SICK
Sensor Intelligence.

Visionary-T Mini CX

Device configuration user guide

3D Compact Systems

December 2021

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

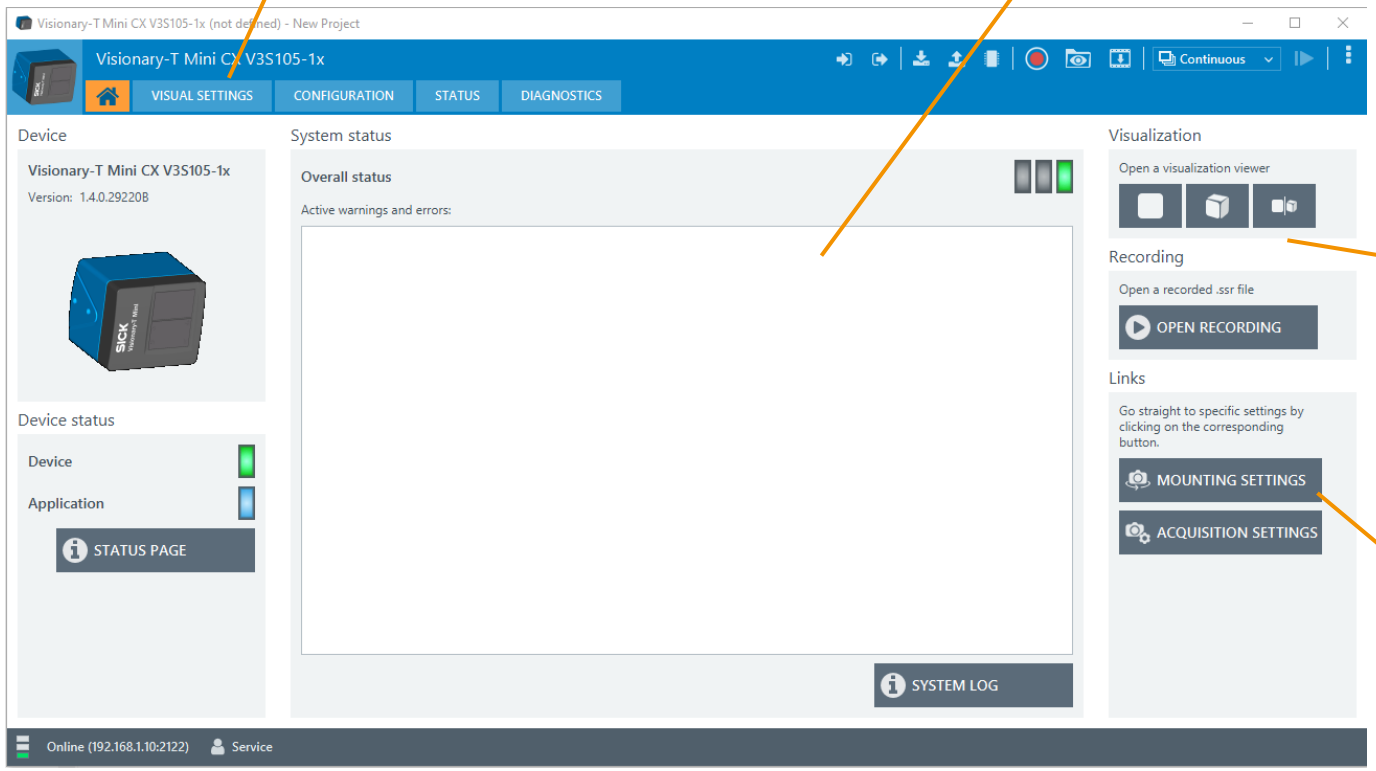
Further details on SOPAS ET can be found under:

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



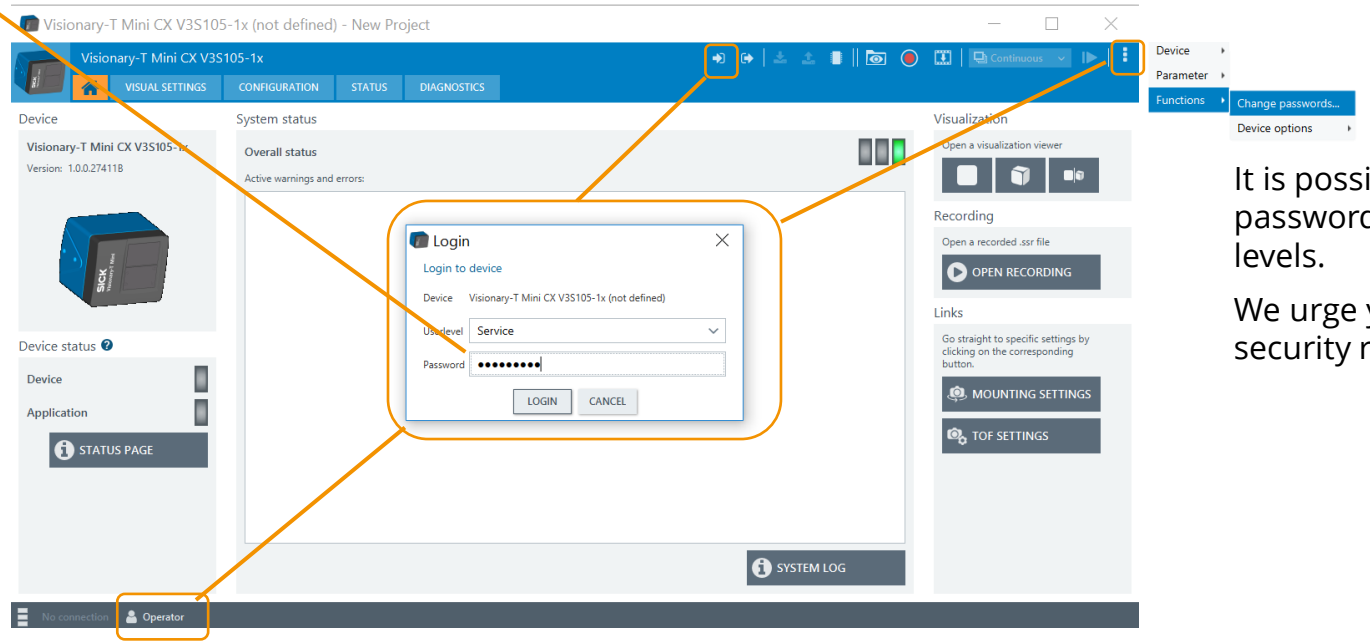
Start the visualization with one of the viewers

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



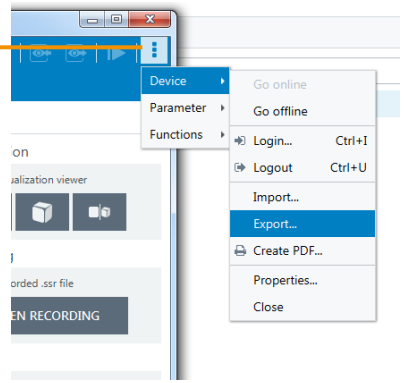
It is possible to change the passwords for different user levels.

We urge you to do so for security reasons!

Visionary-T Mini CX
SAVE AND EXPORT CONFIGURATION

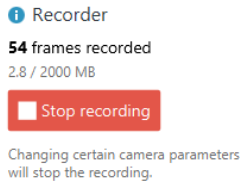
- To save the configurations permanently press **first** the „write parameters to device“ button. In the **second** step press then the „save parameters permanently“ button.
  - Note: If you do not do this, the configurations will be lost when the device is switched off.

- 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.

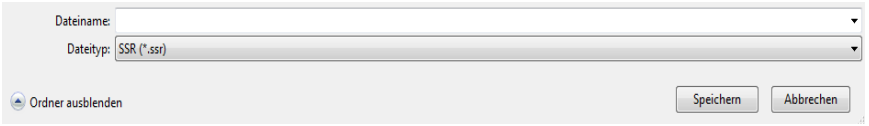


Visionary-T Mini CX
RECORD - STORE*, SSR FILE ON LOCAL DISK

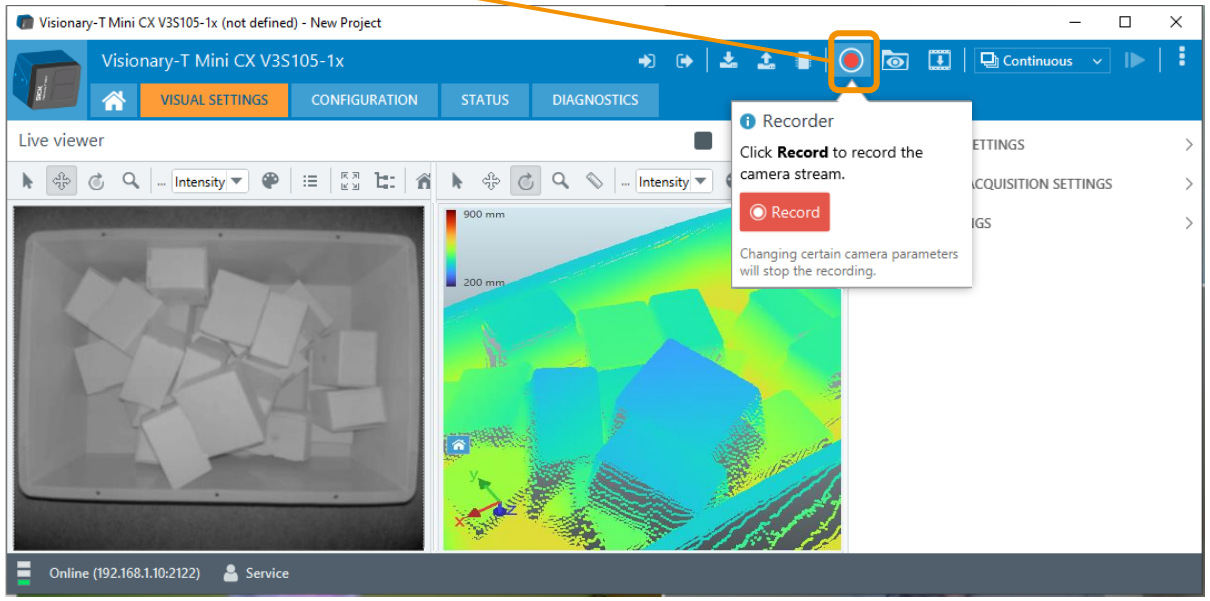
- Press *Start recording* and confirm with the button
- Active recording is shown by this symbol in the upper right image corner and the *Record* button turns to *Stop recording*



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



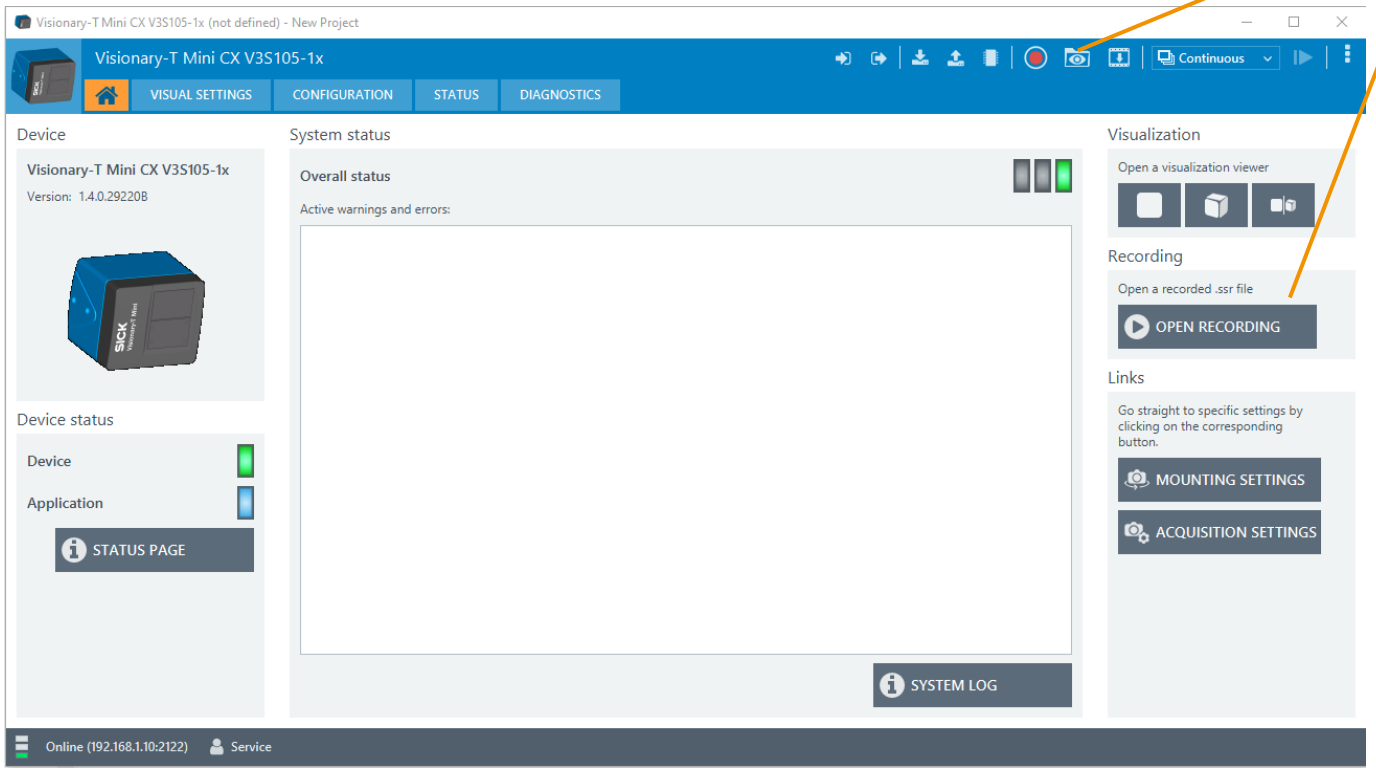
- Select your directory, name the SSR file and save it
- The recording stops automatically, when the file size is about to exceed 2 GBytes.
  - Note: Saving can take some time for bigger file sizes
- Be aware of your computer performance when playing the ssr files!

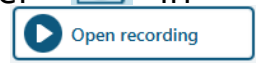


Visionary-T Mini CX
REPLAY - LOAD, *.SSR FILE FROM LOCAL DISK

Available in the device window toolbar

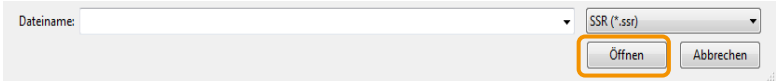
Note that to increase the performance of the playback window the live viewer is automatically set to *Pause*



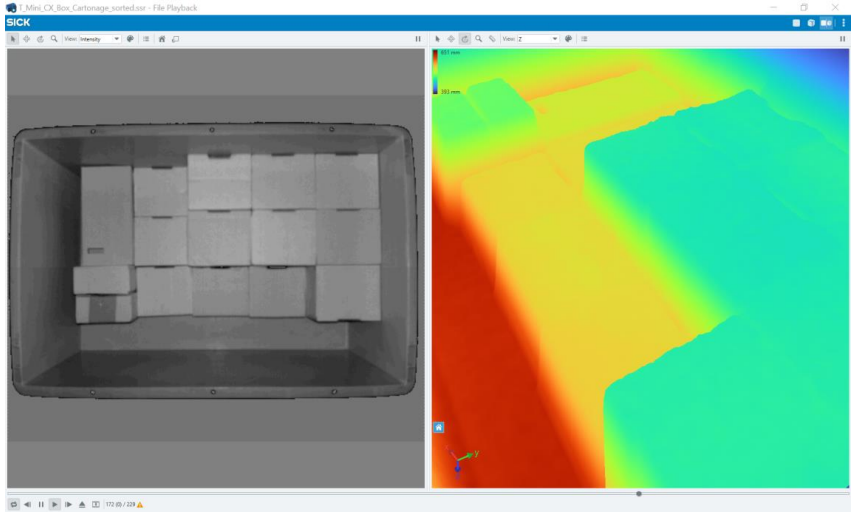
Press *Open recording file* either in the device window toolbar or 

on the homepage

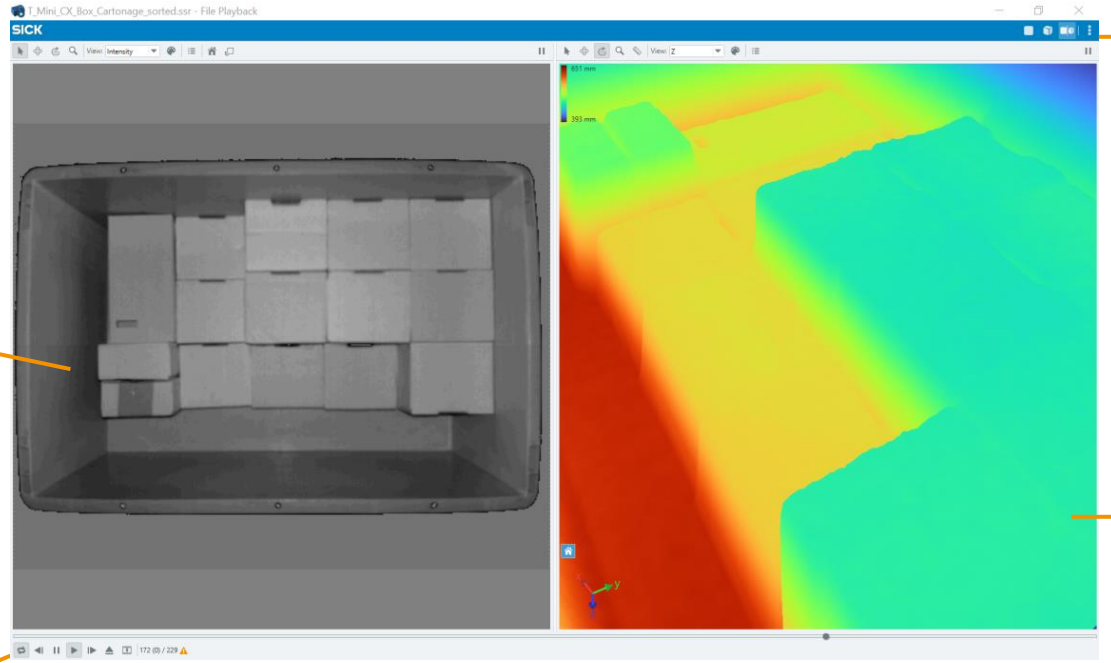
Select your .SSR and choose *open*



A File Playback window opens and offers (nearly) the same options like 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

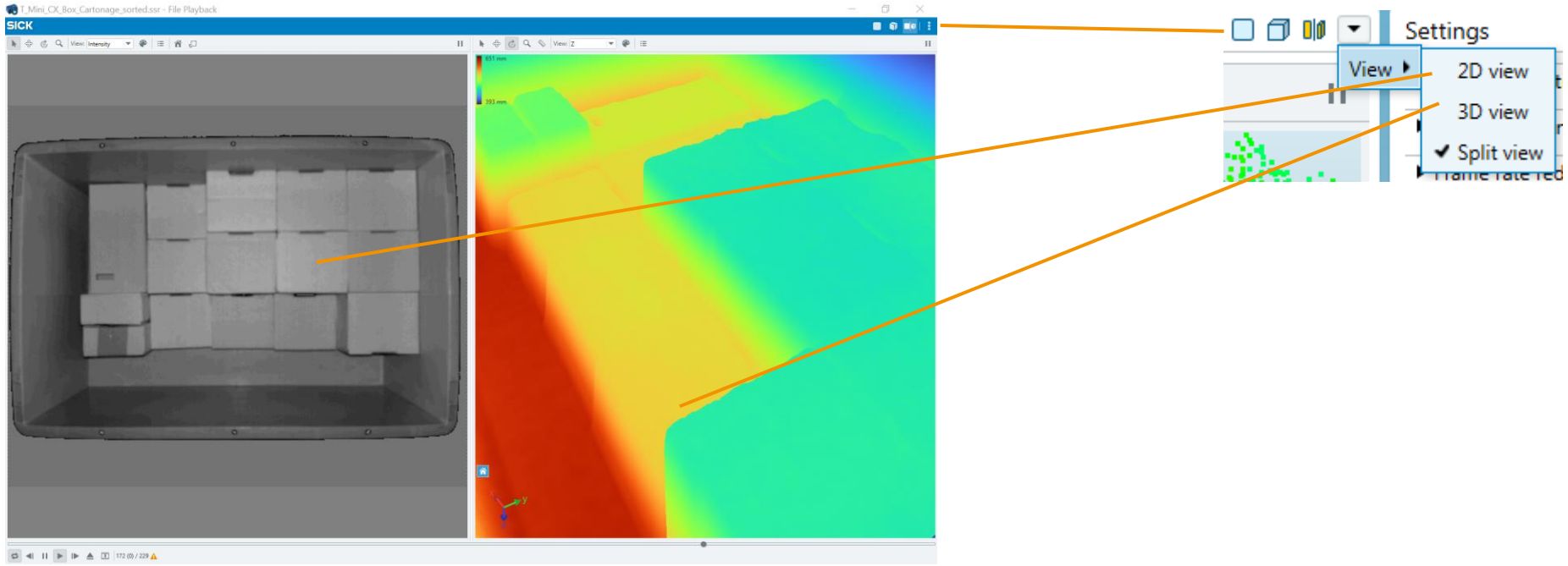
Single Step. Forward or backward

Open file. Open another *.ssr file

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

Visionary-T Mini CX
VISUALIZATION

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

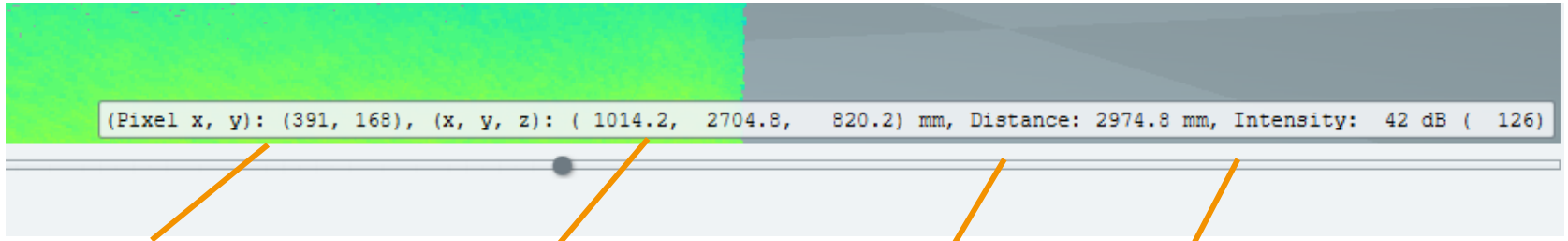


› This scene shows a box with small packages. On the left you can see the 2D, on right the 3D point cloud view of this scene. Both views contain the same information

› 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 if the mouse pointer is in the surrounding of 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

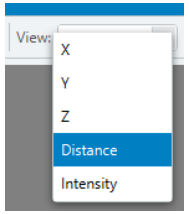
Rotate. Available by pressing ctrl key as well

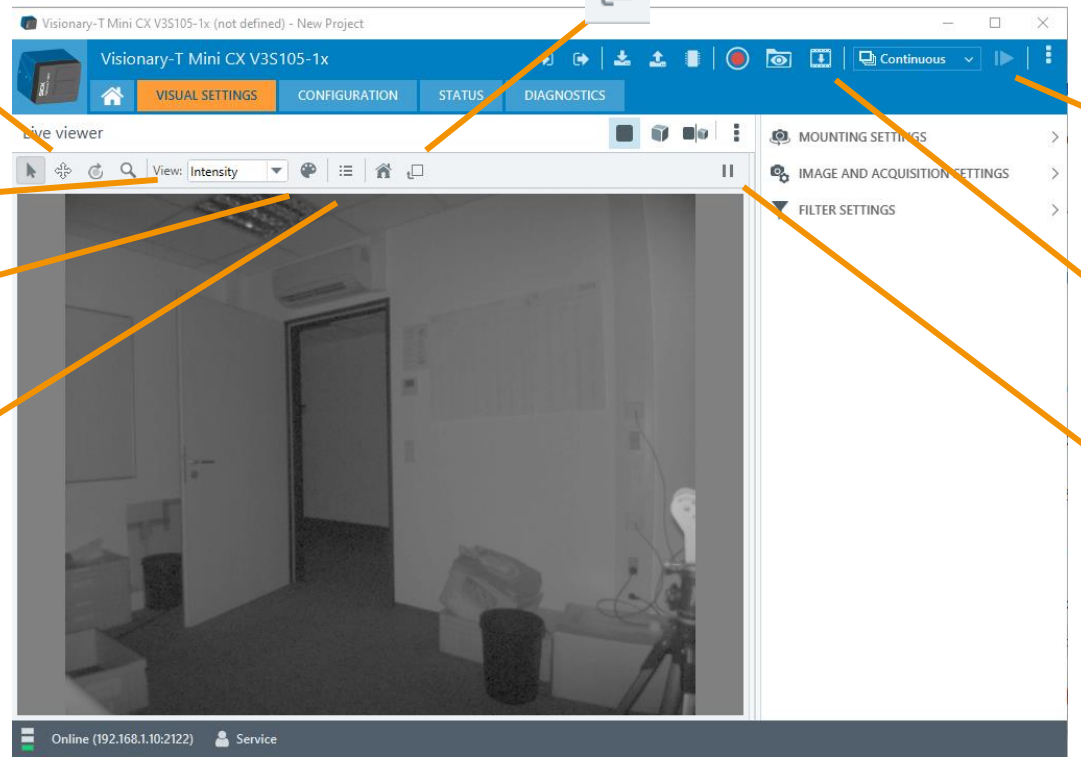
Zoom. Available by mouse wheel as well

Home. Reset zoom and position settings

Rotate view 90° clockwise

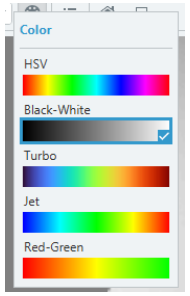
View map selection





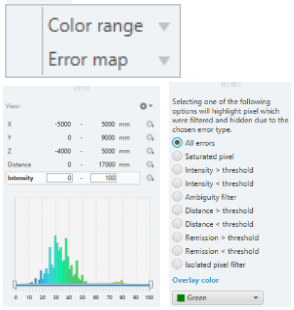
Trigger next frame
(only active in single frame mode)

Color map selection



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

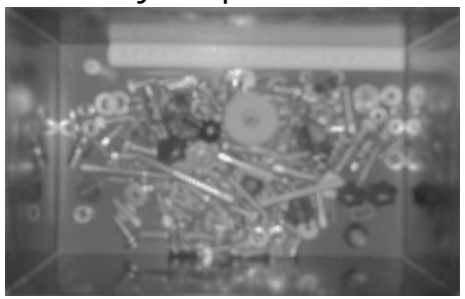
Further options

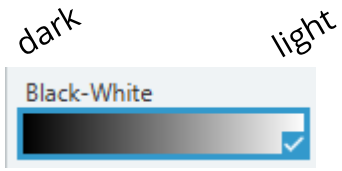


Pause. Freeze current image

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

Intensity map

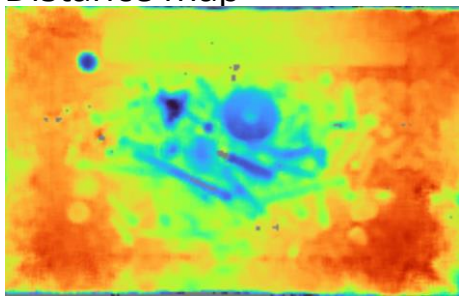


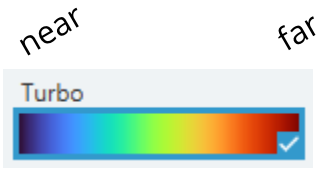


Perfect for visual identification of the scene

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

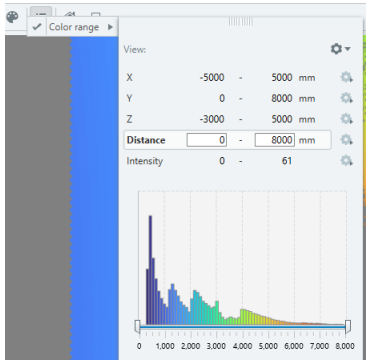
Distance map





Each point -> 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.

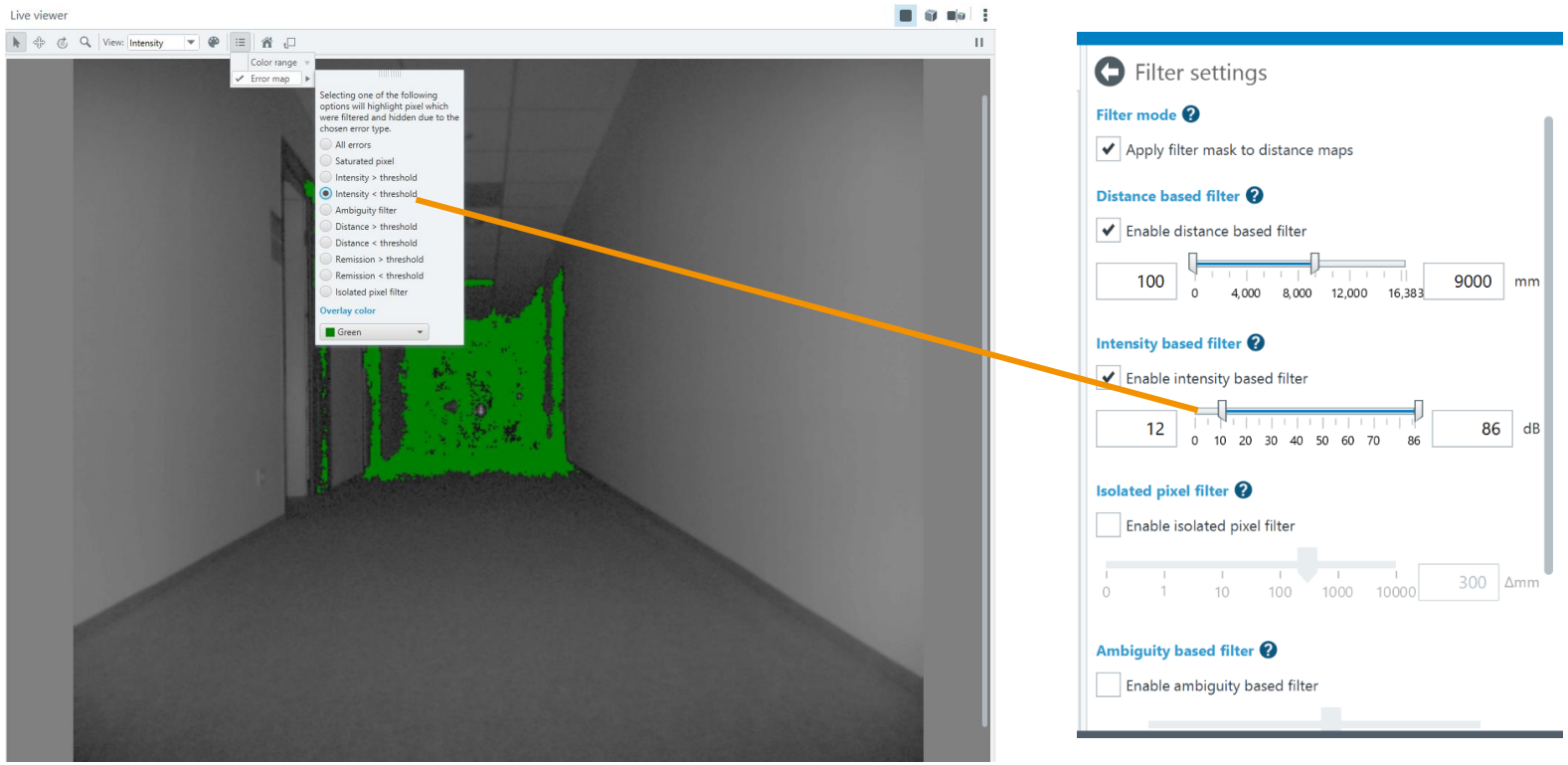


Visionary-T Mini CX
2D VIEWER – STATE MAP 1/2

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):

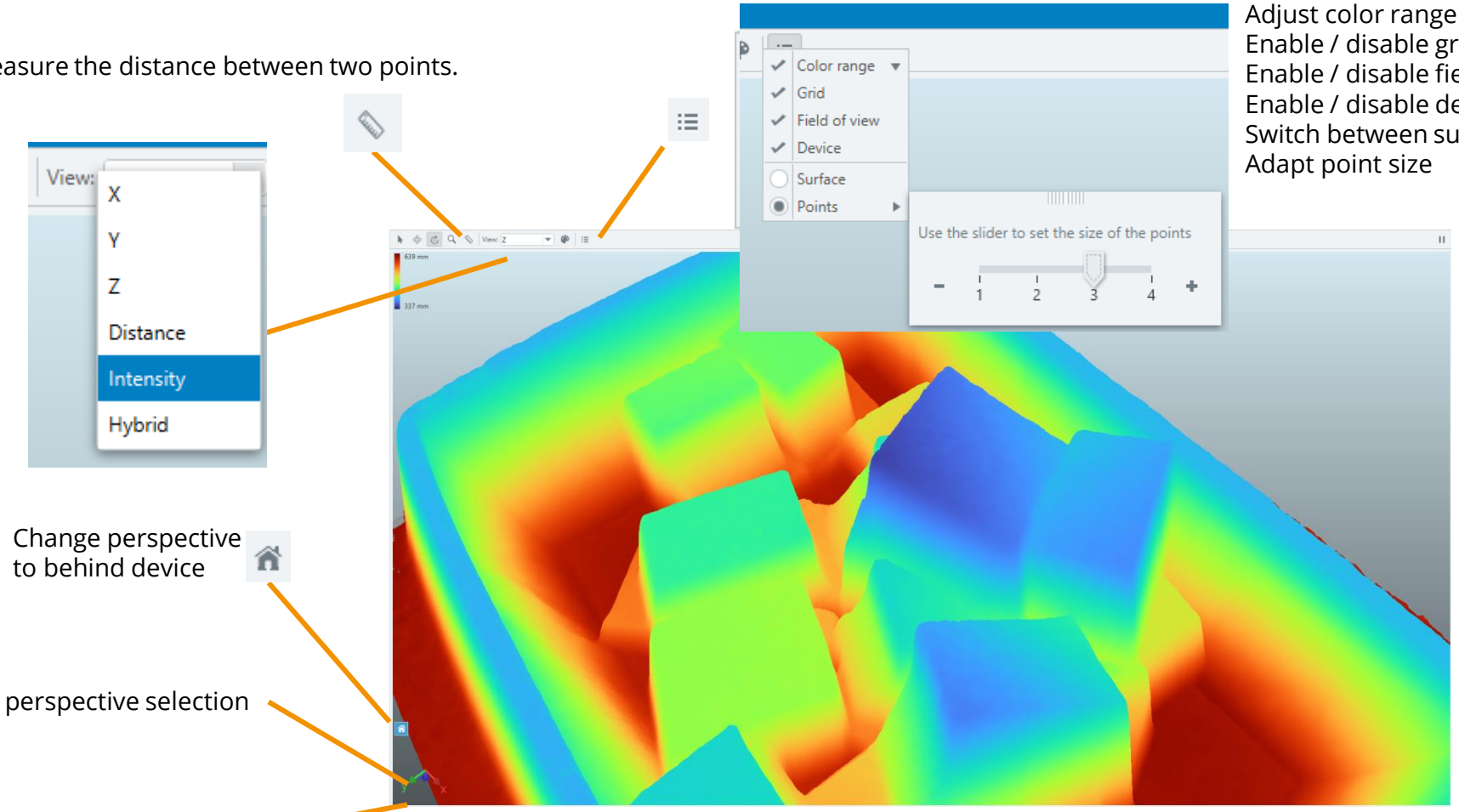


Visionary-T Mini CX
2D VIEWER – STATE MAP 2/2

- **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.



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

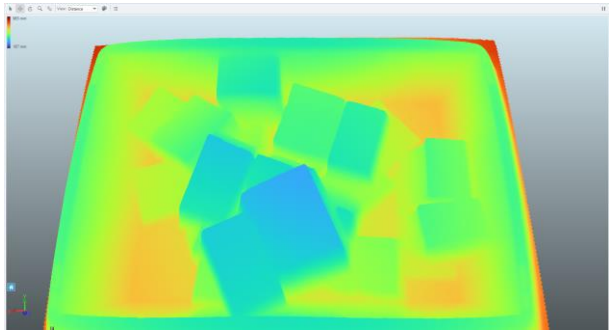
Change perspective to behind device

Quick perspective selection

X, Y, Z orientation of the current perspective

Visionary-T Mini CX
3D VIEWER – VISUALISATION OPTIONS

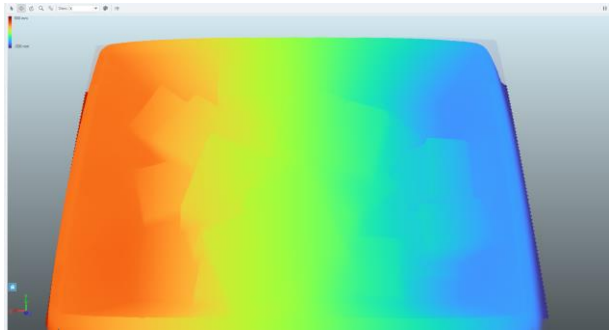
Radial distance values



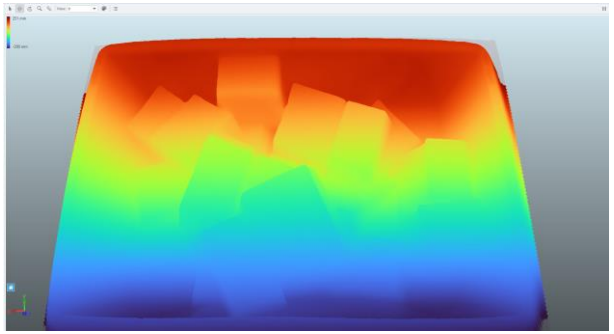
Intensity values

- 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 stored on the device during factory calibration (see settings menu)

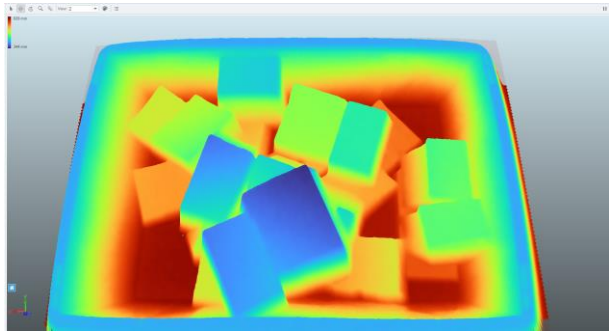
X Map



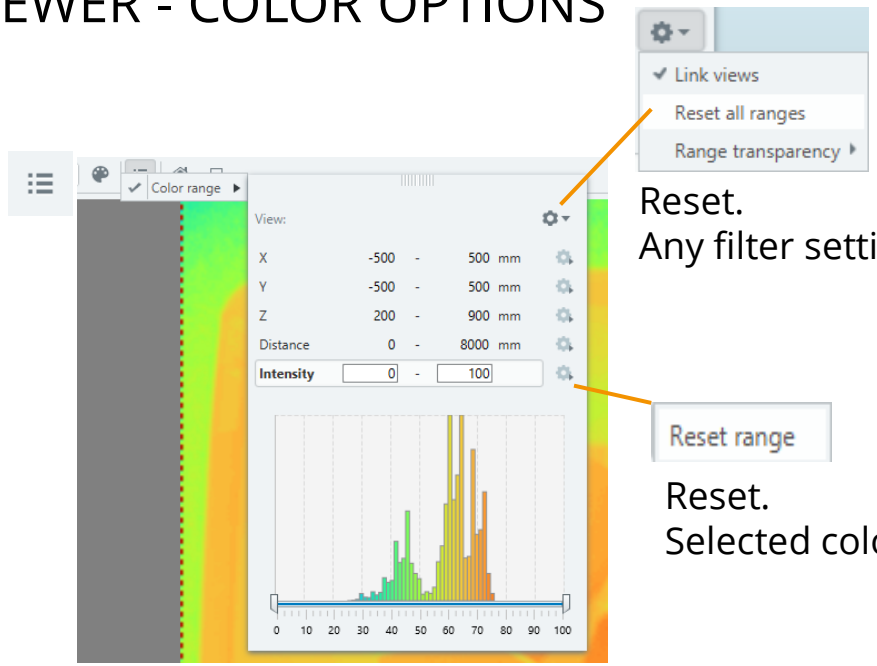
Y Map



Z Map

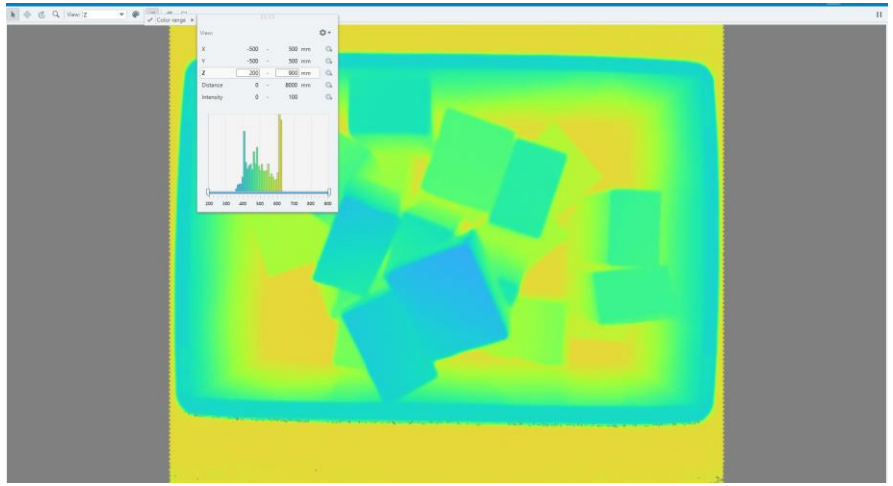


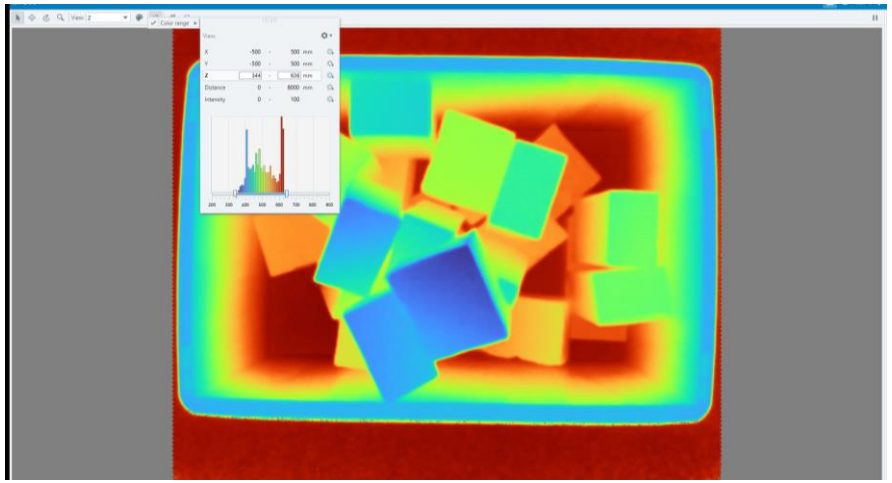
Visionary-T Mini CX
2D/3D VIEWER - COLOR OPTIONS



Reset.
Any filter settings

Reset.
Selected color settings

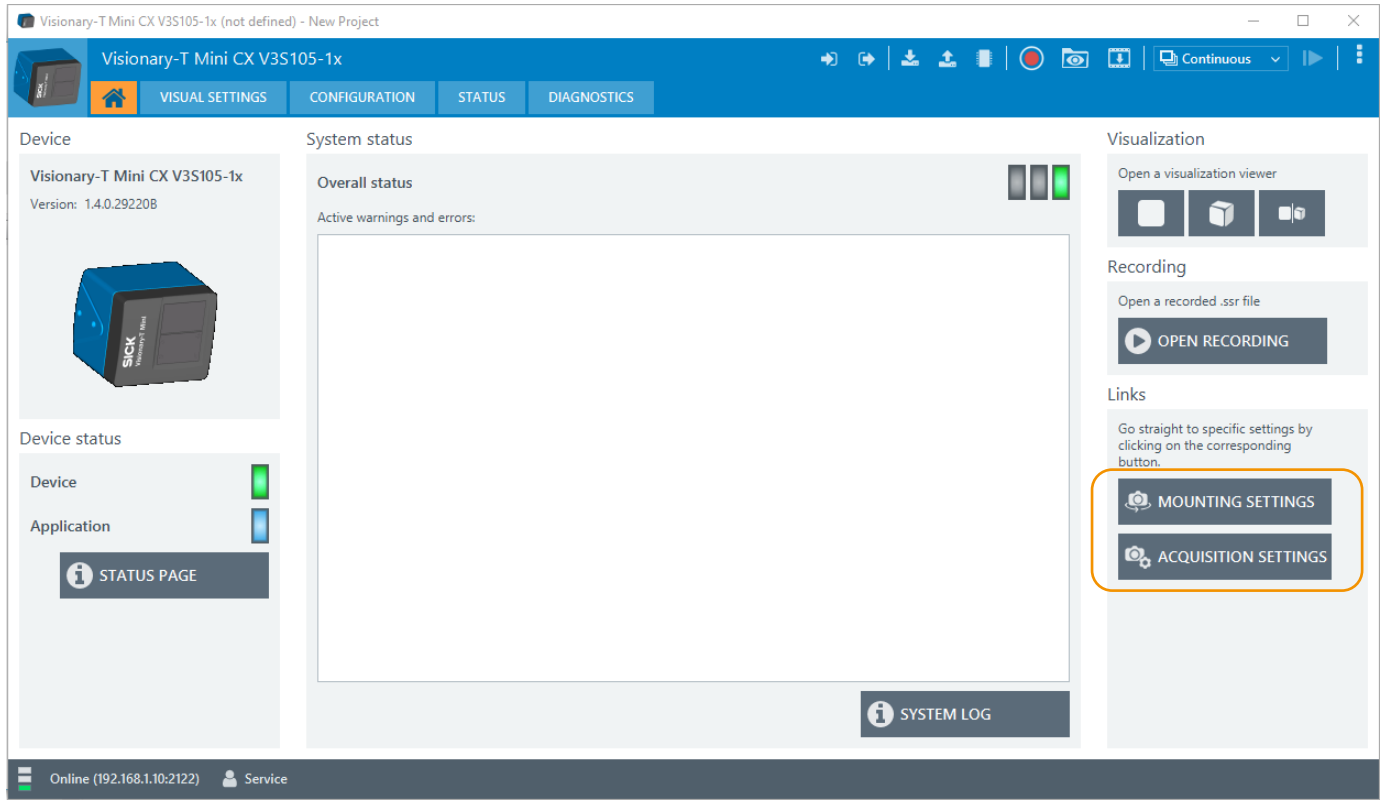


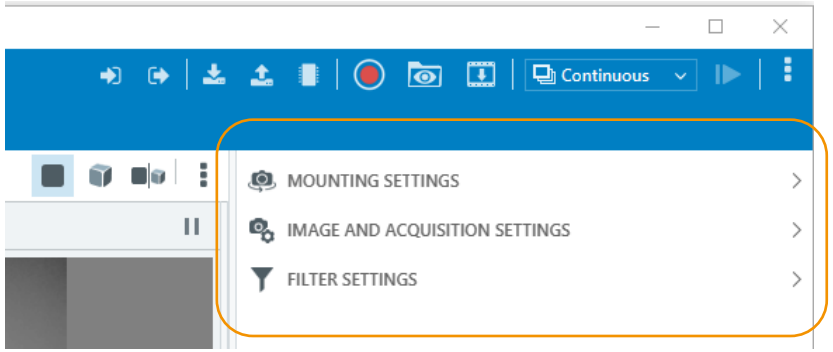


- The color range settings allow to tune the color distribution range
- Color range settings are available for each data source
- Points out of range will be grayed out
- A histogram is shown to support data analyses and to easily select the range of interest
- Some limits of the color range settings 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

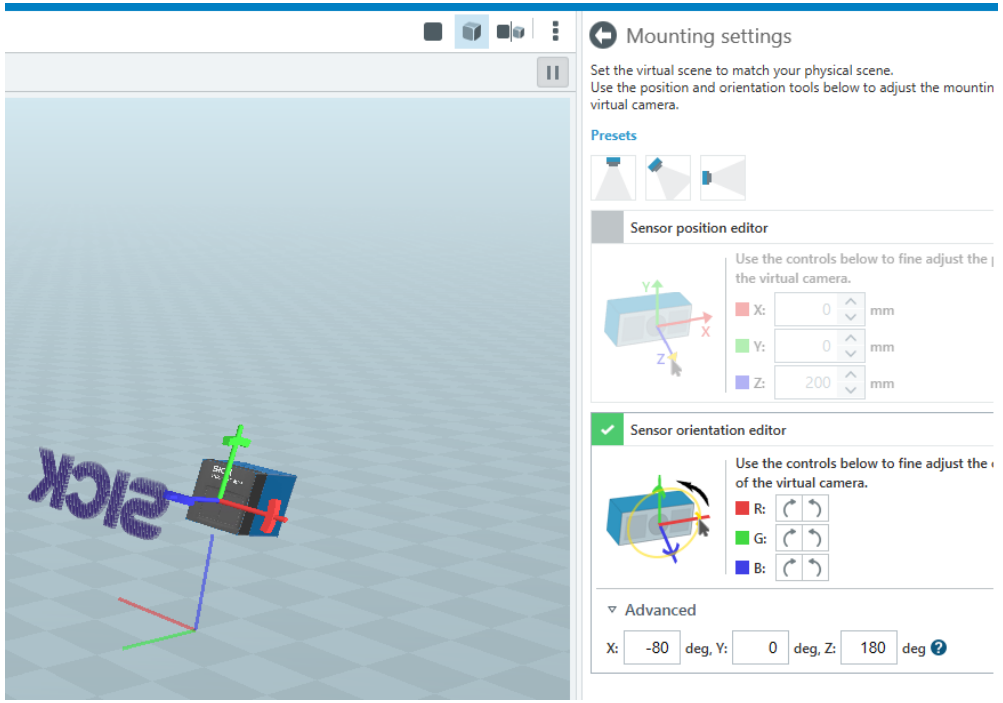
- You can enter the settings menu by using one of the quick links on the homepage
- You can also navigate the settings menu on the right side within the Visual settings





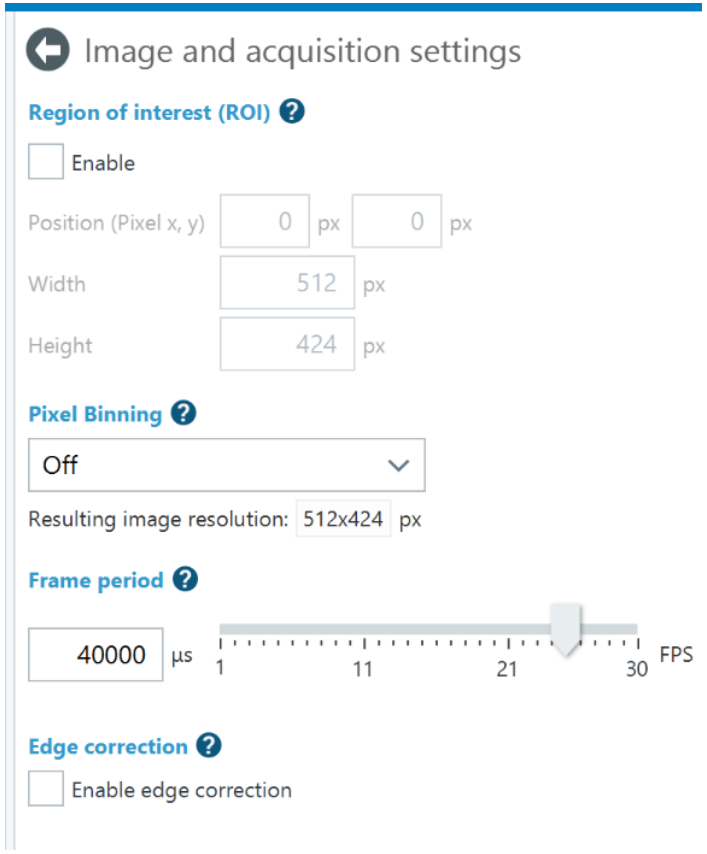
Visionary-T Mini CX
MOUNTING SETTINGS

- 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



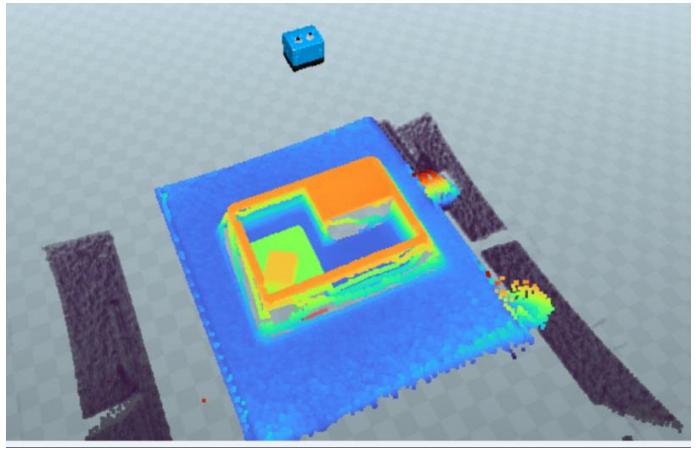
Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

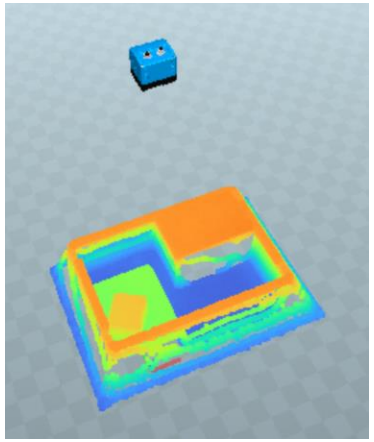
- The image and acquistion settings can be used to optimize the Visionary-T Mini regarding to
  - Bandwidth limitations (ROI, Pixel Binning, Frame rate)
  - Temperature limitations (Frame rate)
  - Data robustness (Pixel Binning, ROI)
  - Frame rate (Frame period)
  - Data quality (Edge correction)

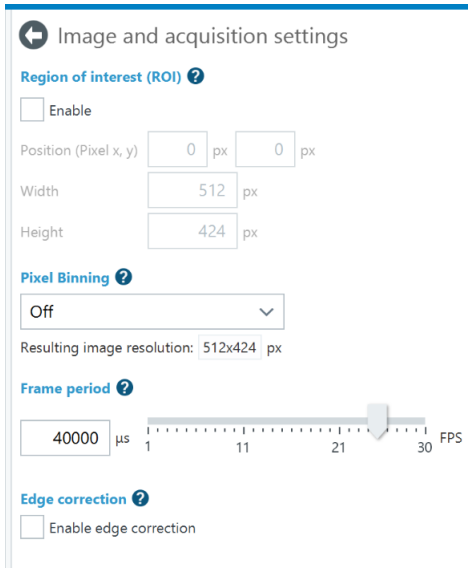


Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

- 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)

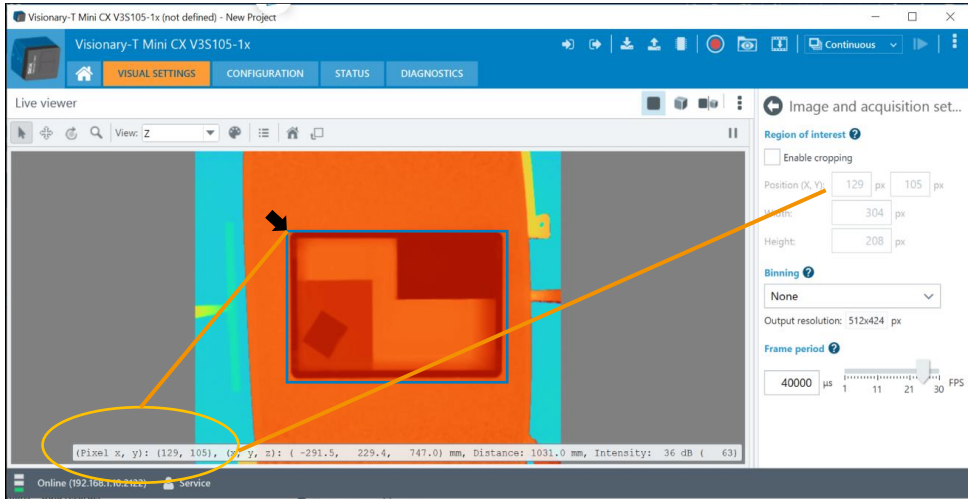


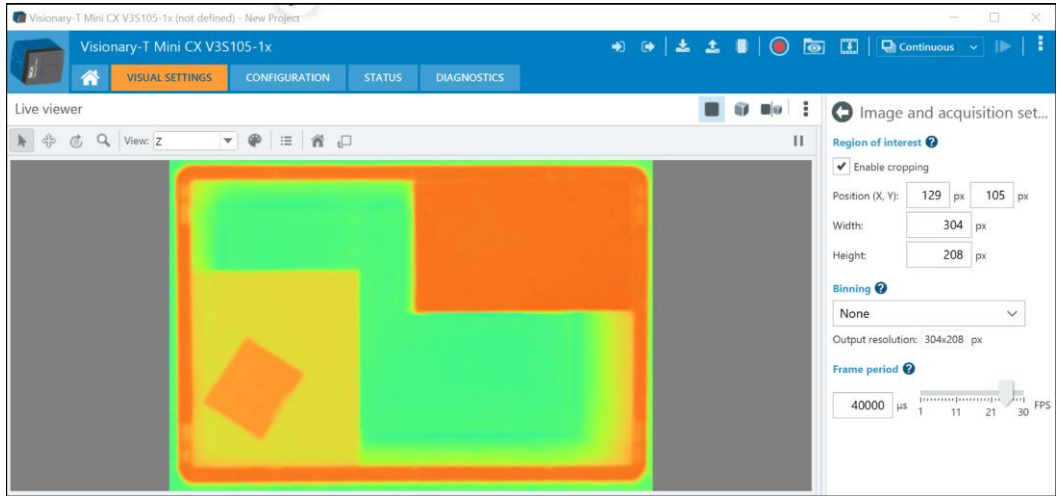




Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

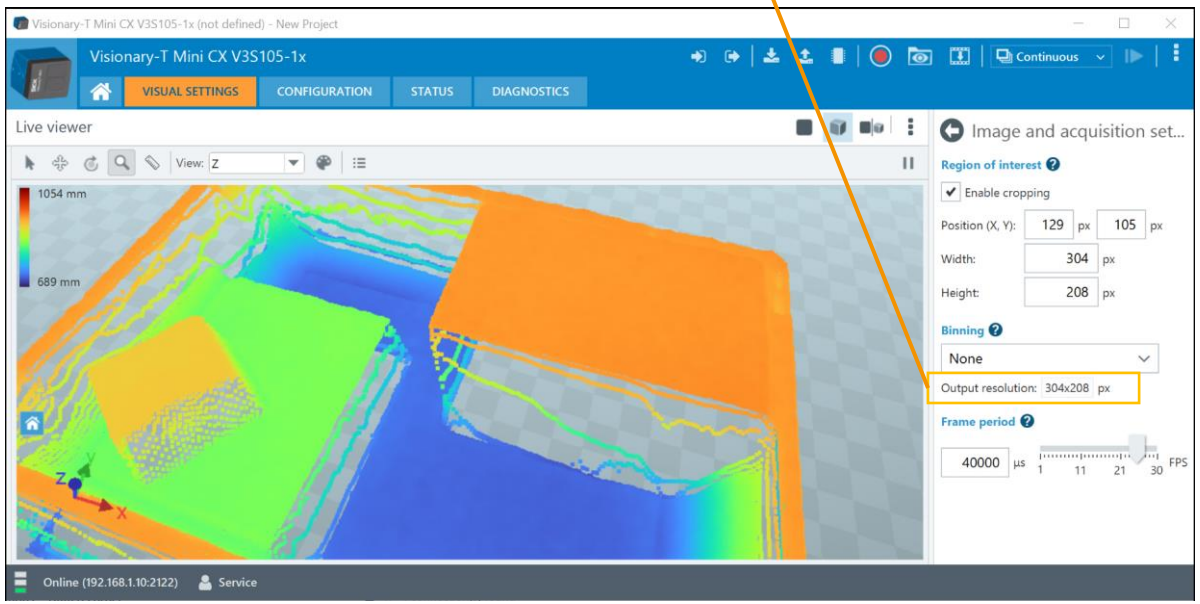
- Region of interest (in this case the box in the center of the image)
  - 1. Use the 2D viewer to identify the position of the upper left corner of your region of interest
  - 2. Enable cropping and enter first the width and the height values
  - 3. Move the cropping window by entering the position

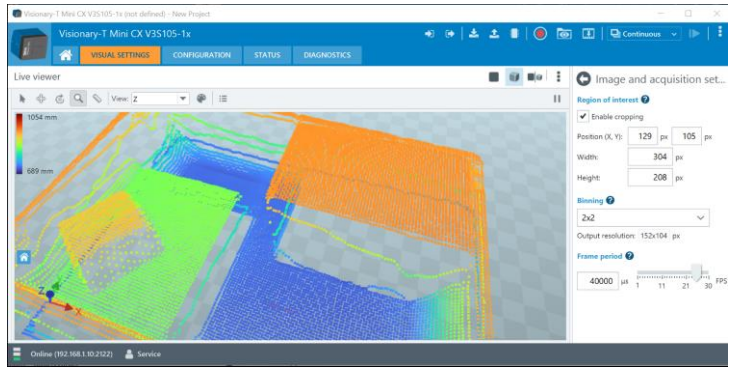


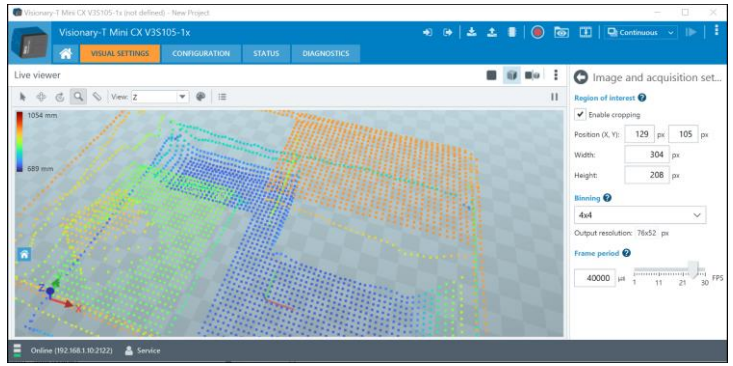


Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

- 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



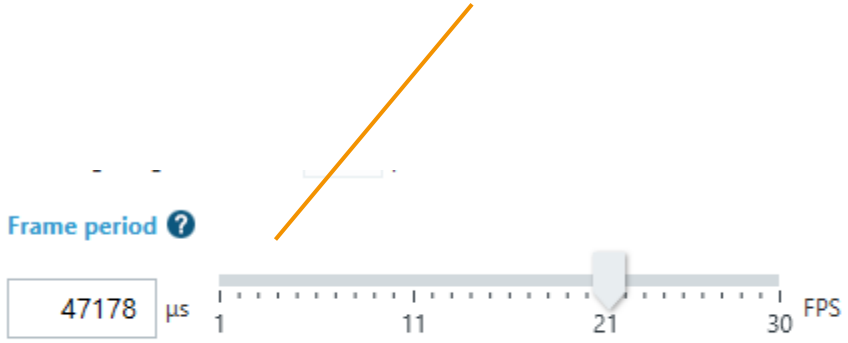




Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

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

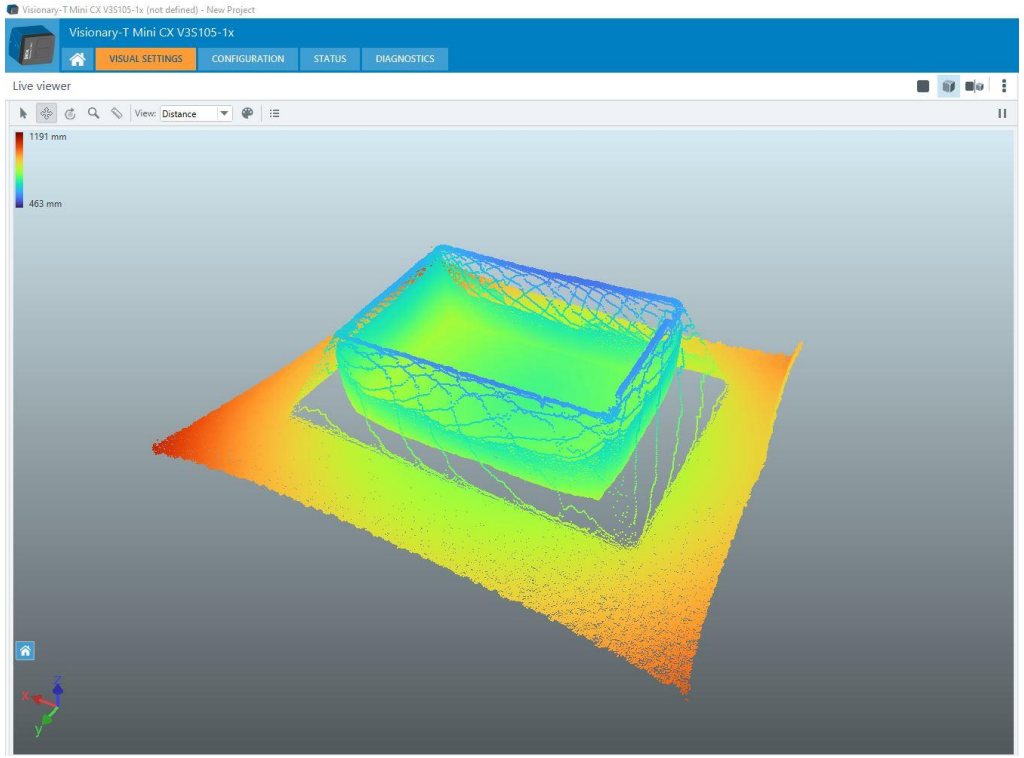
  - Just enter the frame period directly or use the slider to define the FPS

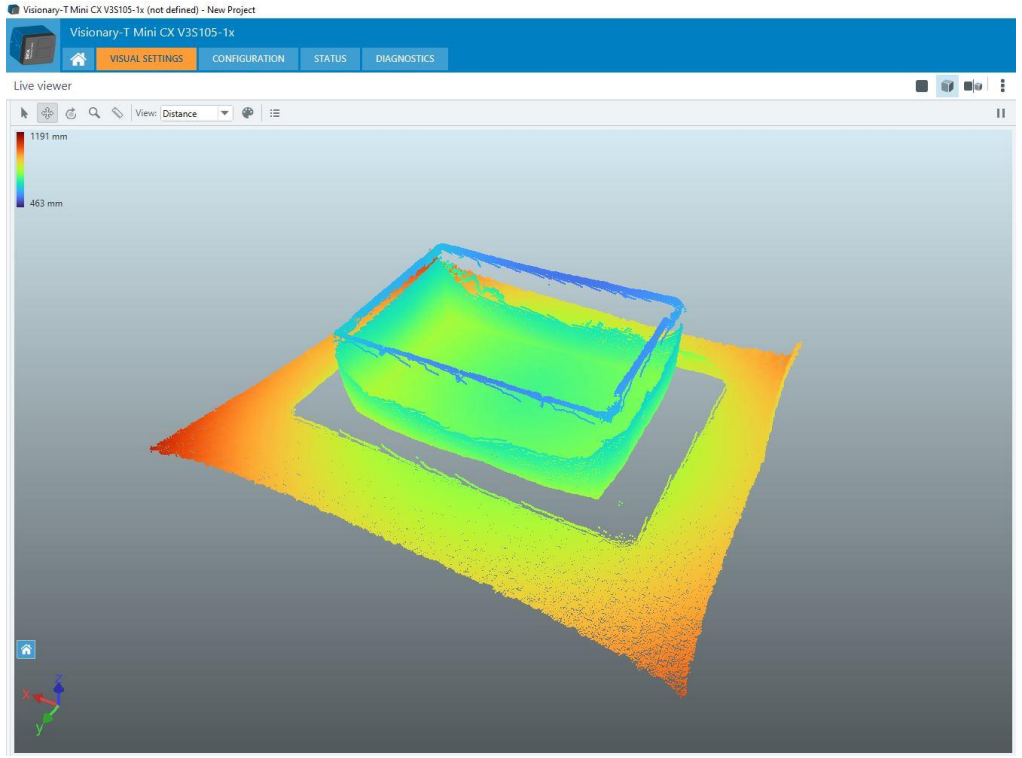


Frame period (µs)	Frame rate (FPS)
33333	30
40000	25
50000	20
66666	15
100000	10
200000	5
1000000	1

Visionary-T Mini CX
IMAGE AND ACQUISITION SETTINGS

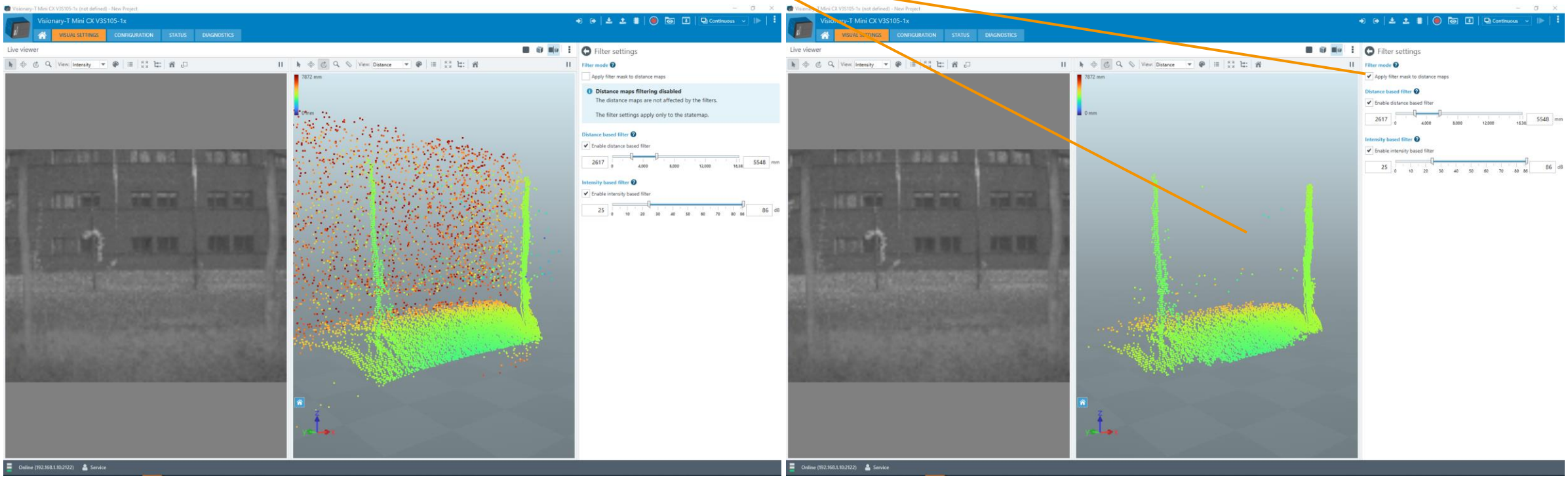
- Use the edge correction function to correct measurement errors on the edges of objects
- This function helps to improve the sharpness of edges
- Note that the filter **changes the values** of individual pixels





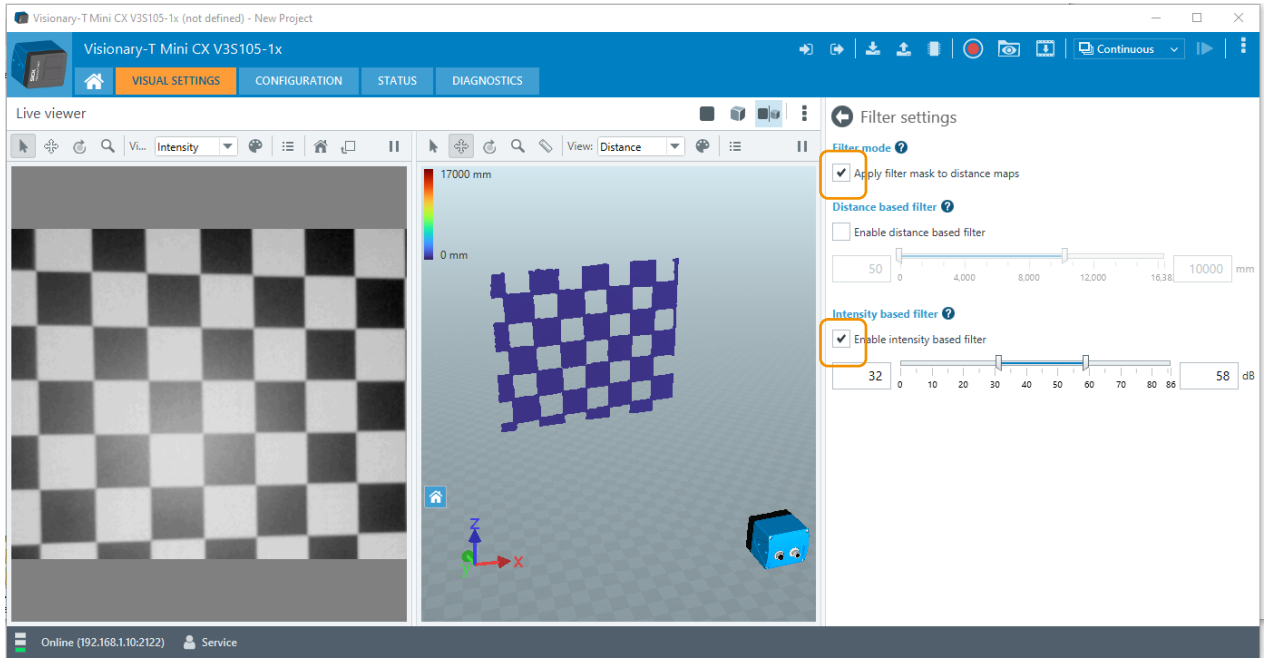
Visionary-T Mini CX
FILTER SETTINGS

- 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

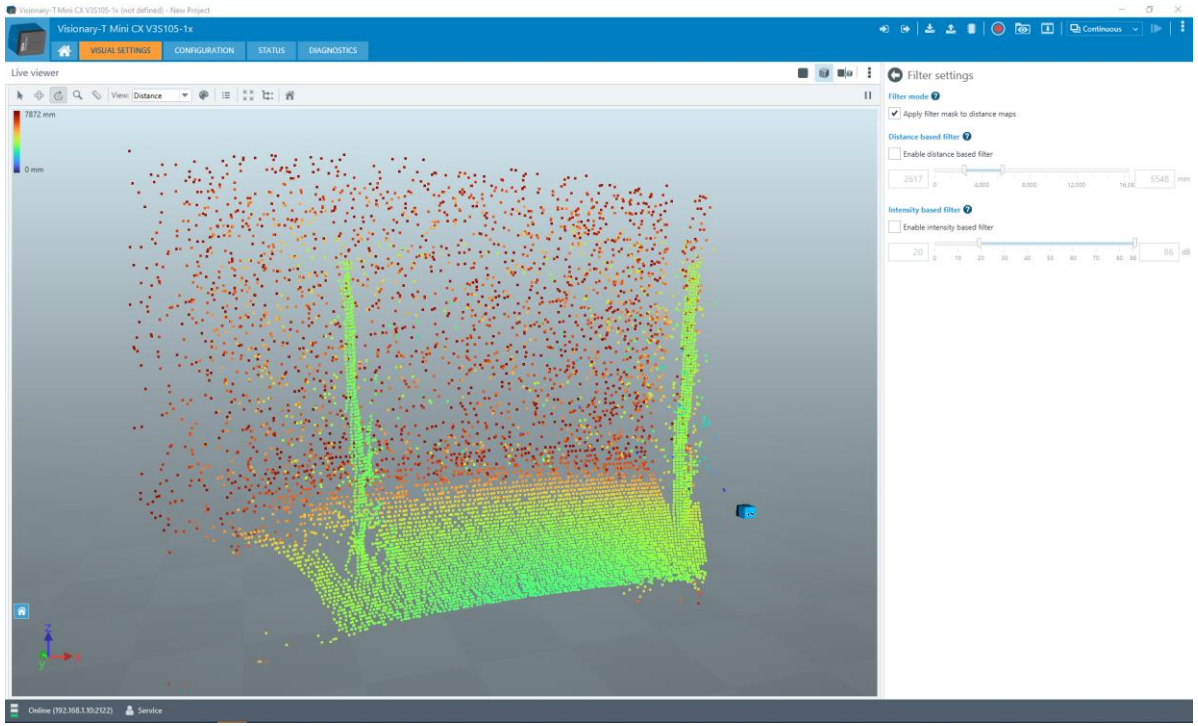
› You can apply all filter configurations at once with the “Apply filter mask to distance maps” checkbox

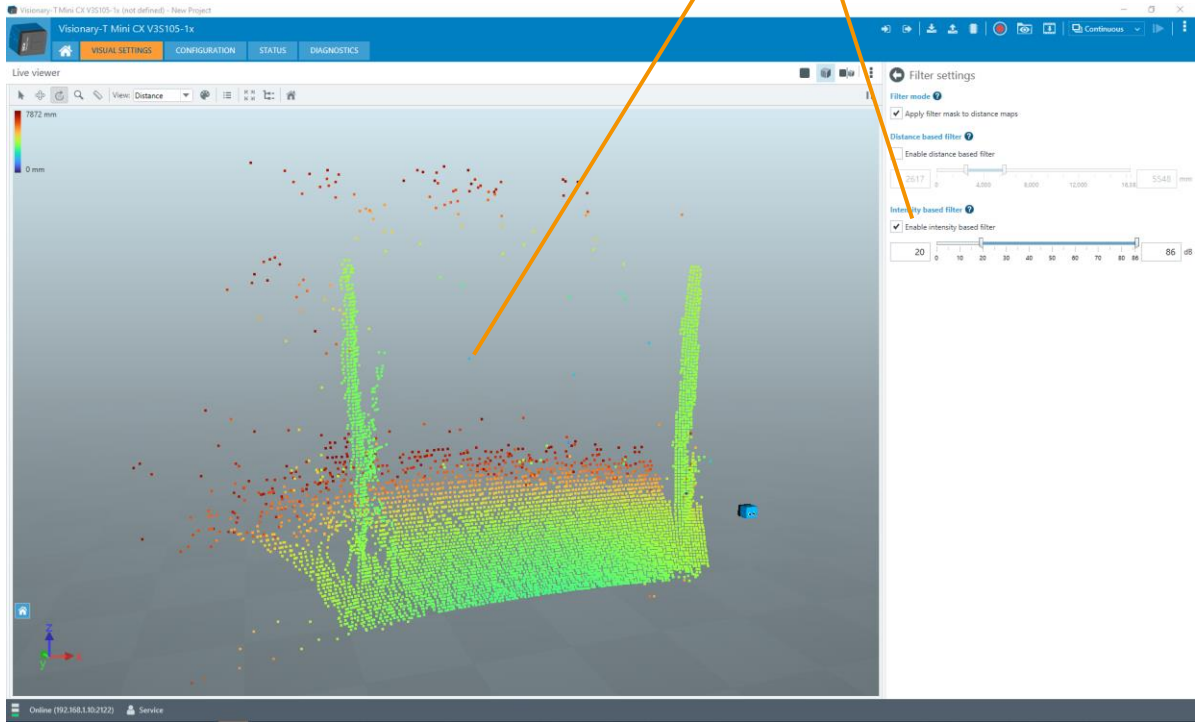


› This example shows how to filter out high intensity pixels e.g. the white squares from your distance data

Visionary-T Mini CX
FILTER SETTINGS – INTENSITY BASED FILTER

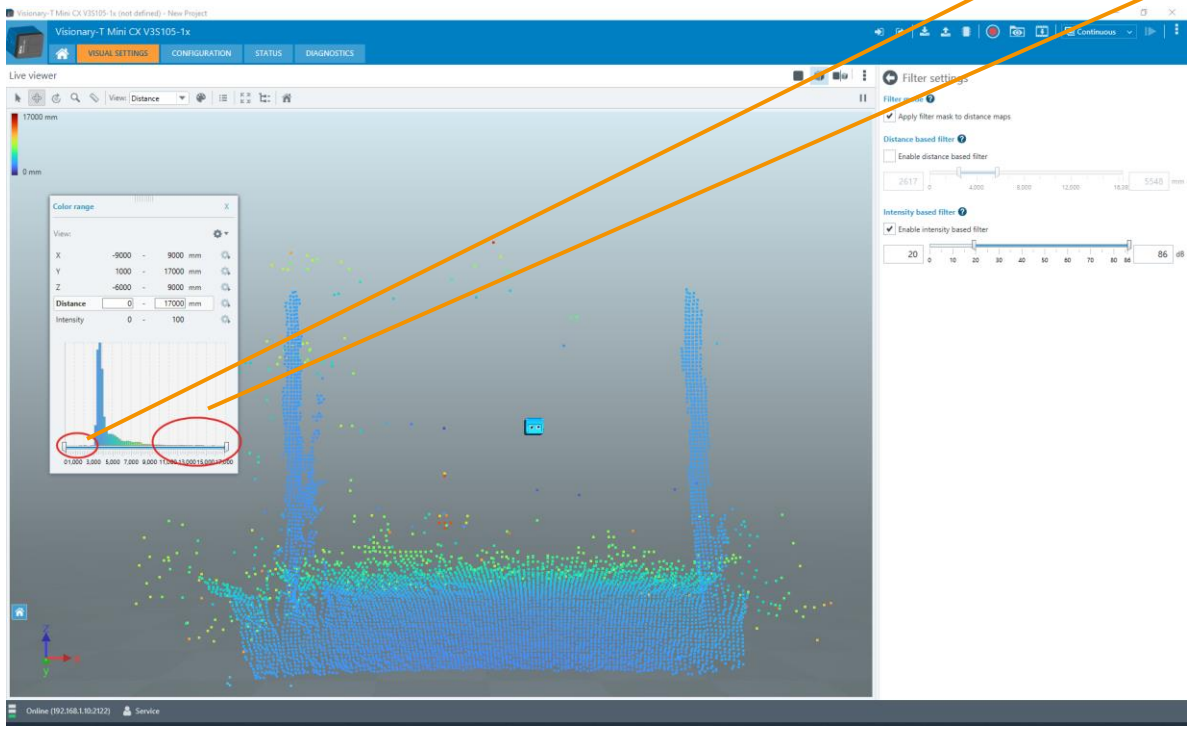
- Low infrared remission of the scene is one of the main cause of distance noise
- Activate the intensity filter to reduce the distance noise by filtering lower intensity values e.g., <20dB
- Please keep in mind that this filter will affect also your max. operating range

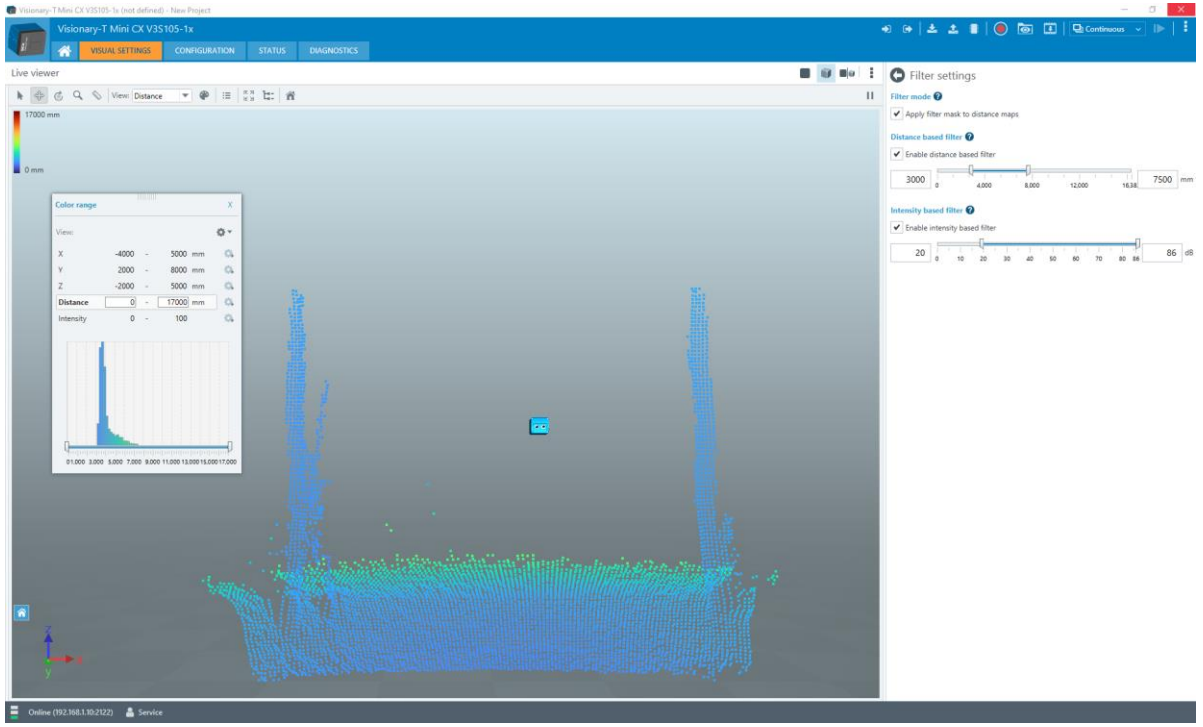




Visionary-T Mini CX
FILTER SETTINGS – DISTANCE BASED FILTER

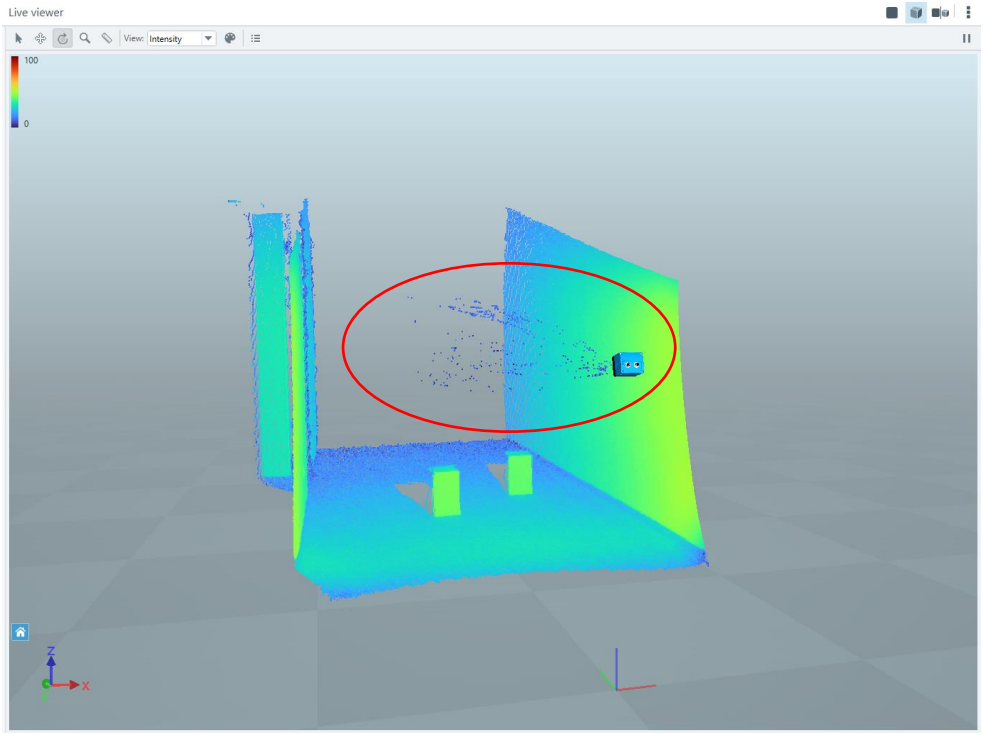
- Use the distance filter to remove data additional noise or to define your operating distance range
- The example below has noise distribution for distances <3m and >7,5m
- Activate the distance filter to remove this noise

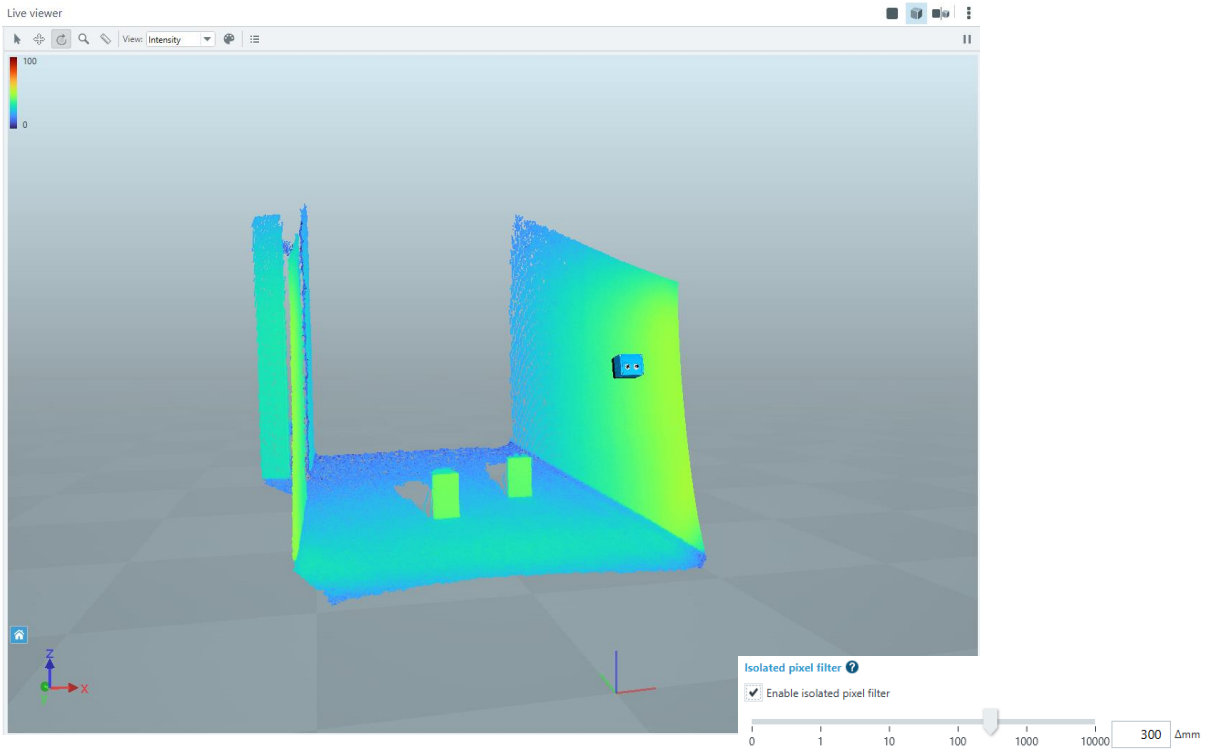




Visionary-T Mini CX
FILTER SETTINGS – ISOLATED PIXEL FILTER

- 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**

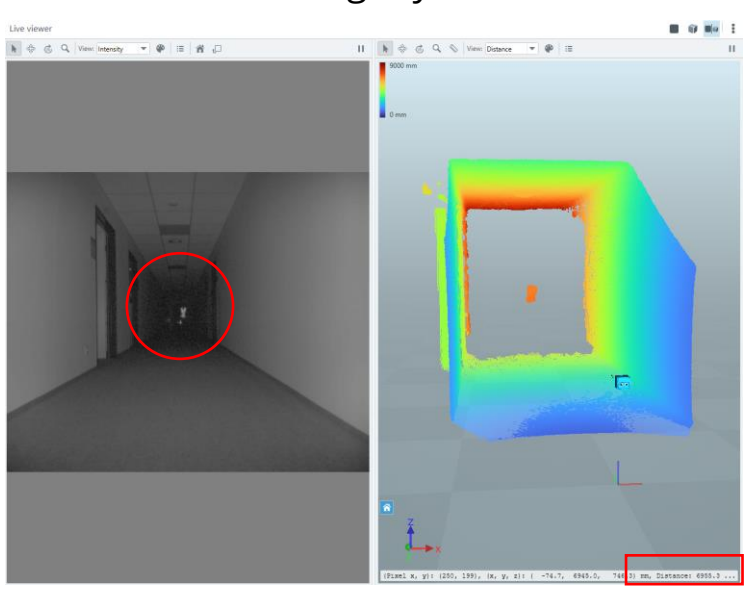


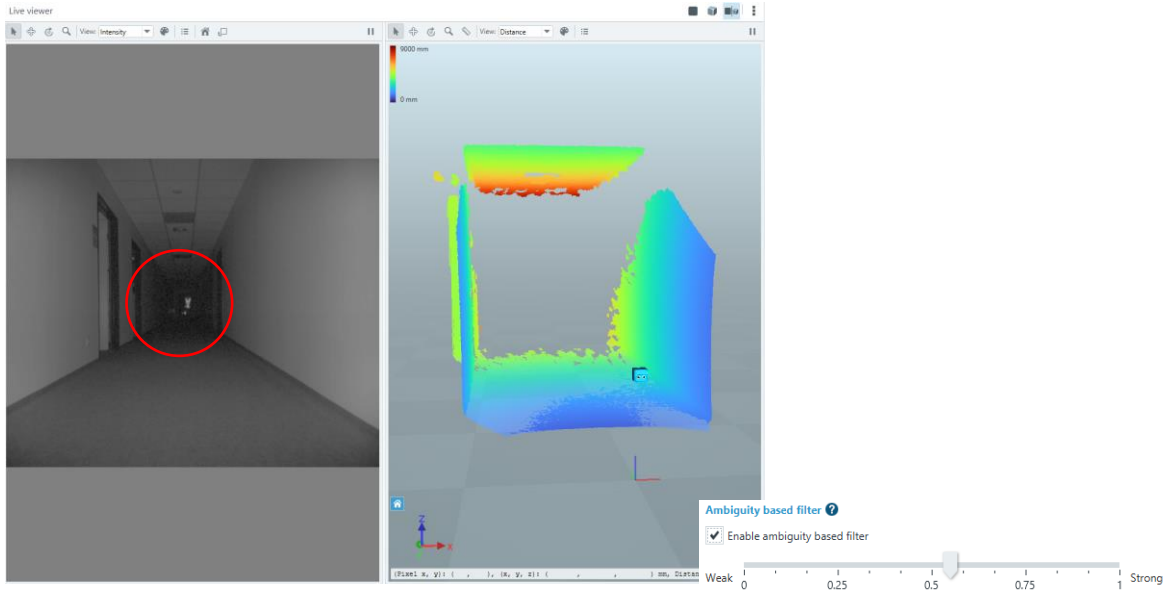


Visionary-T Mini CX
FILTER SETTINGS – AMBIGUITY BASED FILTER

- 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

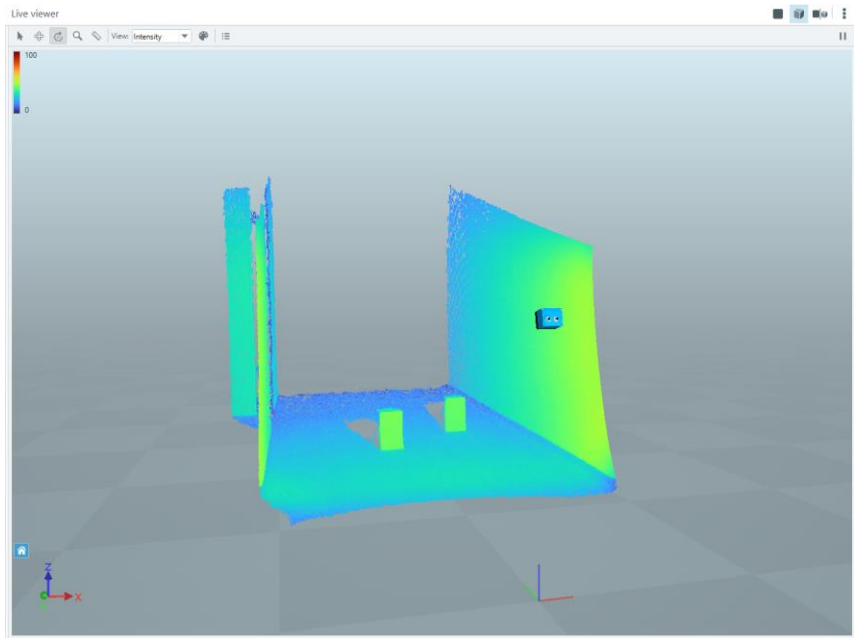
- In the example below a reflector object is placed outside the ambiguity range which leads to a wrong measurement at around 6m
  - Activate the ambiguity-based filter to avoid such false detections

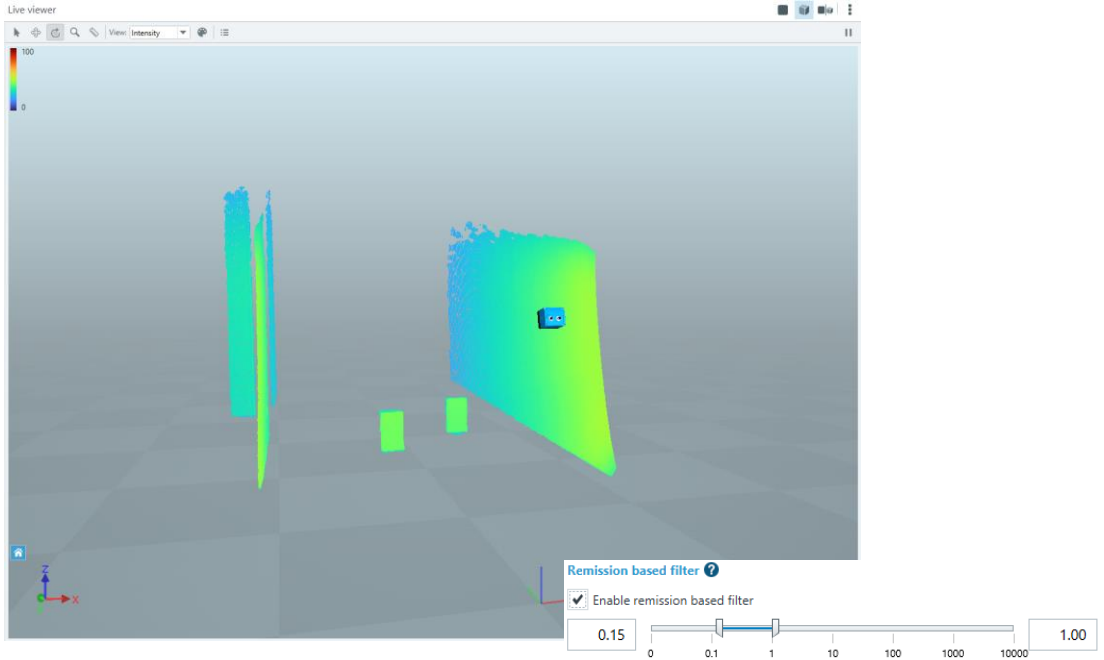




Visionary-T Mini CX
FILTER SETTINGS – REMISSION BASED FILTER

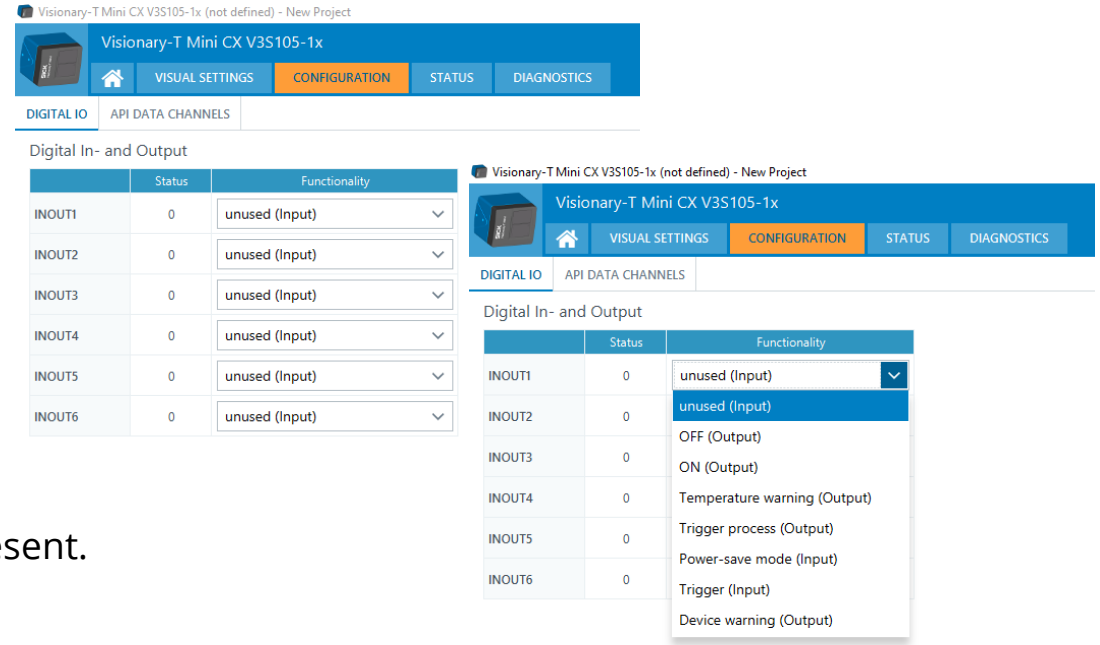
- Use the remission based filter to remove data outside a defined object remission range
- The remission values are calculated from the measured distance and intensity and referring to the scene properties
- Scaling: White paper has a remission value of ~1
- You can use this filter to extract objects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



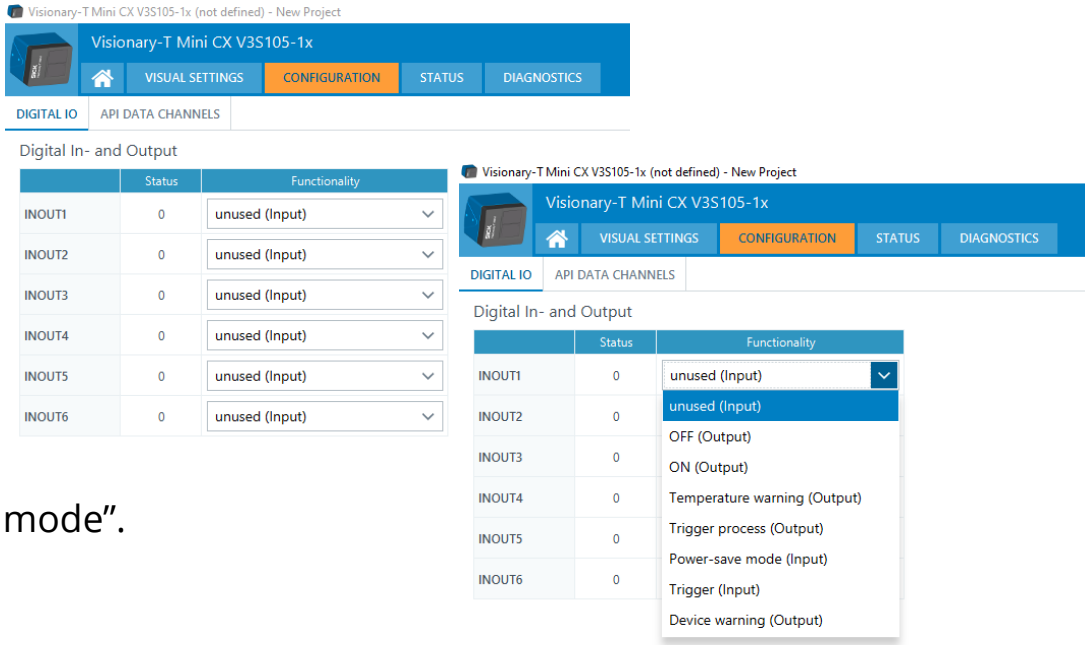


Visionary-T Mini CX
CONFIGURATION – DIGITAL IO 1/2

- 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



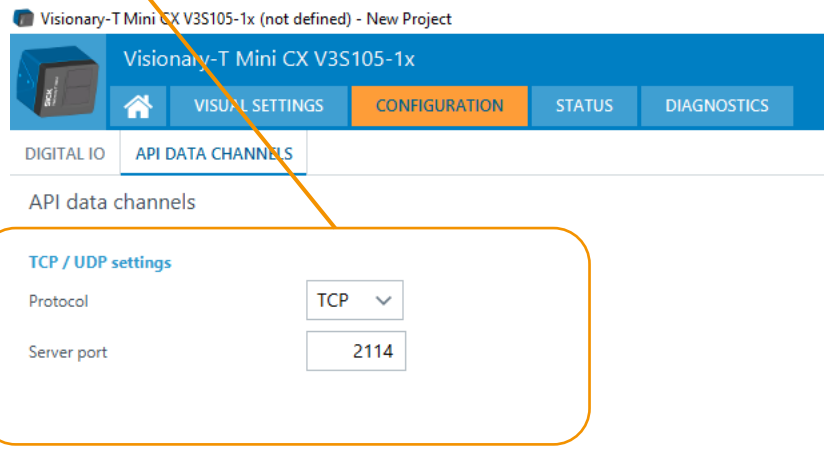
Visionary-T Mini CX
CONFIGURATION – DIGITAL IO 2/2

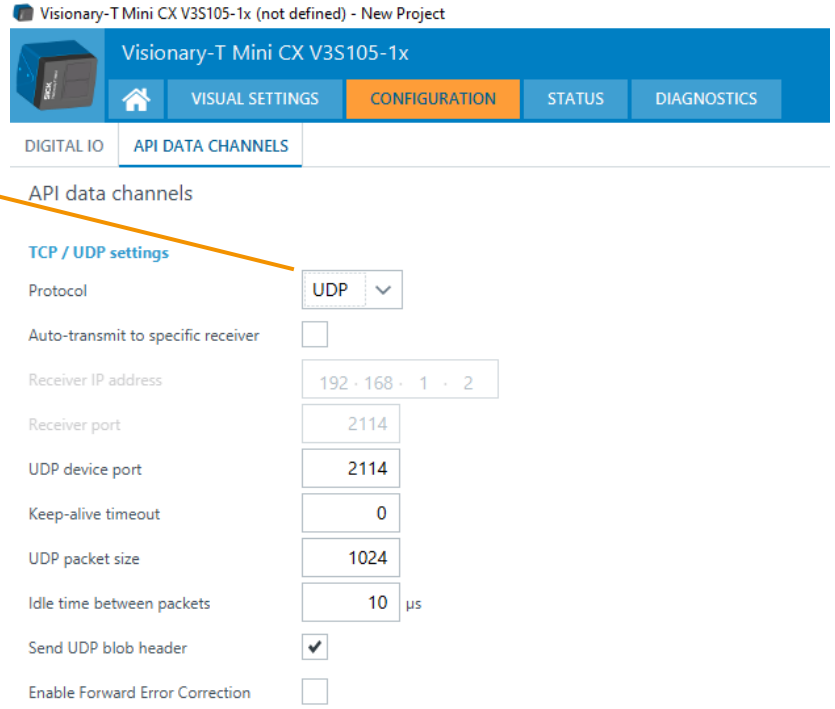


- Further functions are available:
  - Power-save mode (Input):
    - Activates the power-save mode of the device.
      The device does not capture images and the illumination will be turned off as long the input signal is true e.g. high.
  - Trigger (Input):
    - Trigger a single frame transfer when 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

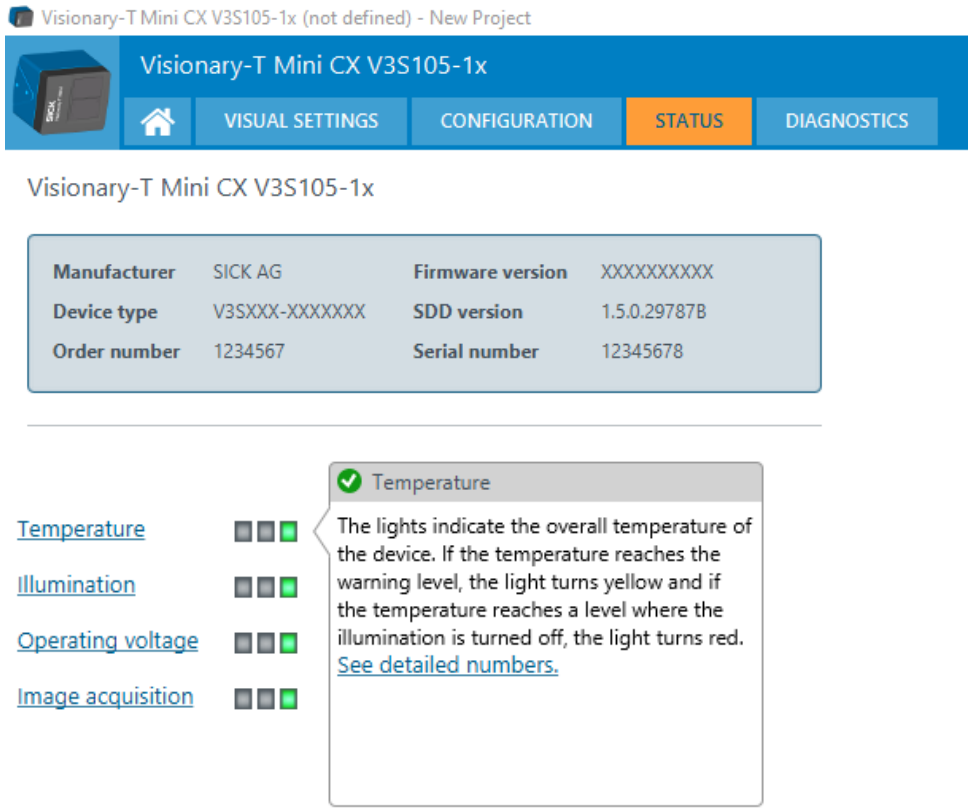
- The Visionary-T Mini supports TCP and UDP protocol
- You can change the Protocol by this dropdown menu
- Default configuration is TCP and Server port 2114





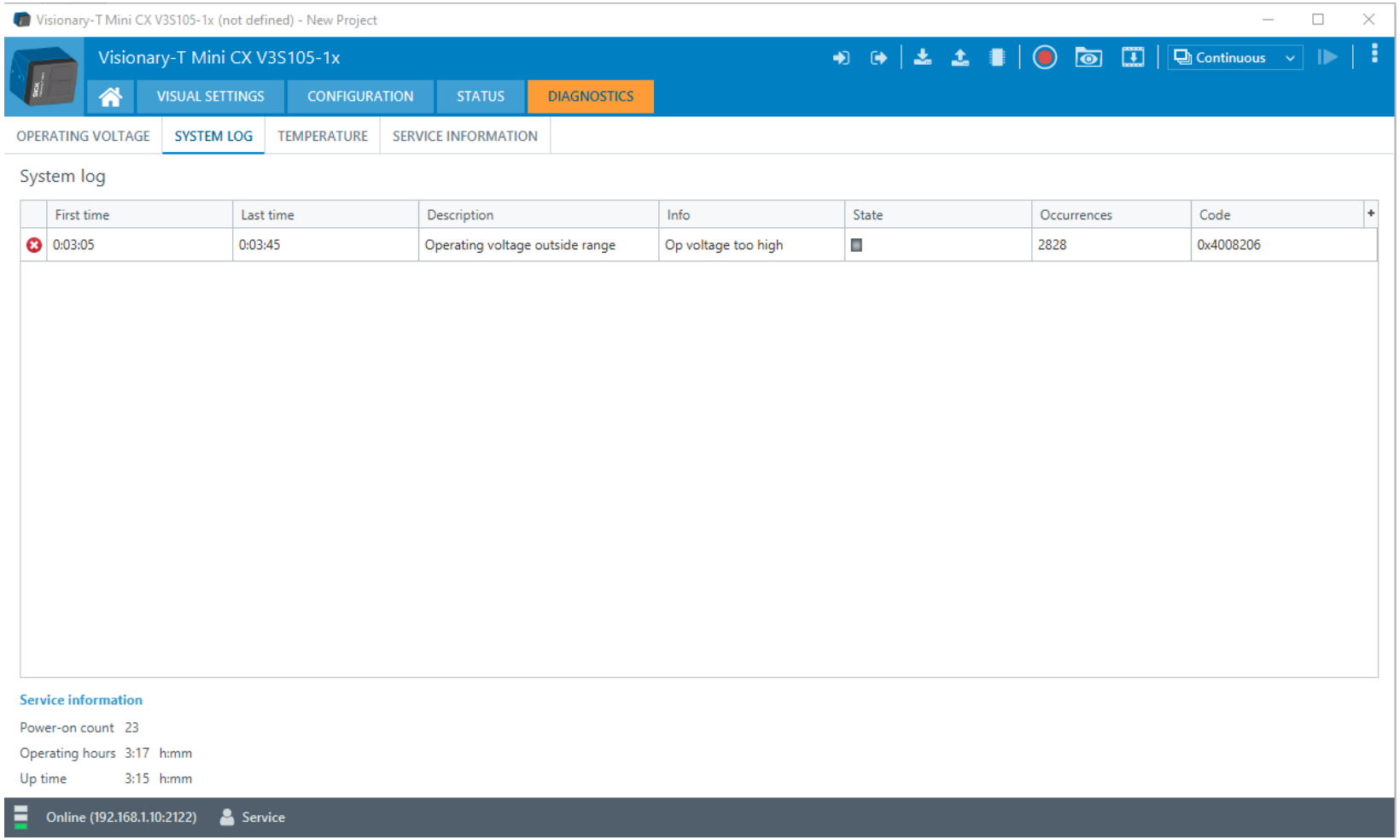
Visionary-T Mini CX
STATUS

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



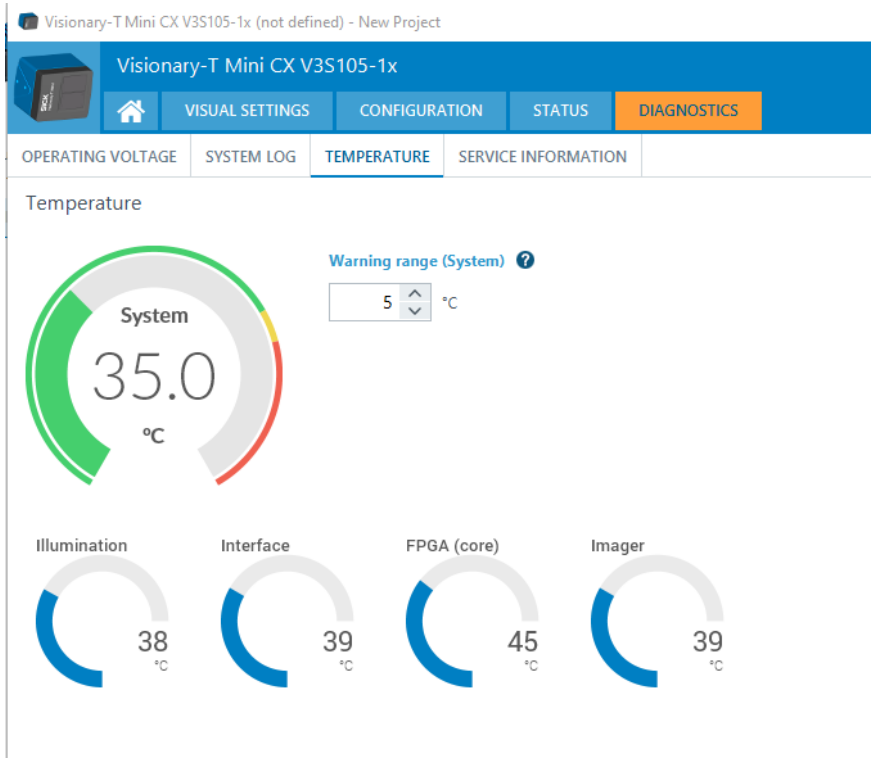
Visionary-T Mini CX
DIAGNOSTICS – SYSTEM LOG

› The system log will list the errors



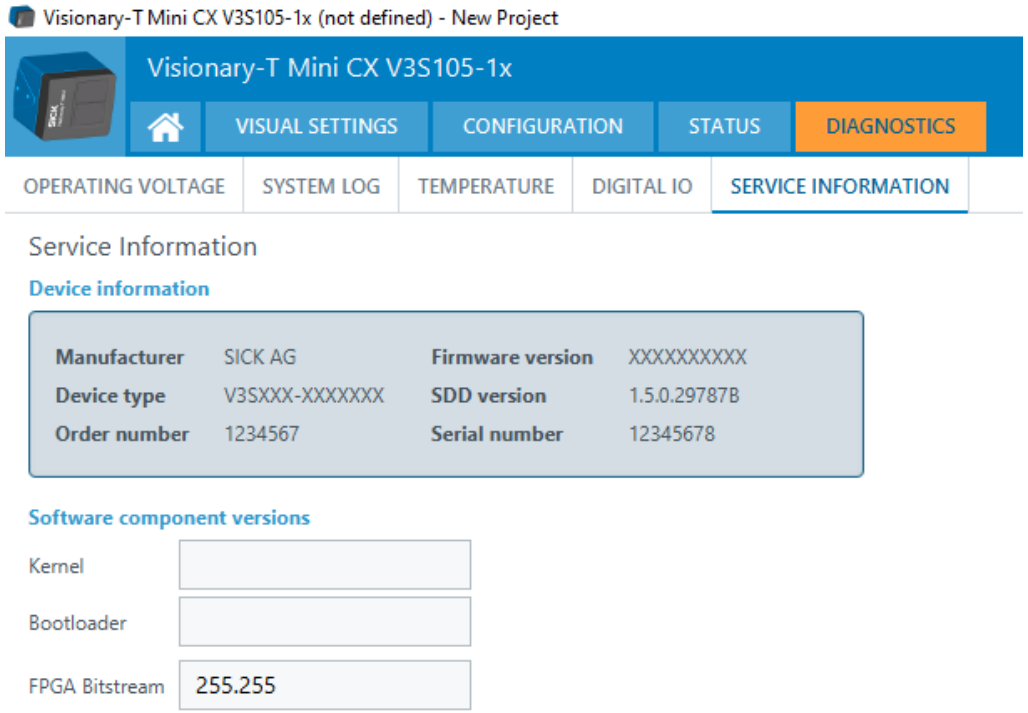
Visionary-T Mini CX
DIAGNOSTICS - TEMPERATURE

- 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.

3D Compact Systems

techsupport0905@sick.de