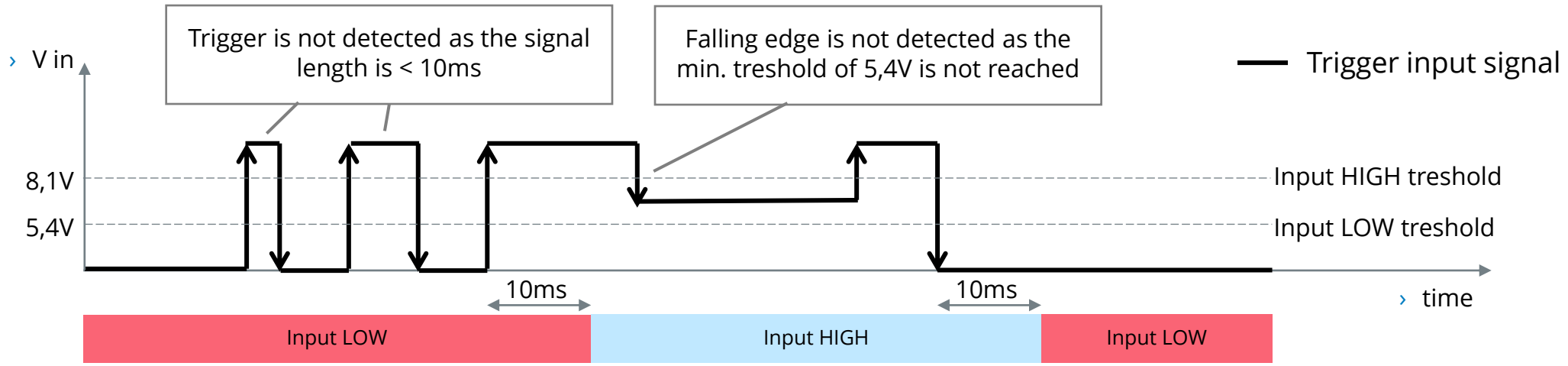
Visionary-T Mini Device Page
OPERATION MODE – SINGLE FRAME

- The Visionary-T Mini CX supports two different image streaming modes
- Set the operating mode to "Single image" to transmit only the next captured image after a trigger signal.
- Please notice:
  As soon as you set the operation mode to “Single frame” the Visionary-T Mini will switch to the standby mode until a first image is requested. This request can be done either by a digital trigger signal, the "Trigger next image" button or an API command. The Visionary-T Mini starts than the internal continuous image capturing in order to guarantee a thermal stable system for calibrated and accurate measurements. However only the triggered frames are being transferred.
  The accuracy of the first triggered image in “Single frame" mode may therefore be out of the specification.



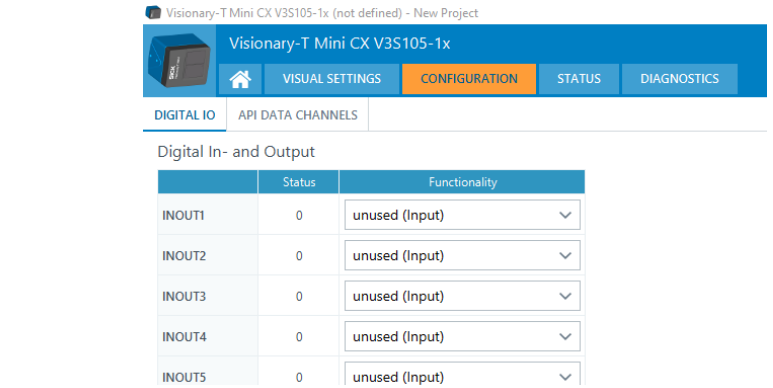
Visionary-T Mini CX
DIGITAL IO – SIGNAL SPECIFICATION

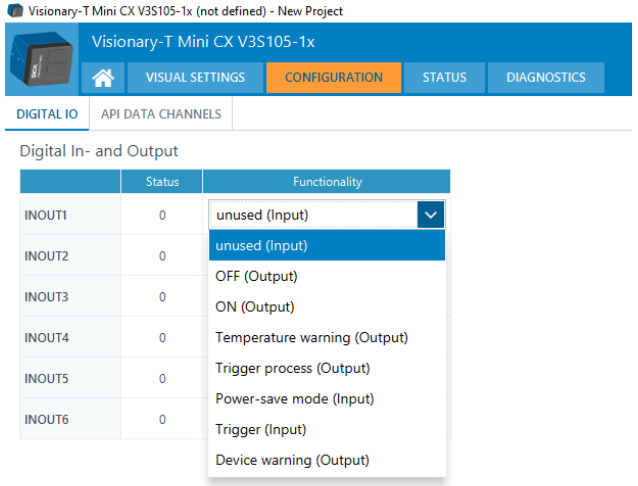
- The HIGH voltage treshold for the digital input during a rising edge is max. 8,1V
- The LOW voltage treshold for the digital input during a falling edge is min. 5,4V
- The minumum duration for a valid digital trigger signal is 10ms otherwise it will not be accepted



Visionary-T Mini CX
CONFIGURATION – DIGITAL IO

- The Visionary-T Mini offers programmable digital in- and outputs
- You can define one input to trigger the next frame.
  Please keep in mind that this feature works only when the device mode is set to “Single frame” mode.
- Following functions are available:
  - Trigger (Input):
    - Trigger a single frame transfer when the device is in “Single frame” mode
  - Trigger process (Output):
    - Sets the output to high during the processing of the input trigger signal. You can use this signal for synchronization purposes.

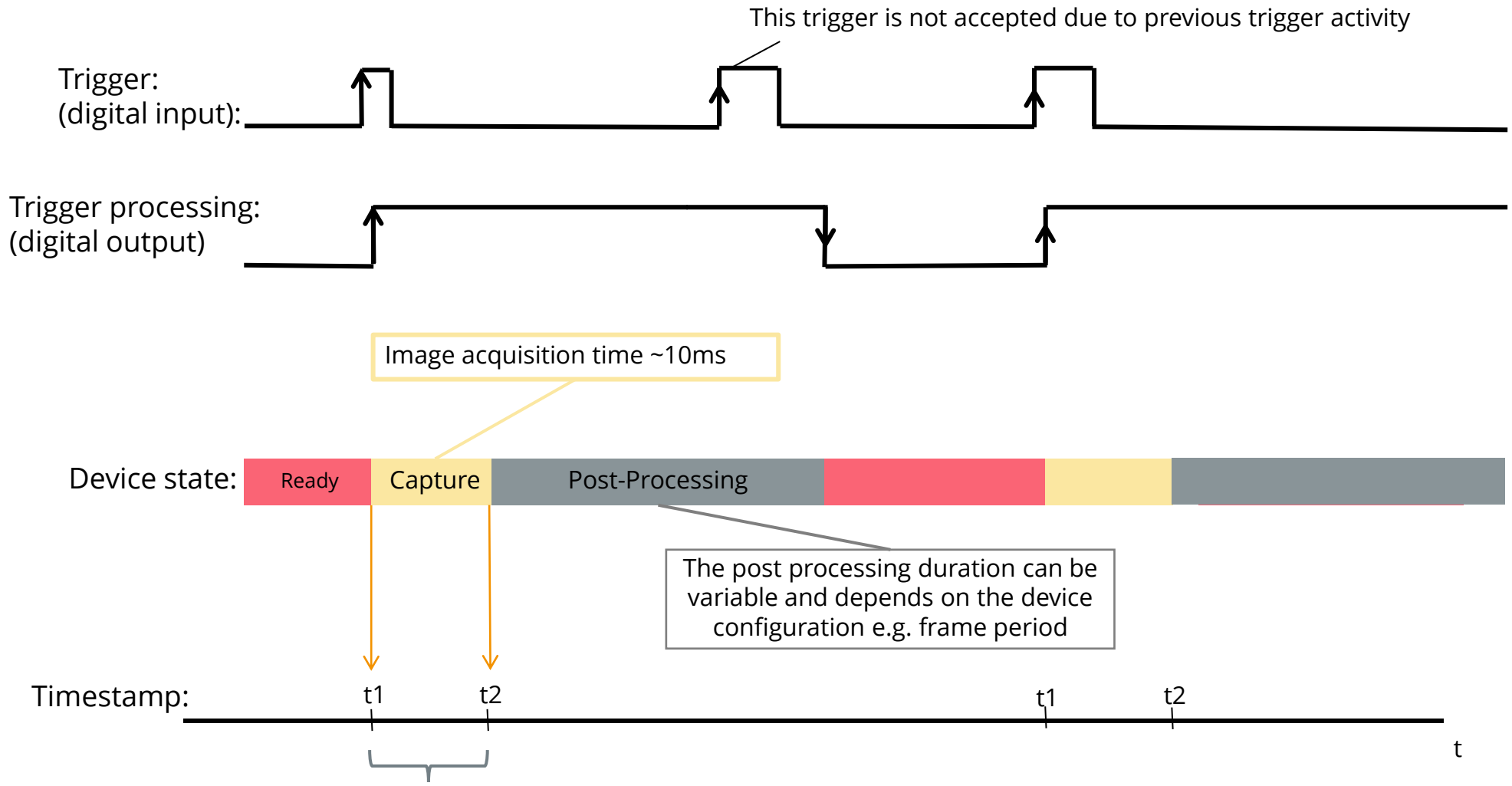




Visionary-T Mini CX
CONFIGURATION – DIGITAL IO

- The Visionary-T Mini CX continuously captures data without streaming it out unless a trigger initializes the sending of the next available frame. Hence the delay between the image acquisition and the data reception is not constant
- This can result in a delay that is as long as the time required to capture an image
- The Visionary-T Mini CX will not accept any new trigger during the processing of a previous trigger
- The Visionary-T Mini CX provides a „trigger processing“ output via one defined digital output. This indicator can be used to synchronize the triggering behavior
- The timestamp within the frame is set as the delay between trigger input and frame capture duration. The timestamp can be used to synchronize your timing in case of real time conditions

Trigger mode
VISUALIZATION



Timestamp is provided as delay between trigger input and duration of image capture

Thank you for your attention.

SICK AG - Mobile Perception – 3D Snapshot