

Manual

AM-T100 3D INDUSTRIAL CAMERA



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1 About this document

1.1 Function

This manual contains essential information on the assembly, installation and commissioning of the AM-T100 ToF camera and the configuration of the camera with the aid of the CONSAM-T application software and for operation of the AM-T100 OS internal camera operating system.

1.2 Target group of the operating instructions: authorised qualified personnel

All operations described in this manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

1.3 Explanation of the symbols used



Information, hint, note:

This symbol indicates useful additional information.



Caution: Failure to comply with this warning notice could lead to failures or malfunctions.

Warning: Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

1.4 Appropriate use

The Schmersal range of products is not intended for private consumers.

The camera must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.



Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

1.6 Warning about misuse



In case of inadequate or improper use or manipulations of the camera, personal hazards or damage to machinery or plant components cannot be excluded.

1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting, installation or configuration or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden, the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

1.8 Supporting documents

The following documents are supporting documents:

- AM-T100 operating instructions (included or available for download at products.schmersal.com)
- Software Licence Contact (on the internet at products.schmersal.com)
- Declaration of conformity

1.9 Abbreviations used

Designation	Meaning
iToF	Indirect Time of Flight
PoE	Power over Ethernet
FPGA	Field-Programmable Gate Array
FPGA PL	FPGA Programmable Logic
FPGA PS	FPGA Processing System

2 Product description

2.1 Performance features

The AM-T100 is a ToF camera with an image rate of up to 60 fps and a resolution of 640 x 480 pixels. With a field of vision of 67" x 51" and high-performance IR illumination, it can detect objects within a range of up to 6 metres¹⁾.

The camera is configured using the CONSAM-T application software, which allows for creation and monitoring of the complex 3D zones. If the camera detects objects within these zones, digital outputs are switched. In addition, digital inputs can be used to switch back and forth between different 3D zones.

The AM-T100 can also supply image data for common image processing software via the standardised GigE Vision and GeniCam interfaces. The integrated SDK allows software developers and integrators to configure the camera and create customer-specific software applications.

1) Depending on the remission properties of the target objects, a range of up to 30 m can be achieved.

2.1.1 CONSAM-T application software

The CONSAM-T application software for Windows is used for camera configuration. The settings are saved in a project file and transferred to the camera. A detailed description can be found in chapter 6 "CONSAM-T application software user interface" from page 30.

2.1.2 AM-T100 OS operating system

The AM-T100 OS is the operating system that is pre-installed on the camera, that runs on the camera autonomously and that can be called via a browser. A detailed description can be found in chapter 7 "AM-T100 OS operating system user interface" from page 53.

2.1.3 System requirements

The following system requirements apply to operation of the AM-T100 camera and the CONSAM-T application software:

- 2 GB free disc space
- 1 x Ethernet 100/1000 MBit/s – RJ45
- Windows 10 as of version 21H1
- Optional: PoE-capable switch or PoE injector, standard IEEE 802.3bt

2.2 Mode of operation

The AM-T100 ToF camera works according to the indirect time of flight measurement principle, whereby the camera emits a continuous beam of modulated light and measures the phase shift between the emitted and reflected light. This phase shift is used to determine the distance between the sensor and the reflecting object. The greater the phase shift, the farther away the object. The camera can then calculate the distance travelled by the light and thus determine the distance between the camera and the object. The phase shift is determined for each individual pixel in the image.

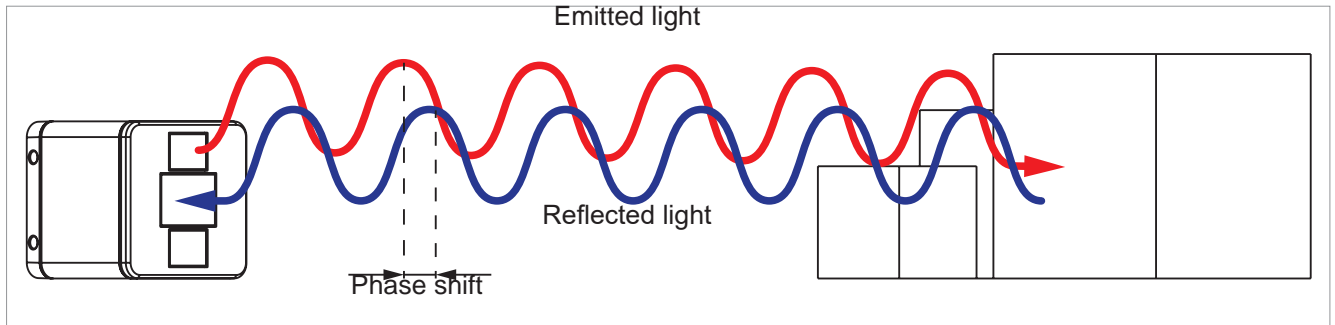


Fig. 1: The greater the phase shift, the greater the distance to the object

The results can be depicted in several ways:

A 2D greyscale image, a 2D image in which the depth information of an object is shown through greyscales, and a point cloud, in which each measured point contains depth information. The depth information can be visualised by user-defined colour scales.

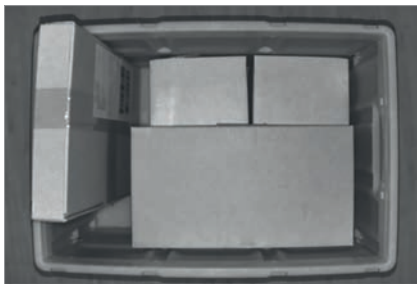


Fig. 2: Image acquisition

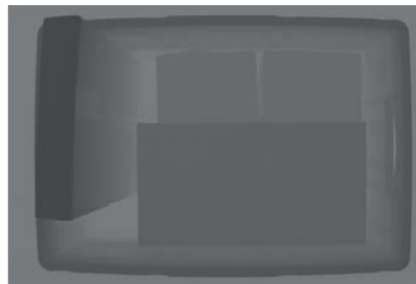


Fig. 3: Depth depiction

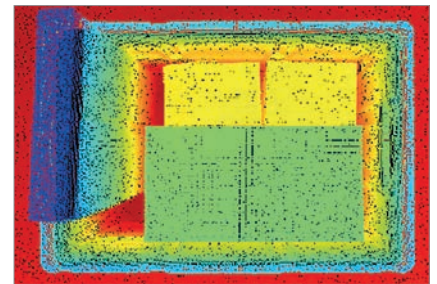


Fig. 4: Point cloud depiction

The camera can be used for various applications, especially where rapid, accurate, non-contact and continuous distance measurements are required. Some applications include:

- Logistics and packaging: in logistics and packaging, the camera can be used for packaging support, box filling, stacking, volume recording or labelling in order to boost the efficiency and accuracy of processes.
- Production monitoring: by monitoring a production process, the camera can identify bottlenecks, improve efficiency and reduce rejects. This allows problems to be identified promptly and rectified.
- Autonomous vehicles: on autonomous vehicles, the camera can be used to monitor the surroundings and detect obstacles so as to ensure fail-safe navigation.
- Image processing: the camera can be used in image processing to create 3D models, Augmented Reality applications or to detect objects in real time.
- Robotics: in robotics, the camera can be used for object detection and distance measurement in order to ensure safe and accurate robot movements.

2.3 Technical data

Designation	Description
Standards	EN 61326-1, EN IEC 60825-1
Working principle	iToF (indirect Time-of-Flight)
Material of the housings	Die-Cast Aluminum
Mechanical data	
Dimensions (H x W x D)	70x70x72 mm
Mounting holes	2x Ø5.3 mm x 70 mm
Tightening torque, fixing screws	1.4 Nm
Mechanical data – Termination	
Termination	I/O connector M12, 8-pole, A-coded Ethernet connector M12, 8-pole, X-coded
Ambient conditions	
Degree of protection	IP67 ¹⁾
Ambient temperature	0 ... +45 °C ^{2) 3)} 0 ... +40 °C ^{2) 4)}
Storage and transport temperature	-20 ... +85 °C
Relative humidity, max.	93%, non condensing, non icing
Permissible installation altitude above MSL, max.	2,000 m
Image acquisition	
Resolution	640x480 px
Frame rate, max.	60 fps
Wave length of the laser diode	850 nm
Field of view (H x V)	67° x 51°
Range, max.	0.2 ... 6 m ⁵⁾
Recommended target reflectivity	20 ... 90 %
Measurement precision	<1 %
Depth resolution	1 mm
Laser class	Laser class 1
Data interface	GenICam

1) If both plug connections are closed.

2) The camera can be operated at an ambient temperature from -20°C after a warm-up period of 30 minutes.

3) Maximum temperature with ACC-AM-MS-F mounting bracket.

4) Maximum temperature without mounting bracket.

5) Higher ranges according to the remission properties of the target object.

Designation	Description
Electrical data	
Operating voltage	24 VDC \pm 10 % or PoE IEEE 802.3bt
Electrical power consumption, typically / max.	15 W / 40 W
Electrical data - Digital inputs/outputs	
Inputs/outputs	2x opto-isolated, potential-free input 2x opto-isolated, potential-free output
Interface	
Ethernet	10/100/1000 Mbps Ethernet, GigE Vision 2.0 Compliant
Status indication	
Switching condition:	green, red, orange LED
Supply voltage:	green LED

3 Assembly

3.1 General mounting instructions

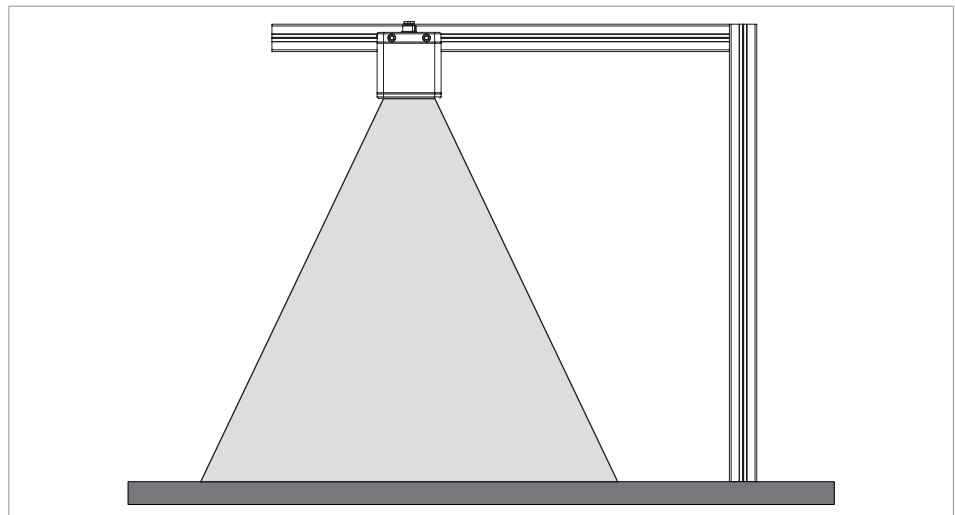
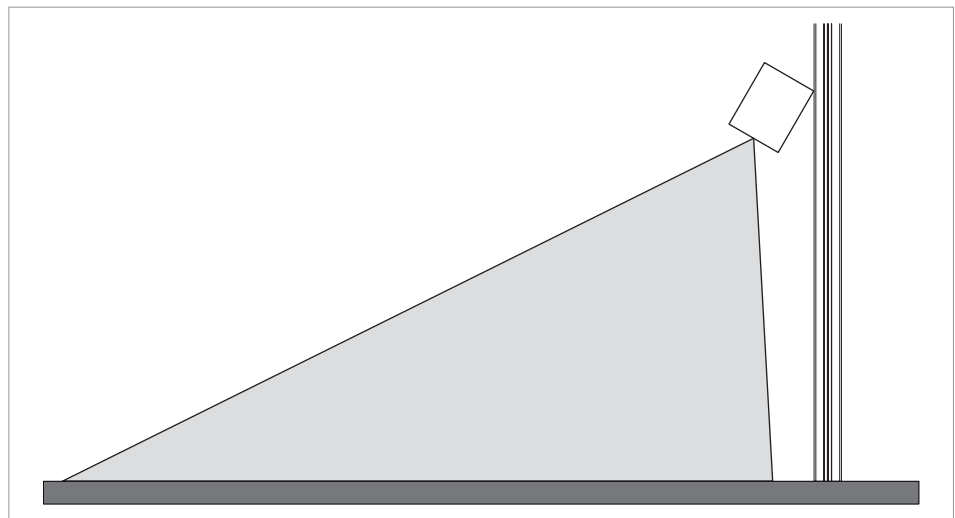


Fitting is only authorised in a de-energised condition

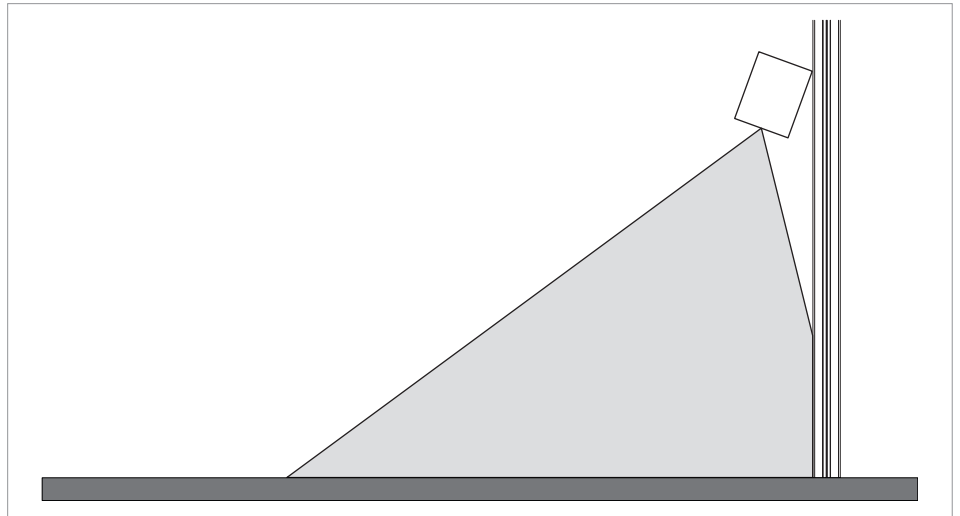
- Do not install the camera near high-voltage equipment and power consumers.

To prevent additional reflection surfaces, the field of view and the installation level must not intersect.

Correct



False



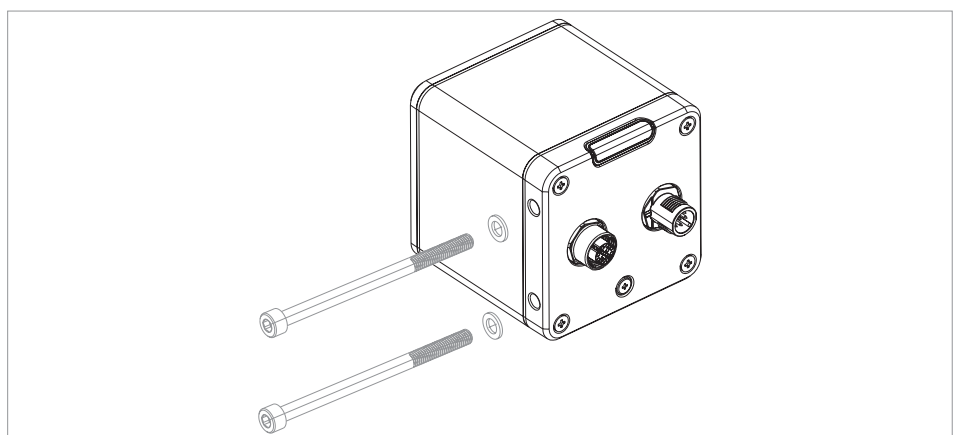
In order to optimally dissipate the heat generated during operation and to guarantee the performance data of the camera over the entire operating temperature range, the camera must be mounted in such a way that the heat is dissipated. This is done via a suitable holder or via contact surfaces between the housing and the environment.



Please note that the IP degree of protection can only be guaranteed if the cables are properly connected to the two sockets at the rear of the camera or the sockets are sealed with protective caps.

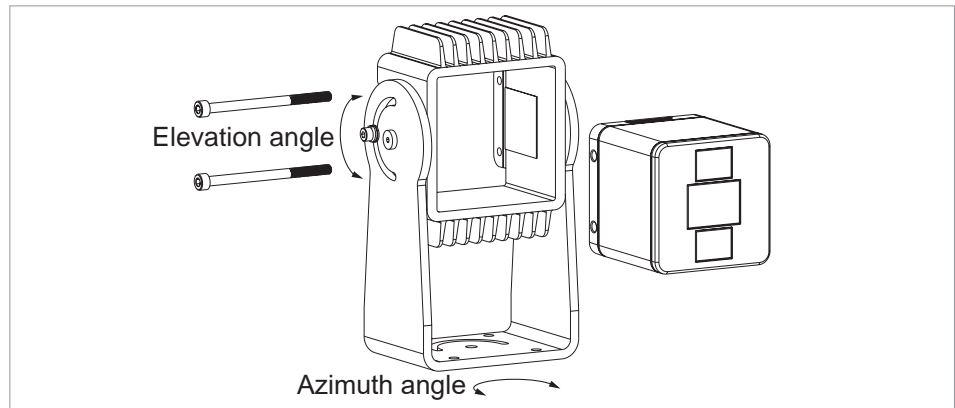
If the user does not require precise alignment setting, the camera can be fitted directly to a metallic component of a machine, such as an aluminium profile.

M5 clearance holes are provided for camera mounting. The bolts and plain washers are not included in the delivery and must be chosen according to the desired mounting type.



**ACC-AM-MS-F, 103049934
mounting bracket**

The following mounting bracket is available to enable flexible assembly and adjustment of the camera to vertical surfaces or on horizontal levels. The bolts are included in the delivery. Align the heat transmission pad to the square marking on the inside of the mounting bracket. The heat transmission pad is optional and is used to improve contact between the camera and the bracket. The user can decide whether or not the heat transmission pad is needed for heat dissipation.



- Insert the camera into the hollow space in the bracket.
- Tighten the fixing bolts on the camera.
- Adjust the azimuth and elevation angles.

3.2 Dimensions

Camera AM-T100

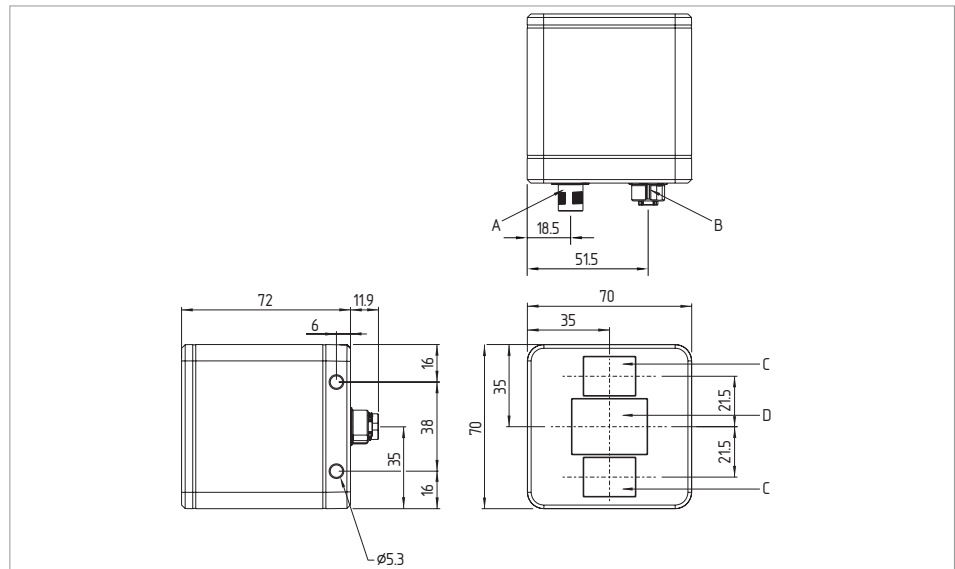


Fig. 5: Dimensions of camera AM-T100 (measurements in mm)

Pos.	Designation
A	I/O connection
B	Ethernet connection
C	Laser diode
D	Lens

Mounting bracket ACC-AM-MS-F

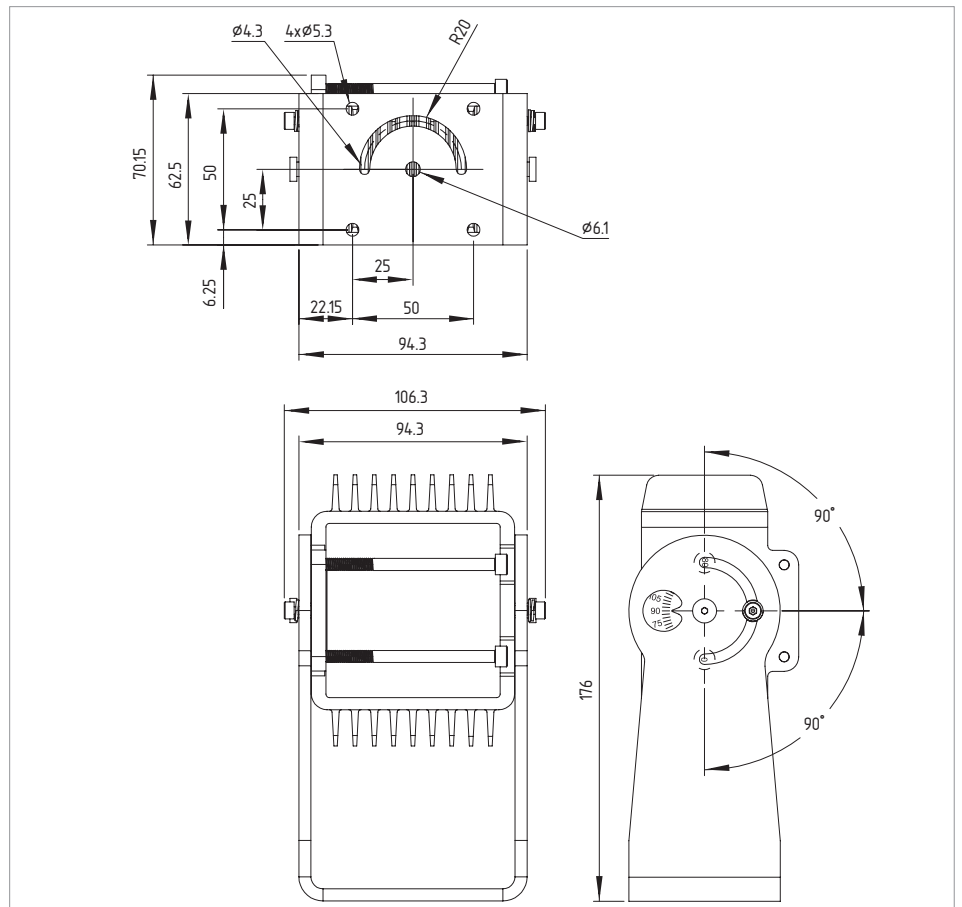


Fig. 6: Dimensions of mounting bracket ACC-AM-MS-F (measurements in mm)

4 Electrical connection

4.1 General information for electrical connection

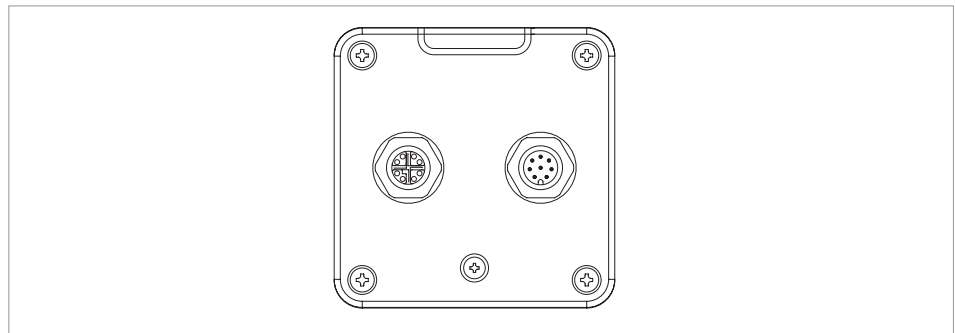


The electrical connection may only be carried out by authorised personnel in a de-energised condition.

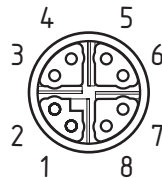
- Provide the requisite electrical cable fuse for the installation.
- Before switching on, ensure that all signal connections and the power supply are correctly connected to prevent damage.

The connection is made via an I/O connector and/or an Ethernet connector.

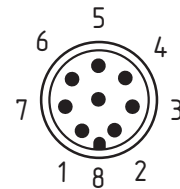
4.1.1 Wiring configuration



**Ethernet connector plug
M12, X-coded**

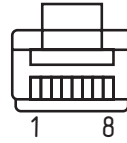
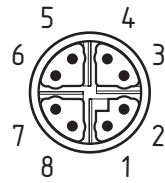


**I/O connector plug
M12, 8-pole, A-coded**



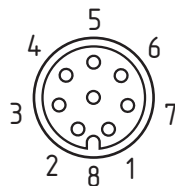
4.1.2 Connector accessories

Ethernet connecting cable M12, X-coded
ACC-AM-CON-VIE-SS8P-M12-RJ45-G-5M-S, 103048465



M12, X-coded PIN	Signal	RJ45, 8P8C PIN
1	BI_DA+	1
2	BI_DA-	2
3	BI_DB+	3
4	BI_DB-	6
5	BI_DC+	7
6	BI_DC-	8
7	BI_DD+	5
8	BI_DD-	4

I/O connecting cable M12, 8-pole, A-coded
ACC-AM-CON-A-K8P-M12-G-5M-S, 103048464



PIN	Function	Colour code of the Schmersal connector plug to DIN 47100
1	Input 1	WH
2	Output 1 (Warning)	BN
3	Input 2	GN
4	Output 2 (Alarm)	YE
5	24 VDC power supply	GY
6	GND outputs	PK
7	GND power supply	BU
8	GND inputs	RD

5 Commissioning

5.1 Tips for using the camera

When acquiring images, the following must be taken into consideration in order to obtain accurate distance measurements:

Assembly

The camera must be installed so that there are no unnecessary objects or reflections in the field of view. Large surfaces in the foreground of the field of view must be removed in particular in order to avoid over-exposure of the sensor.

Cameras installed adjacent to one another can influence one another and cause measurement errors. When using multiple cameras, it is important that the installation positions be chosen so that the cameras cannot influence one another. If this isn't possible, the anti-interference function for multiple devices can be activated with the "Interoperability" function (chap. 6.2.2, p. 32). This function creates random modulation changes to the signals, which enable device-specific signal differentiation and prevent interference with other devices.

Influence of different material properties on image acquisition

Measured values are also influenced by material properties such as reflection, transparency, scatter and absorption. Materials that are highly reflective are highly suitable as they reflect the emitted light back well. Metals and shiny surfaces can, however, cause excessive reflection with over-exposure. Transparent materials, such as glass and perspex, can allow the light through and falsify the depth information. To ensure good signal strength, objects with light-penetrating materials and sufficient remission must be used.

Multiple reflections

The illumination of a scene may cause the modulated light from an object or from surfaces such as concrete, walls and ceilings to be reflected back to the sensor indirectly rather than directly. This can cause artifacts (unwanted, additional data not created by real objects). The light beam that covers the theoretical direct path mixes with the indirectly reflected light beam. In that case, different phase information becomes overlaid and falsifies the measurement data. This means that the phase shift can no longer be reliably detected and there will be a discrepancy between the calculated and actual distance. Multiple reflections can also be caused by dust, droplets of water and transparent objects.

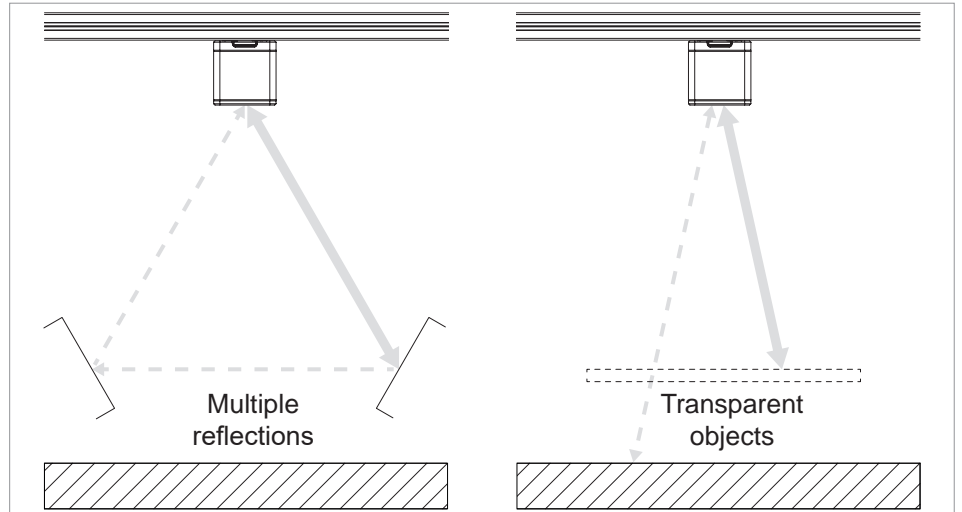


Fig. 7: Unwanted reflections

Flying pixel

When the light beams hit corners and edges of objects, "flying pixels" become visible. At these points, multiple measurement points come together, which may be at different depths. The measured distance is between the foreground and the background.

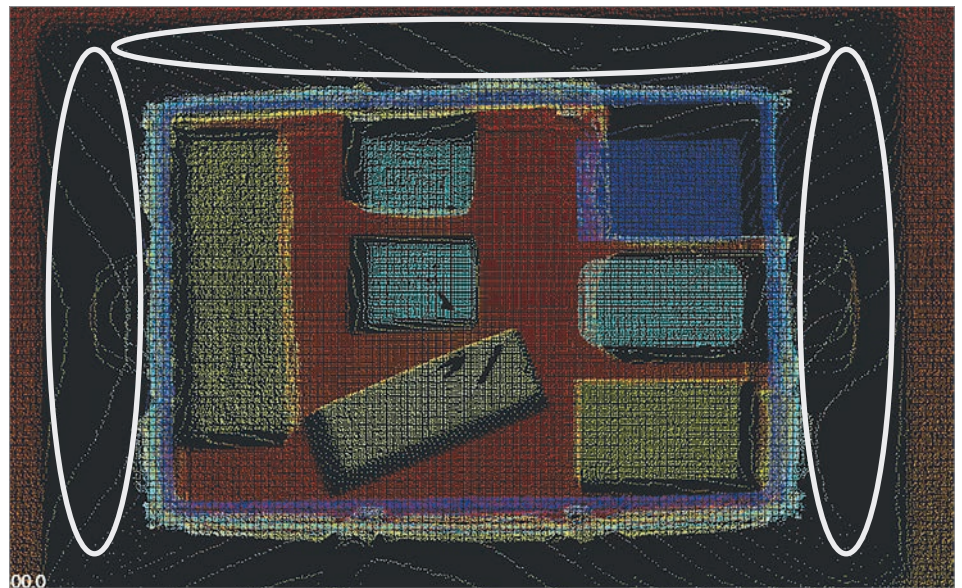


Fig. 8: Flying pixel

Influence of the distance on accuracy

The accuracy of image acquisition decreases as distance increases, as the intensity of the reflected light falls, leading to reduced signal quality. With this in mind, it's important to take the distance between the object and the camera into consideration when planning ToF acquisition and, if necessary, to adjust the position of the camera or the exposure.

Guideline value for an exposure of 1000 µs and range mode of 7500 mm:

Objects with high reflection (80 %), at 6 m distance	
Accuracy	± 50 mm
Accuracy	< 16 mm
Precision	< 23 mm
Objects with low reflection (10%) at max. 3 m distance	
Accuracy	± 50 mm
Accuracy	< 13 mm
Precision	< 23 mm

Influence of ambient illumination

The camera operates in the visible, near infrared wave length range of 850 nm. When choosing the ambient illumination, it must be ensured that this is not in the same wave length range and can influence the camera. Avoid sources of light, such as direct sunlight or halogen bulbs, as these are in a range that could interfere with the acquisition.

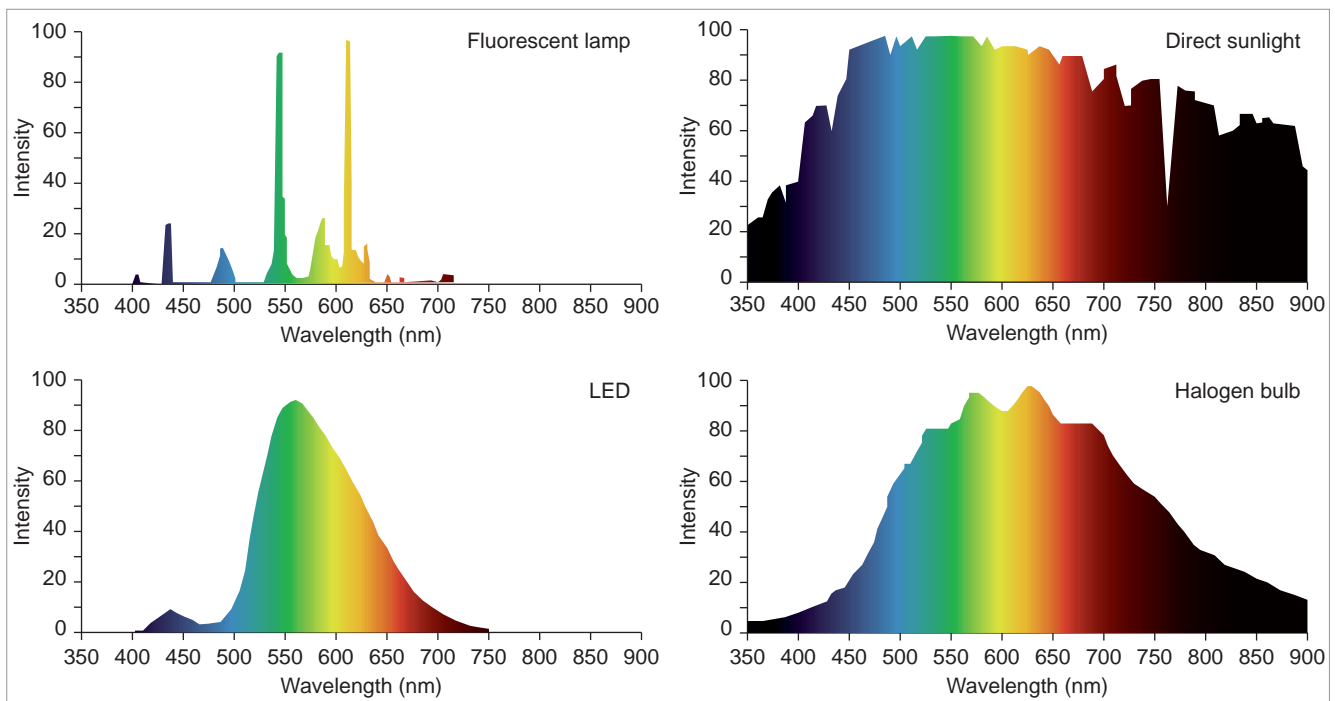


Fig. 9: Spectrums of different sources of light

Distance calculation

The distances are calculated from the front edge of the camera to the reflecting object. Objects that are outside the visible axis of the camera are calculated as farther away accordingly. The distances are not converted into absolute values (dashed arrow).

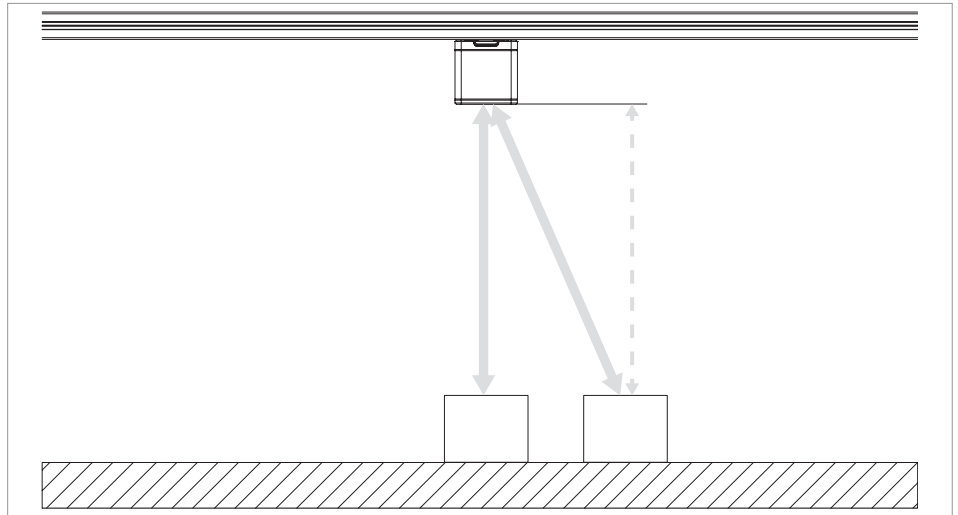


Fig. 10: Distance calculation

Setting the range

The range under "Device Settings > Range Mode" should be greater than or equal to the maximum radial distance in a scene in order to prevent distortion (see thick arrow in Fig. 10).

An incorrectly set range will give rise to a distorted point cloud. The shifted points of a distorted point cloud can protrude into the configured zone and constantly activate it.

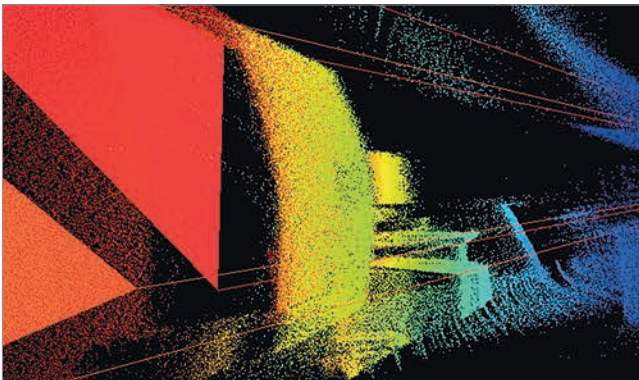


Fig. 11: Distorted point cloud due to incorrectly set range. Straight surfaces are depicted as curved. The zone is activated.

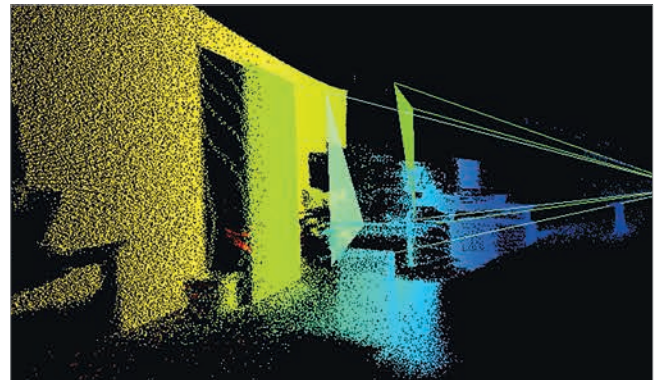


Fig. 12: Correctly set range. Point cloud is depicted correctly. Straight surfaces are depicted as straight. The zones are not activated.

Distance ambiguity

When measuring greater distances, the periodic repetition of the phase angle can cause the measured phase shifts to be attributed to different distances so that a determined distance is not clear.

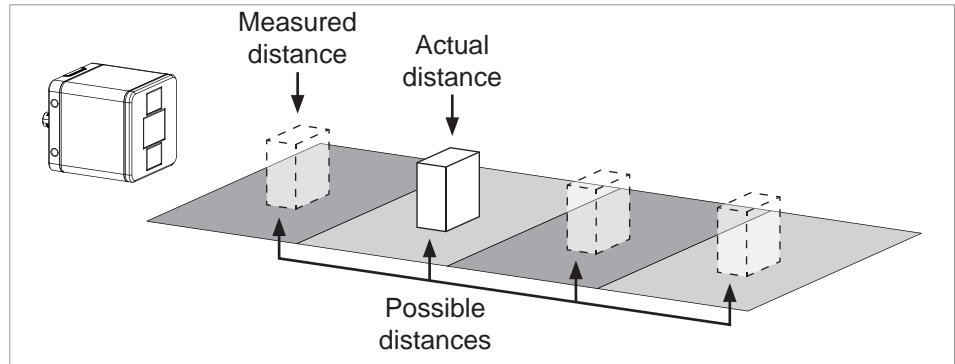


Fig. 13: Distance ambiguity due to periodic phase angle

To ensure unambiguous results at greater distances, the AM-T100 uses multi-frequency technology. This uses two phases with different frequencies for distance measurement. Each modulation frequency has a different ambiguity distance (D_1 , D_2). The actual distance of an object can therefore match only at points at which the results of both measurements are identical.

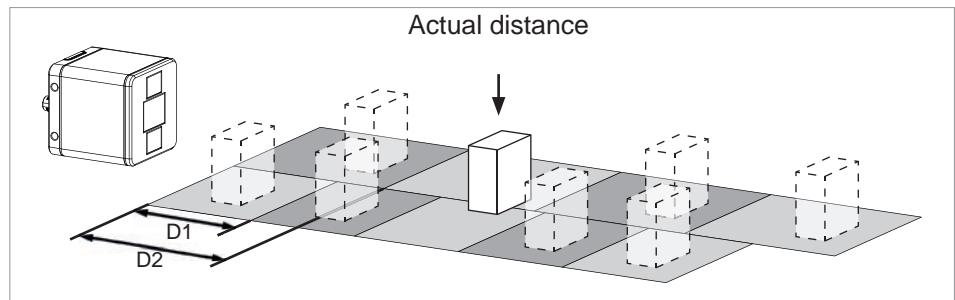


Fig. 14: Multi-frequency technology for unambiguous distance measurement

Coordinate system

The coordinate system of the camera can be imagined as a left-hand coordinate system with a y axis oriented downwards. In this coordinate system, the positive x axis is consistent with the horizontal expansion to the right, the positive y axis to the vertical expansion downwards and the positive z axis points in the direction of the camera's viewing angle.

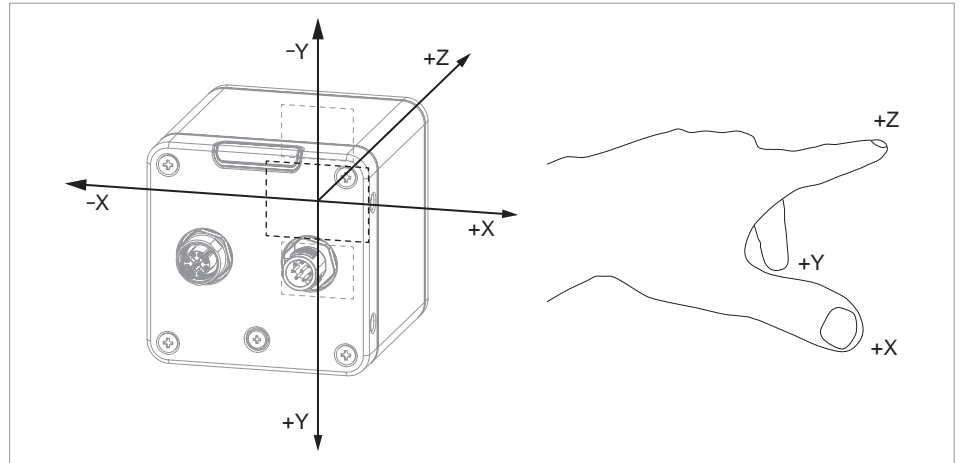


Fig. 15: Coordinate system of the sensor

GigE Vision and GenICam

The camera is equipped with GigE Vision and GenICam interfaces to enable simple and standardised data exchange.

The GigE Vision standard (Gigabit Ethernet for Machine Vision) offers reliable and cost-effective options for the transmission of image data over a Gigabit Ethernet interface. With standard network cables, distances of up to 100 metres can be bridged without difficulty.

GenICam (Generic Interface for Cameras) is a standard for a standardised interface for the control of image processing systems and cameras.

Software Development Kit

The camera has a dedicated Software Development Kit (SDK). The SDK comprises a collection of programming tools and libraries that software developers can integrate into their own software.

The SDK is described in a separate manual.

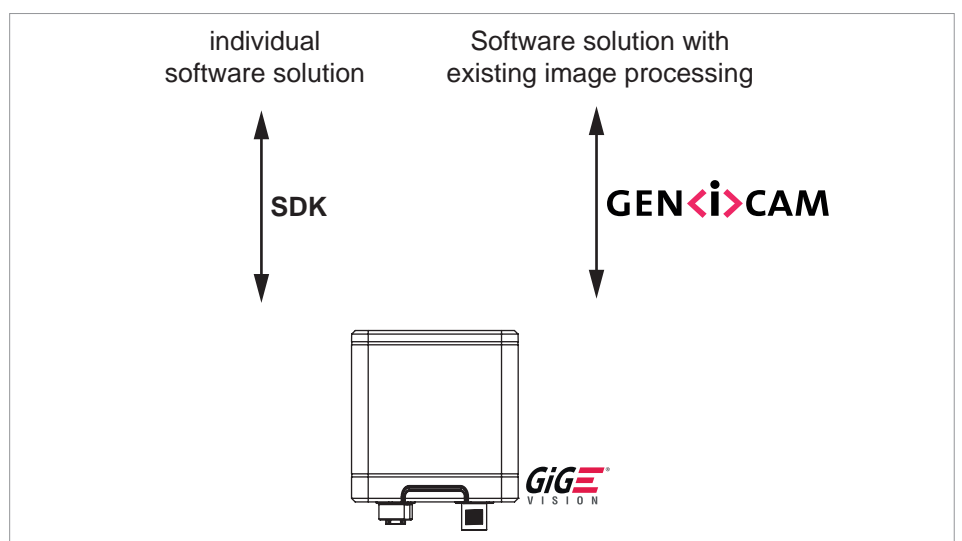


Fig. 16: Transmission and programming interfaces

5.2 Download

The CONSAM-T application software can be downloaded from products.schmersal.com.

The CONSAM-T application software contains the current firmware and can be updated after installation (see chap. 6.2.5, p. 38).



Fig. 17: CONSAM-T setup assistant

Here's how to install the CONSAM-T application software:

- Start the setup assistant by double clicking on the installation file.
- Select "Complete".
The software is installed in "C:\Programs\Schmersal\CONSAM-T\desktop".
- Carry out the AM-T100 OS Update (see chap. 6.2.5, p. 38).



Do not switch off the power supply during the update and do not cancel the update. Otherwise the camera may be damaged.

5.3 Uninstalling the software

Here's how to uninstall the CONSAM-T application software:

- Start the setup assistant by double clicking on the installation file.
- Select "Remove".
The software is uninstalled.

As an alternative, the software can also be uninstalled via "Apps and Features" in Windows settings.

5.4 Updating the software

A software update updates both the application software and the camera's operating system.

- Uninstall the software from the PC.
- Then, install the new software version on the PC.
- Carry out the AM-T100 OS Update (see chap. 6.2.5, p. 38).



Do not switch off the power supply during the update and do not cancel the update. Otherwise the camera may be damaged.

5.5 Functional testing

The following must be ensured before commissioning:

- Check that the camera is firmly seated.
- Check the integrity of the cable connections.
If necessary, use connector caps.
- Remove dirt residue.
 - Clean the camera with a dry cloth. Do not use cleaning solutions containing acids or alkalis.
 - Cleaning with wet cloths could damage the glass coating and lead to additional contamination.

5.6 Connecting the camera



This section outlines installation of the camera. Further information and camera assembly can be found in the operating instructions.

The AM-T100 can be connected in two ways.

1. I/O cable and Ethernet cable (permanently or temporarily)

The I/O cable must be used if the camera is to be controlled via the digital inputs and outputs.

The voltage is supplied through the I/O cable. The camera is configured via the Ethernet cable.

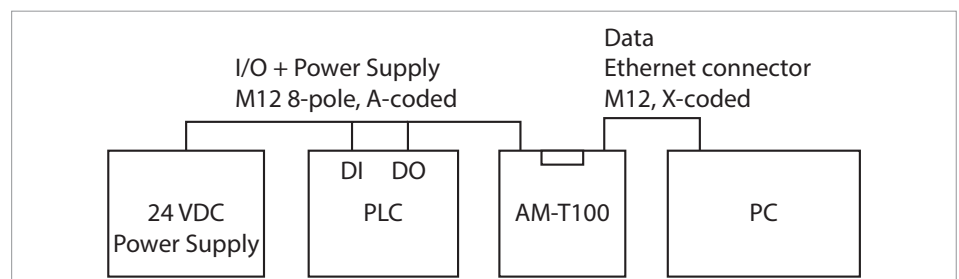


Fig. 18: I/O cable and Ethernet cable for configuration

- Connect the camera to the power supply via the I/O cable and the digital inputs and outputs of a control system.
- Connect the camera to the PC via the Ethernet cable.

The Ethernet cable can be disconnected after configuration. The camera is only operated via the I/O cable.

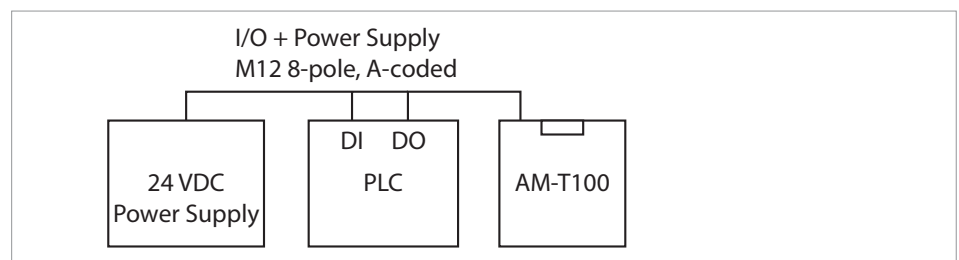


Fig. 19: I/O cable

2. Ethernet cable

If the digital inputs and outputs are not required, the camera can be connected via the Ethernet cable. Power supply and data communication are used exclusively via the Ethernet interface. The power is supplied via a PoE-capable switch to the PoE standard IEEE 802.3bt. As an option, the power can be supplied via the I/O cable.

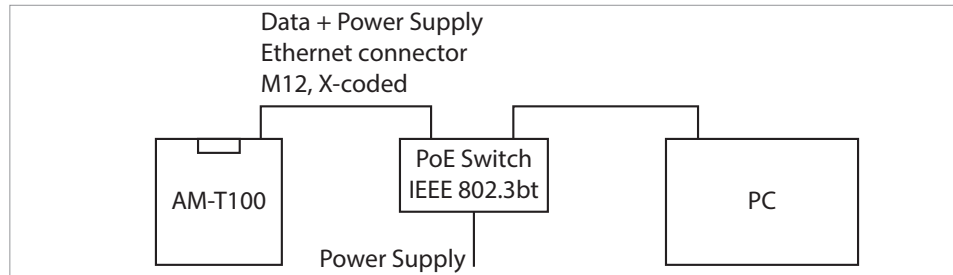


Fig. 20: Ethernet cable

- Connect the camera to the PC via a PoE--capable switch.

5.7 Establishing the connect to the camera

The following describes the basic configuration of the camera. An extensive description can be found in chapter 1 "About this document" from page 6 and in chapter 7 "AM-T100 OS operating system user interface" from page 53. More information can be found in chapter 8 "Diagnosis and troubleshooting" from page 60.

Once the camera has been switched on, a connection is established to the AM-T100 OS operating system and, depending on the setting, a project is started or executed (see chapter 7.1.4 "More" on page 58). As a result, a PC is not required for a camera restart.

To connect the camera to the CONSAM-T application software, proceed as follows:

- Start the CONSAM-T application software.

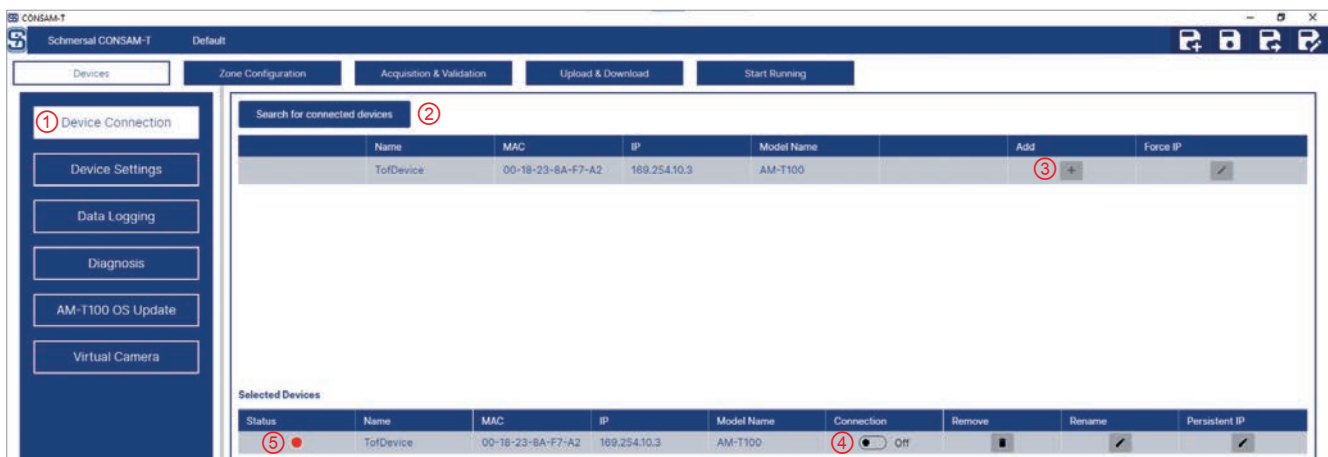


Fig. 21: Devices > Device Connection

- Navigate to the "Devices > Device Connection" (1) menu.
- Click on "Search for connected devices" (2) to find the connected camera on the network.
- Click on the "Add" button (3) to select a camera.

- Click on the "Connection" button (4) to establish the connection to the camera.

The "Status" indicator (5) lights up green if the connection is successful.

5.8 Configuring the camera

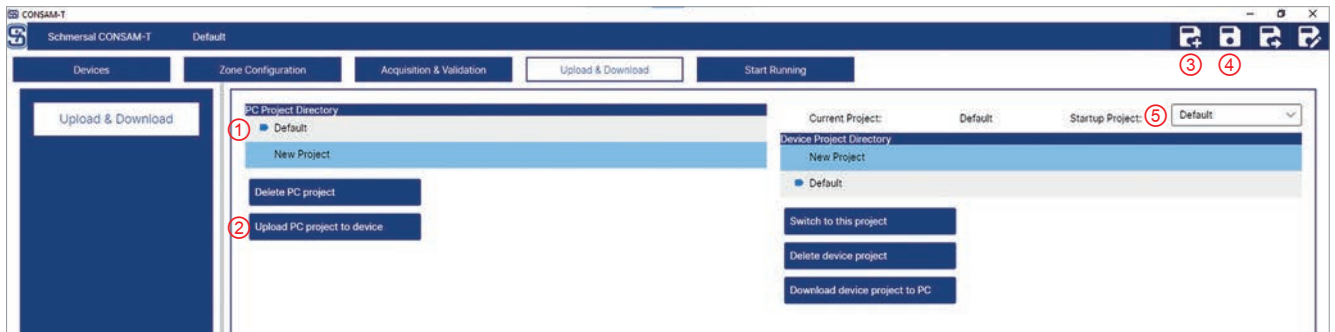



Fig. 22: Upload & download

This menu allows projects to be managed on the PC and on the camera. Projects are used to save different settings. The project that is currently loaded is indicated by the  symbol.



Changed settings are not saved automatically. If the software is terminated or a project is newly created or loaded, previous settings are lost.

- Click on the "Save" button (4) to save the settings in a project.

- Save the settings, if necessary.
- Click on the "New" button (3) to create a new project.

A newly created project is activated automatically.

5.9 Implementing settings

The camera is supplied calibrated, which means that initial calibration is not required.

The reflectivity and the parameters outlined in chapter 6.2.2 “Device Settings” on page 32 must be adjusted according to the assembly and ambient conditions in order to ensure accurate measurement results.

Under "Device Settings", select the next "Range Mode" up to the maximum distance in your scene in order to avoid distortions.

With the help of this software, the camera can be configured to monitor complex 3D zones. A warning or alarm can be assigned to each zone that is triggered as soon as an object penetrates or leaves the zone. Multiple, including identical, zones can be defined. Different configurations can be activated through the combination of signals from the digital inputs.

- Configure the zones as outlined in chapter 6.3 “Zone Configuration” from page 40.
- Navigate to the "Acquisition & Validation" menu and click on the "Execute Continuous" button to start continuous image acquisition and test the configured zones.

Warnings are output via the digital output 1.
Alarms are output via the digital output 2.

5.10 Loading settings on the camera

After successful configuration, the projects saved on the PC can be transferred to the camera so that the camera can be operated autonomously.

- Save the settings, if necessary.
- Select a project under "PC Project Directory" (1) and click on the "Upload PC project to device" button (2) to copy a project from the PC to the camera.
- Under "Startup Project" (5), select the project that should be started on the camera by default.



Fig. 23: Start Running

- Navigate to the "Start Running" menu (6).
- Click on the "Run Project on device in web user interface" button (7) to call the AM-T100 OS operating system.

A browser window opens.

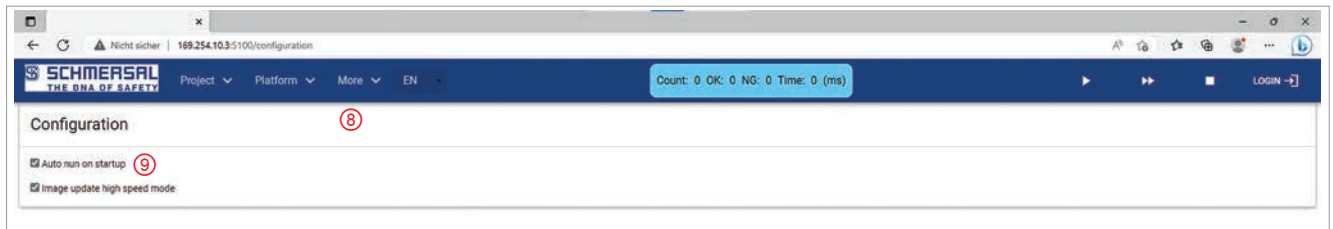


Fig. 24: More > Configuration

- Navigate to the "More > Configuration" menu (8).
- Select the "Auto run on startup" checkbox (9).

The selected projected is loaded and started automatically.

5.11 Reading out log and point cloud files

Each entry and exit into/from a zone is saved in a log file. A point cloud file is also saved each time an event occurs.

The data can be read out as outlined in chapter 6.2.3 "Data Logging" on page 35.

6 CONSAM-T application software user interface

6.1 Overview

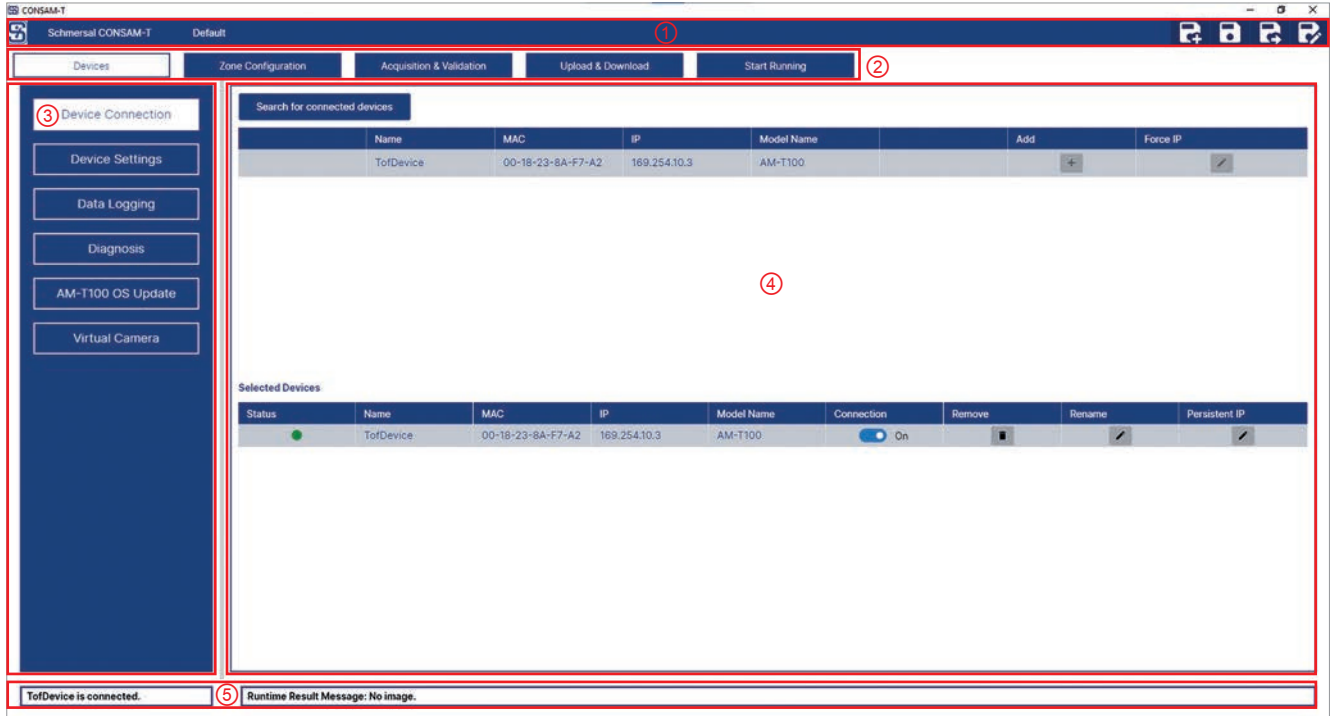


Fig. 25: Start screen

Pos.	Designation	Description
1	Symbol bar for quick access	Displays the active project name, create, save, save as and edit a project.
2	Main menu	Main menu bar
3	Submenu	Submenu bar
4	Main window	Display and changes in main window
5	Status bar	Displays current device and software states

6.2 Devices

6.2.1 Device Connection

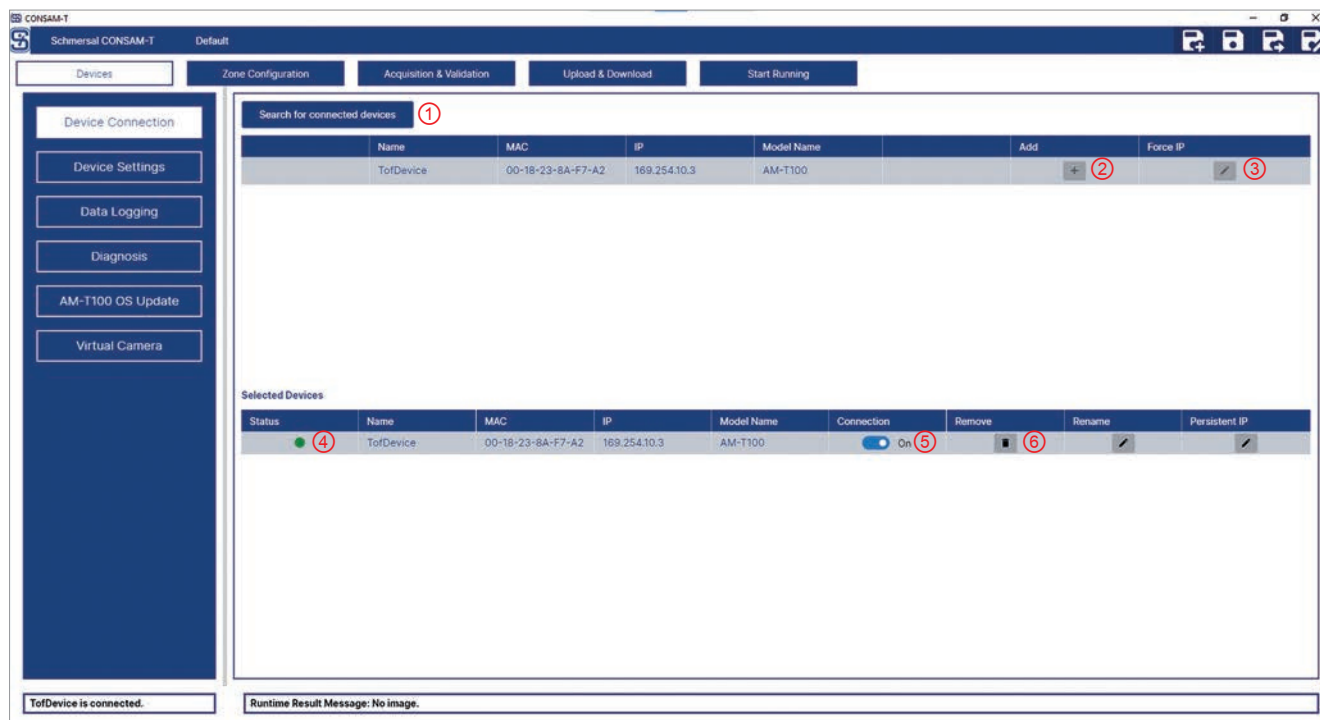


Fig. 26: Devices > Device Connection

Pos.	Designation	Description
1	Search for connected devices	Searches for new connected devices.
2	Add	Adds a new camera to the connection list.
3	Force IP	Changes an IP address.
4	Status	Displays the connection status.
5	Connection (On/Off)	Connects/disconnects a camera.
6	Remove	Removes a camera from the connection list.

In this menu, the camera is connected to the configuration software.

- Click on "Search for connected devices" (1) to find the connected camera on the network.
- Click on the "Add" button (2) to select a camera.
- Click on the "Force IP" button (3) to change the camera's IP address.

A submenu opens.

- Click on the "Parameter" table header to load the network information.
- In the "Force IP" field, change the IP address and click on the "Execute" button to adopt the changed IP address.
- Click on the "Connection" button (5) to establish the connection to the camera.

Click on the "Connection" button (5) to disconnect the connection again.

The camera can be removed with the "Remove" button (6).

In the event of connection problems, see chapter 8 "Diagnosis and troubleshooting" on page 60.

6.2.2 Device Settings

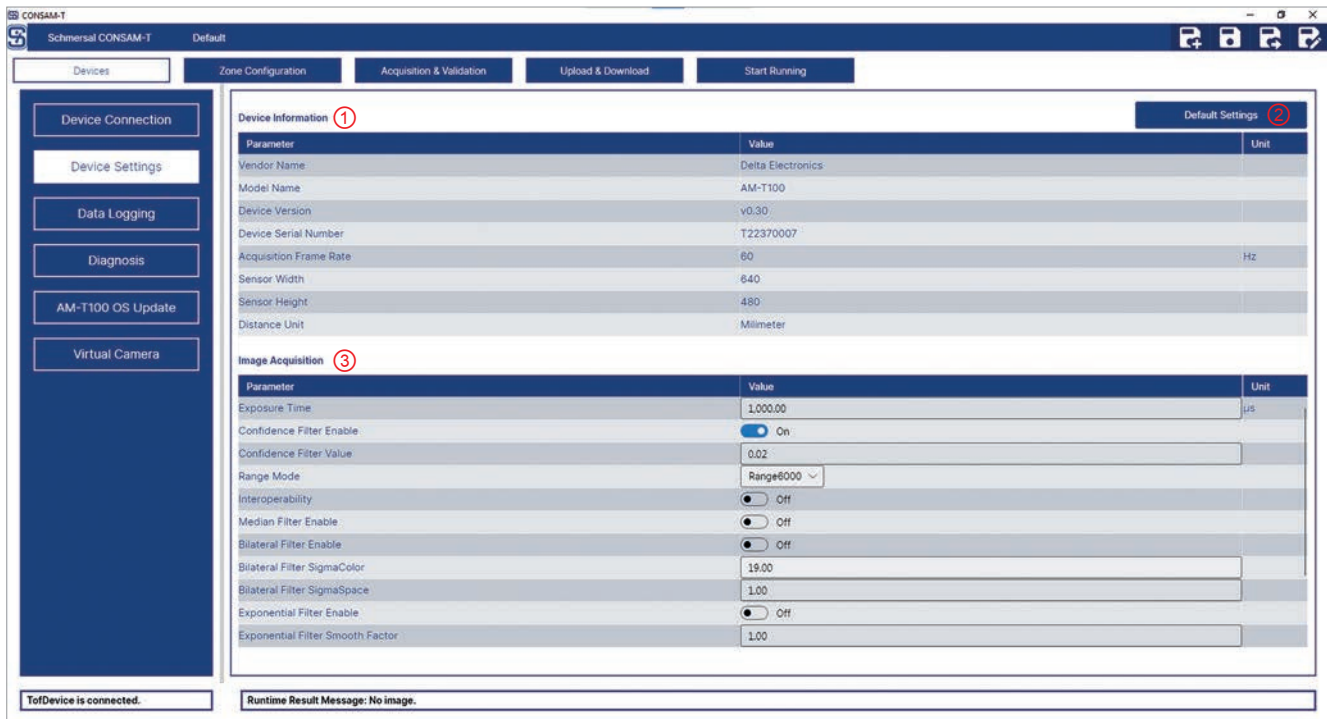


Fig. 27: Devices > Device Settings

Pos.	Designation	Description
1	Device Information	Detailed information on the connected device.
2	Default Settings	The "Default Settings" button resets all values to the factory settings.
3	Image Acquisition	The parameters for image acquisition can be set under "Image Acquisition".

This menu shows camera information and is where the parameters for image acquisition can be set.



The camera must be connected to CONSAM-T.



The error message in the "Runtime Result Message: Configuration setting is wrong." status bar does not refer to the settings in this menu but to the configuration of the zones.

Parameter description

Exposure Time:	<p>Exposure time setting (in μs) <i>Value range: from 1.00 to 1000.00</i></p> <p>Selection of the optimal exposure time depends on the degree of reflection of the surfaces to be measured and their distances. If heavily and poorly reflective surfaces need to be acquired at the same time, the exposure time must be adjusted so that the most heavily reflective surface at the shortest distance is no longer over-exposed. This can be checked in the intensity image and then on the depth chart. To achieve a higher signal quality, the exposure time must be set as long as possible, but under the saturation in any event. If required, the position and alignment of the camera can be varied in order to find the optimal exposure time.</p>
Confidence Filter Enable:	<p>This function activates the confidence filter.</p> <p>The accuracy of the ToF camera depends on a number of factors, including the power of the source of light, the receive and processing process of the sensor and distance to the object. In some cases, there may be errors or inaccuracies in the depth information acquired, especially in the case of difficult light conditions or materials that absorb or reflect the light.</p> <p>A confidence filter can help to reduce these errors by combining the recorded depth information with an estimate of the confidence or reliability of the data. The filter then decides which data is considered reliable enough to be processed further and which data should be ignored or filtered out in order to improve the quality of the depth information recorded.</p>
Confidence Filter Value:	<p>Setting the confidence filter value <i>Value range: from 0.00 to 1.00</i></p> <p>The higher the value, the higher the value is weighted.</p>
Exposure Filter Enable:	<p>This function activates the exposure filter.</p> <p>Over-exposure gives rise to "black", invalid pixels or depth information. If the exposure filter is activated, a time window can be set under "Zone Configuration" for which image acquisition is stopped in the event of over-exposure. During this time window, the last status of the zones is output.</p>
Range Mode:	<p>Setting the range <i>Value range: to 1500 mm, 1875 mm, 2000 mm, 6000 mm and 7500 mm</i> (the 30000 mm range is experimental. It should only be selected in the event of highly reflective objects).</p> <p>Select the next "Range Mode" up from the maximum distance in your scene in order to prevent distortion.</p>
Interoperability:	<p>This function activates the anti-interference function.</p> <p>This function creates random modulation changes to the signals, which enable device-specific signal differentiation and prevent interference with other devices.</p>
Median Filter Enable:	<p>This function activates the median filter.</p> <p>The median filter is suitable for removing "salt and pepper noise" from an image.</p>
Bilateral Filter Enable:	<p>This function activates the bilateral filter.</p> <p>The bilateral filter is a weighted filter that weighs the pixel values around every pixel and then forms a weighted average. The bilateral filter takes into consideration both the spatial similarity as well as the confidence value of pixels in an image in order to reduce the noise and improve edge retention. The bilateral filter is generally more effective when removing uniform noise and preserves fine details in the image.</p>
Bilateral Filter SigmaColor:	<p>This parameter determines the colour sensitivity of the bilateral filter. <i>Value range: from 1.00 to 300.00</i></p> <p>The higher the value, the higher the value is weighted.</p>

Bilateral Filter SigmaSpace:	This parameter determines the spatial sensitivity of the bilateral filter. <i>Value range: from 1.00 to 300.00</i> The higher the value, the wider the range around each pixel in order to find similar pixels that should be taken into account when smoothing.
Exponential Filter Enable:	This function activates the exponential filter. The exponential filter weights the pixel values from frame n and frame n-1 according to the smooth factor.
Exponential Filter Smooth Factor:	This parameter determines the smoothing factor of the exponential filter: <i>Value range: from 0.00 to 1.00</i> The higher the value, the higher the value is weighted.
Line Inverter Line 0:	Inversion of the input or output signal Input 1 (IN 1)
Line Inverter Line 1:	Input 2 (IN 2)
Line Inverter Line 2:	Output 1 (OUT 1)
Line Inverter Line 3:	Output 2 (OUT 2)

6.2.3 Data Logging

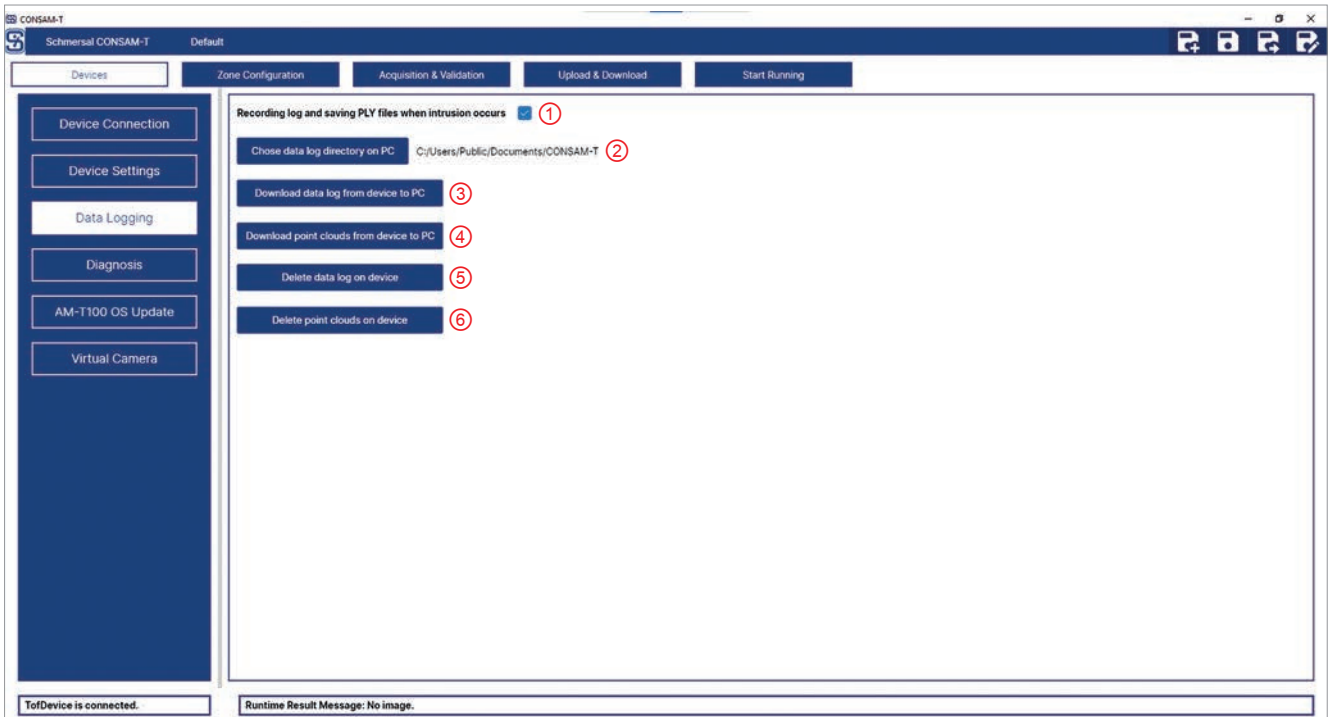


Fig. 28: Devices > Data Logging

Pos.	Designation	Description
1	Recording log and saving PLY files when intrusion occurs	Saves log and point cloud files in the vent of an entry or exit into/from a zone. A point cloud file of several megabytes is created for each event. Sufficient disc space must be made available.
2	Choose data log directory on PC	Directory for saving the log and point cloud files to the PC. Default directory: C:\Users\Public\Public documents\CONSAM-T Entry and exit into/from a zone are saved to the "intrusion.log" log file in the "Intrusion" subdirectory. A point cloud in PLY format is also saved at the time of each event.
3	Download data log from device to PC	Transfer the log file from the camera to the PC. The "Intrusion.log" log file is saved in the "Download" subdirectory.
4	Download point clouds from device to PC	Transfer the point cloud files from the camera to the PC. The point cloud files are saved in the "Download" subdirectory.
5	Delete data log on device	Deletes the log file from the camera.
6	Delete point clouds on device	Deletes the point cloud files from the camera.

This menu is used to manage the acquisition of entries into and exits from a zone in a log file as well the corresponding point clouds.

The following must be satisfied for acquisition on the PC:

- The camera must be switched on.
- The PC and the application software must have been started.
- The save location must have been determined.
- The connection to the camera must be inactive in the operating system under "Platform > Camera".
- The connection to the camera must be active under "Device Connection".
- The "Execute Continuous" image acquisition is active under "Acquisition & Validation".

The following must be satisfied for acquisition on the camera:

- The camera must have been started.
- The connection to the camera must be inactive under "Device Connection" in the configuration software on the PC.
- The connection to the camera must be active under "Platform > Camera" in the operating system.
- "Execute Continuous" image acquisition must active.

6.2.4 Diagnosis

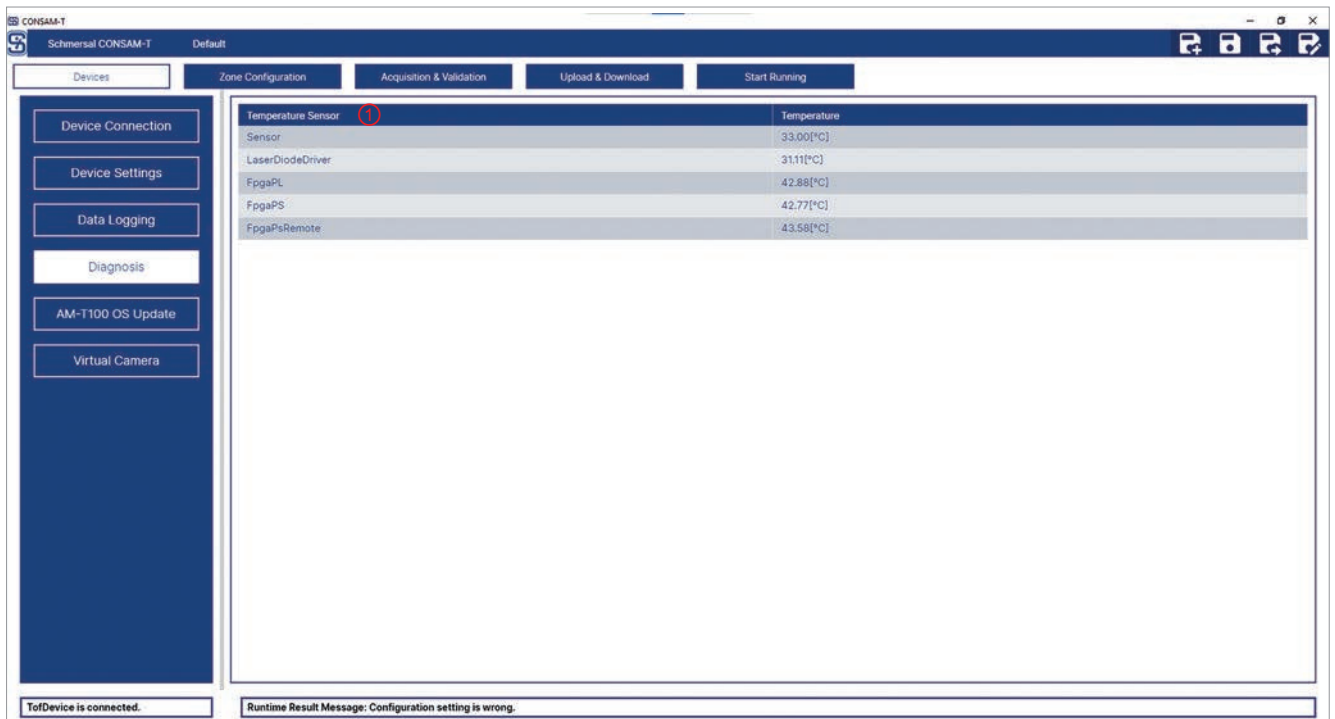


Fig. 29: Devices > Diagnosis

Pos.	Designation	Description
1	Temperature Sensor	Temperature display for the individual components: Sensor, Laser Diode Driver, FPGA (Field-Programmable Gate Array), FPGA PL (FPGA Programmable Logic), FPGA PS (FPGA Processing System), FPGA PS Remote (FPGA Processing System Remote)

The temperatures of the individual components are displayed in this menu. There is no automatic shutdown in the event of an excess temperature.

6.2.5 AM-T100 OS Update

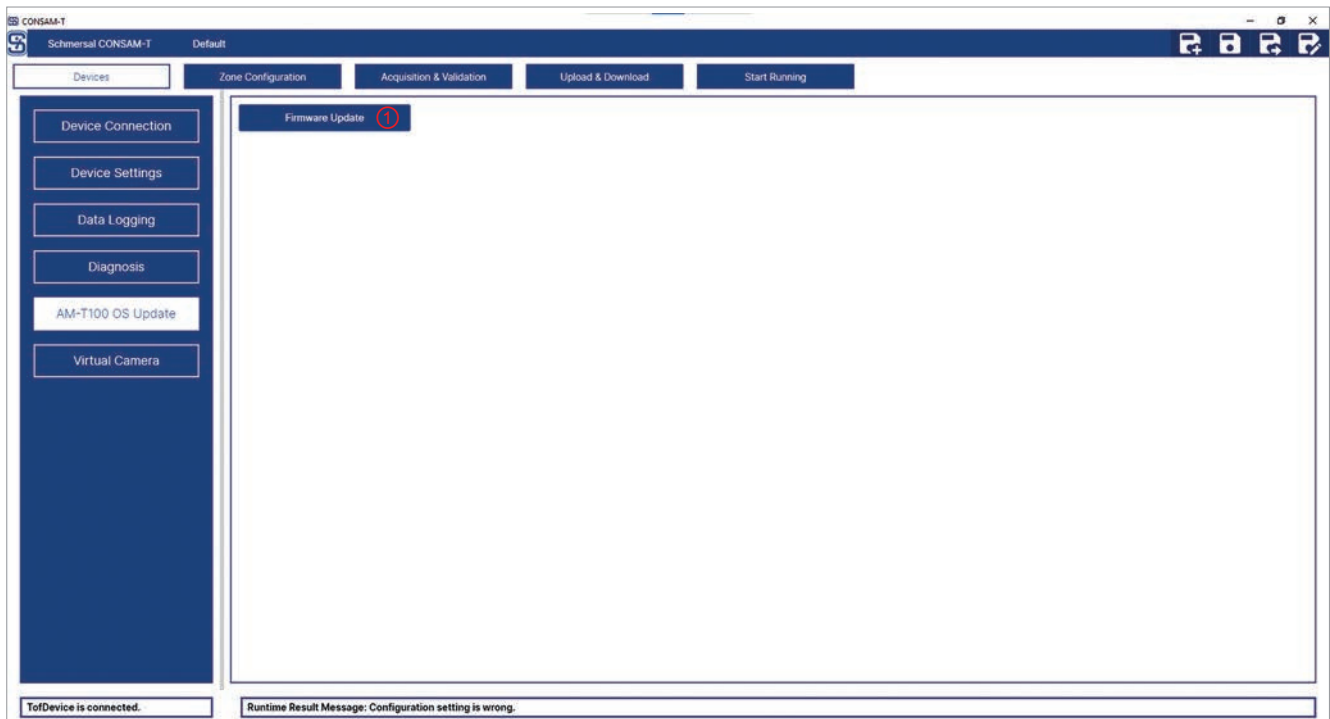


Fig. 30: Devices > AM-T100 OS Update

Pos.	Designation	Description
1	AM-T100 OS Update	Update of the device firmware.

The camera firmware can be updated in this menu.

- Connect the camera to the configuration software (see chap. 6.2.1, p. 31).
- Click on the "AM-T100 OS Update" button to start the firmware update.

The update may take several minutes. Do not switch the camera off while the update is underway. The message "AM-T 100 OS update succeeded" will appear when the update is complete.

The connection to the configuration software is terminated after the update.

6.2.6 Virtual Camera

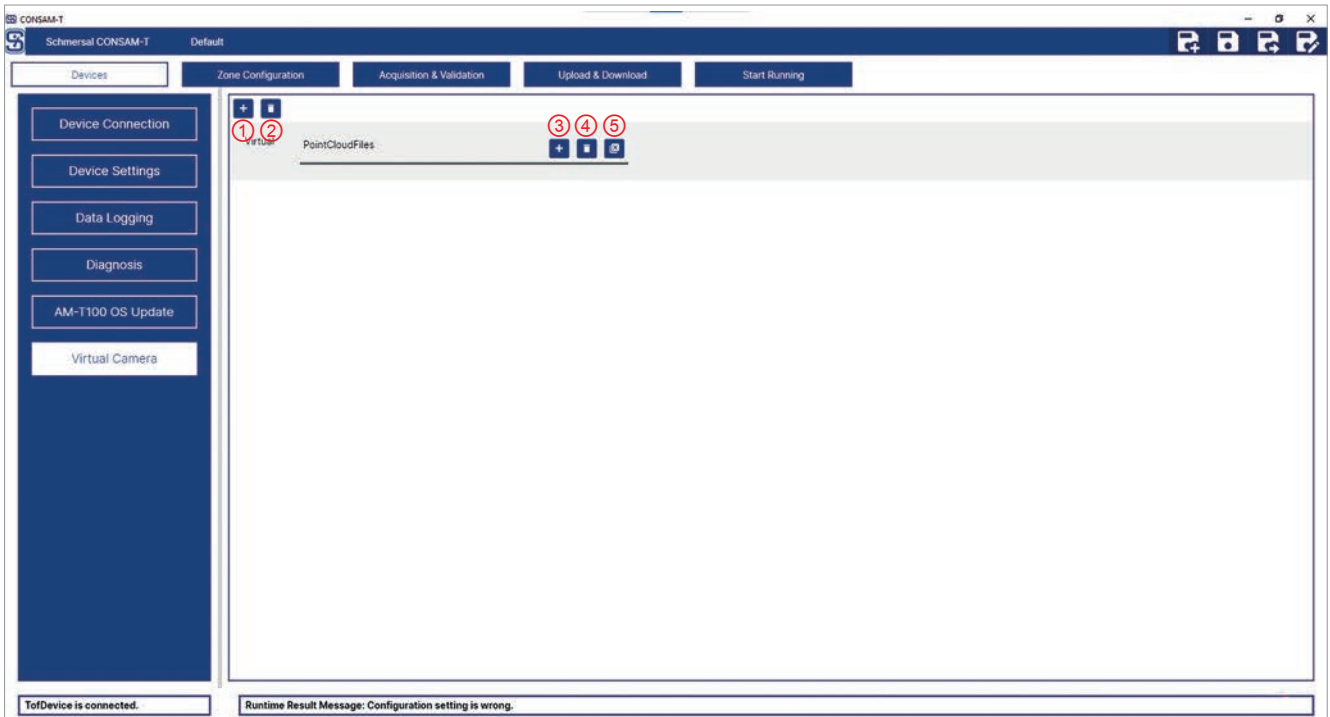


Fig. 31: Devices > Virtual camera

Pos.	Designation	Description
1	Add Virtual Camera	Adds a virtual camera.
2	Delete Virtual Camera	Removes a virtual camera.
3	Load File	Loads one or several point cloud files in PCD file format.
4	Discard File	Discards a selected point cloud file.
5	Discard all Files	Discard all point cloud files.

In this menu, saved point cloud files can be assigned to a virtual camera. The virtual camera can then be selected in the "Zone Configuration" menu.

A new virtual camera is added as follows:

- Click on the "Add Virtual Camera" button (1).

A new virtual camera is added.

Here's how to load one or several point cloud files into a virtual camera:

- Click on the "Load File" button (3), select one or several point cloud files and confirm with "Open".

The virtual camera can be deleted again with the "Delete Virtual Camera" button (2).

The selected point cloud file can be removed with the "Discard File" button (4).

The "Discard all Files" button (5) can be used to remove all point cloud files.



A point cloud file can be saved by right clicking in the output window under "Zone Configuration" or "Acquisition & Validation".

6.3 Zone Configuration

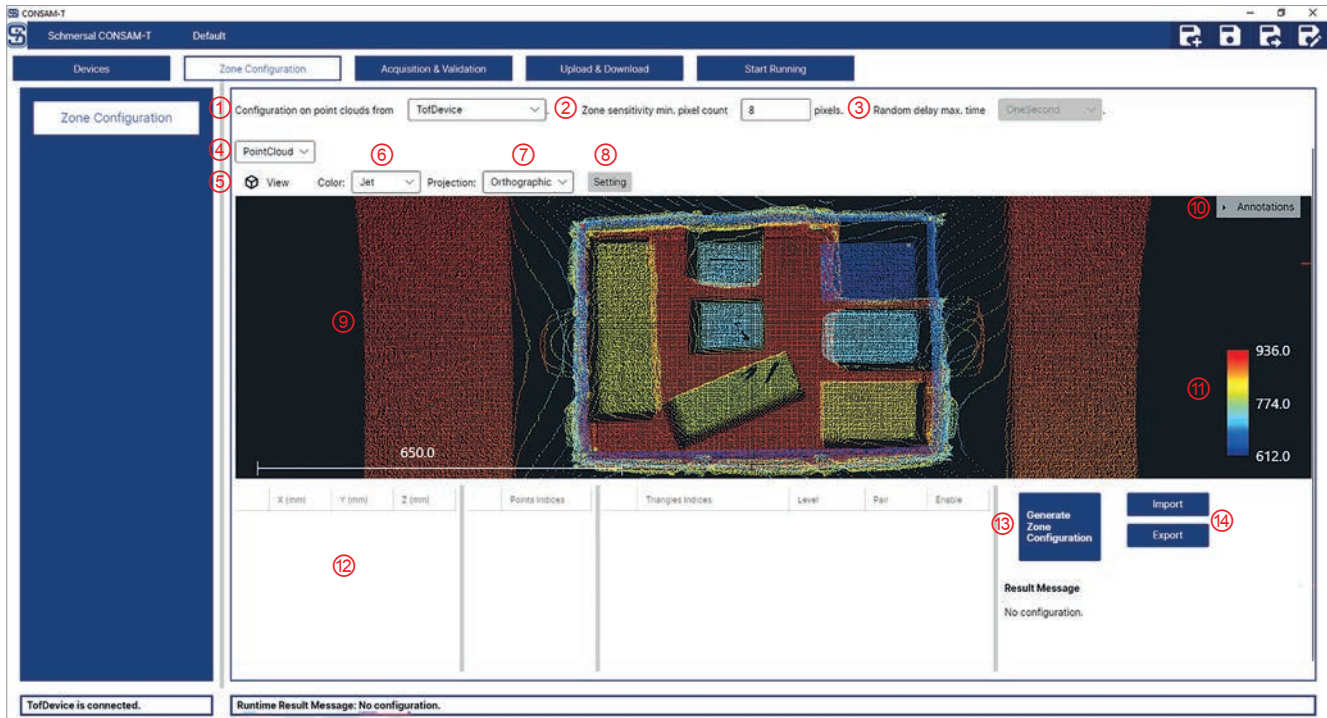


Fig. 32: Zone Configuration

Pos.	Designation	Description
1	Configuration on point clouds from	Configuration with point clouds from – ToF device: depiction of the point clouds of the connected camera – Virtual: depiction of the point clouds loaded under "Devices > Virtual Camera" (chap. 6.2.6, p. 39)
2	Zone Sensitivity Min. Pixel Count	The minimum number of connected pixels that must change in depth in order to trigger a warning stage for a configured zone. Value range: ≥ 3 pixel
3	Random delay max. time	Only active when the exposure filter is on under "Device Settings". – OneSecond – FiveSeconds – TenSeconds Over-exposure gives rise to "black", invalid pixels or depth information. In the event of over-exposure, a random time window is generated within the set maximum delay time for which the image acquisition is stopped. During this time window, the last status of the zones is output.
4	Display mode	Display mode – Depth Map – Point Cloud
5	View	View type Predefined views, including the "Reset" view to reset to the original view.
6	Colour	Selection of different colour scales to colour the captured scene.

Pos.	Designation	Description
7	Projection	<p>Depiction of the point cloud</p> <ul style="list-style-type: none"> – Perspective: in the perspective view, all edges have a common vanishing point in the origin of the optical axis in the sensor. Objects that are located close to the sensor are depicted large, while objects farther away from the sensor are depicted small. – Orthographic: in the orthographic view, all objects appear at the same scale, parallel lines remain parallel.
8	Setting	<p>Colour depiction setting</p> <p>The "Setting" button can be used to set the colour scale for distance depiction. The description can be found in chapter 6.3.2 "Setting" from page 46.</p>
9	View Area	<p>View area</p> <p>Rotate view: press and hold the left-hand mouse button</p> <p>Move view: press and hold the scroll wheel or centre mouse button</p> <p>Zoom view: rotate scroll wheel</p> <p>Save point cloud file: press right-hand mouse button</p>
10	Annotations	Show or hide points, surfaces or zones.
11	Colour Bar	<p>Colour scale</p> <p>The distance is depicted in different colours according to the distance between the object and the camera.</p>
12	Points, Triangle and Zones	Display and edit points, surfaces and zones.
13	Generate Zone Configuration	"Generate Zone Configuration" button to create a zone configuration. After creating the zone configuration, the change must be saved in the project.
14	Import/Export	"Import" button for loading and "Export" button for saving a zone configuration to the PC as a CSV file.

In this menu, areas can be defined with complex 3D zones. A warning stage "Warning" or "Alarm" must be assigned to each zone that is then triggered as soon as an object penetrates or leaves the zone. The combination of signal states of the digital inputs must also be assigned to each zone in order to be able to switch between different zones. These are selected in the "Pair" dropdown menu.

The detailed description of how the zones are set and the assignment to the digital inputs and outputs can be found in chapter 6.3.1 "Defining zones" from page 43.

A zone comprises the shell geometry, which is formed from a defined surface and the origin of the camera coordinate system.

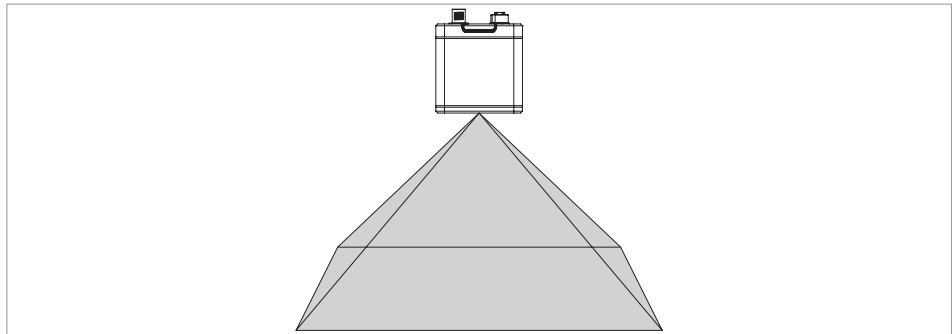


Fig. 33: Example zone

The zones are depicted as follows:

Zone	Warning	Alarm	Runtime Result Message
Inactive/free			Safe
Active/busy			{Alarm/Warning}{Zone Number}

The area within this shell geometry must be free. If an object is permanently within this shell geometry, the zone must be designed such that permanently penetrating objects are left out. The surface of a zone must not be defined too close to objects/walls. Points that penetrate the zone due to measurement inaccuracies can trigger a warning or alarm.

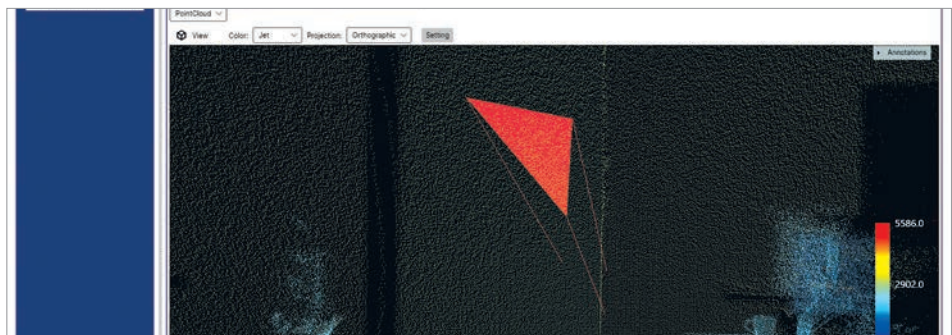


Fig. 34: Surface of a zone is too close to an object. Measurement inaccuracies can cause points to penetrate the zone.



It is not possible to define a shell geometry that is freely suspended in space in which the zone alone is triggered. The zone/shell geometry is always formed from the origin of the camera coordinate system up to a defined surface.

6.3.1 Defining zones



As an option, the depiction of the point cloud can be changed to perspective depiction (1).

To define a zone, adjacent points and surfaces (triangles) must be determined.

- Double click on a point in the image (2) to create a new point.



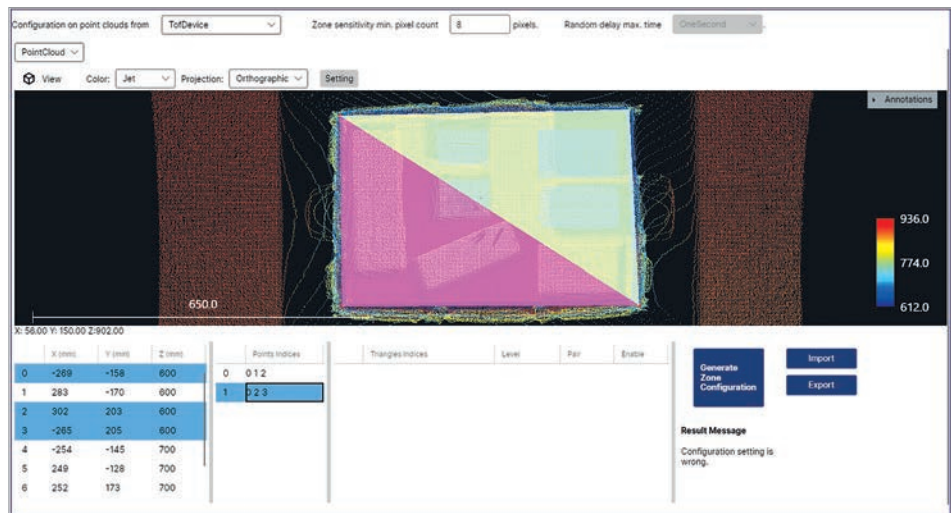
The values can be modified by clicking on the value field (X, Y, Z). For example, multiple points can be created at the same height.



- Select three points while pressing and holding the CTRL key.
- Right click on the selected points and select "Form a triangle".

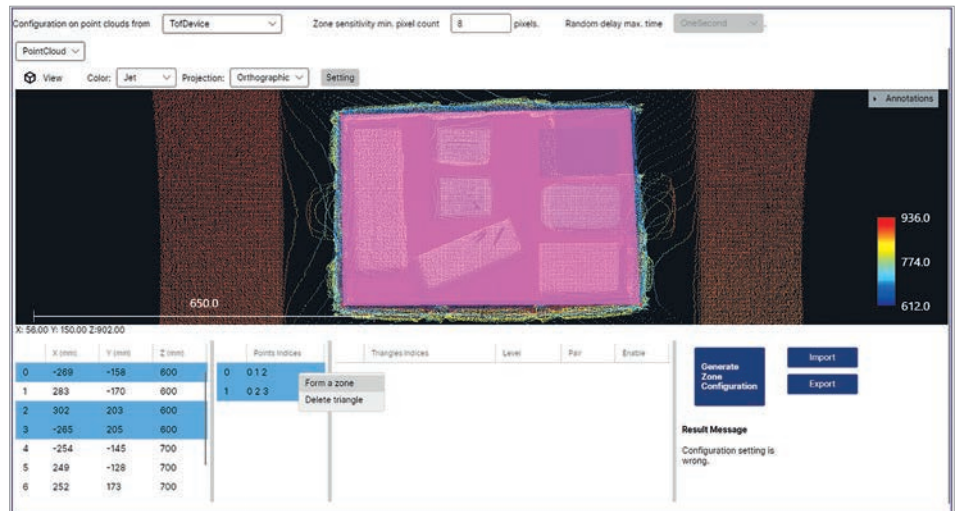
A triangular surface is created.

The "Delete points" menu item can be used to delete selected points and, if applicable, the dependent surfaces and zones.



- Repeat the steps until the desired surface is defined.
The individual surfaces must not be connected together. This could mask fixed objects in the detection range.

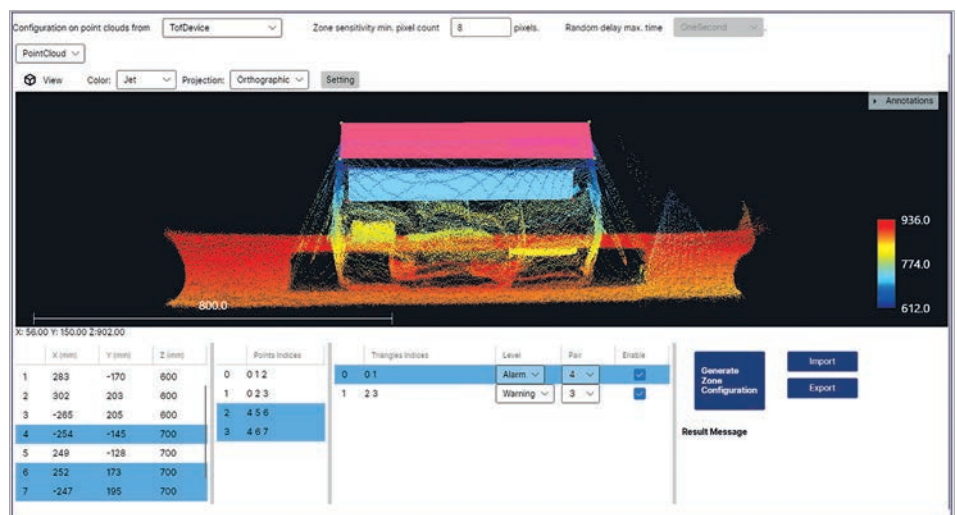
The "Delete triangles" menu item can be used to delete selected surfaces and, if applicable, the dependent zones.



- Select multiple surfaces by pressing and holding the CTRL key.
- Right click on the selected surfaces and select "Form a zone".

A zone is created from the selected surfaces.

The "Delete zones" menu item can be used to delete selected zones.



- Select a zone.
- Assign the warning stage "Warning" or "Alarm" to the zone under "Level".
- Assign the combination of digital inputs that should activate zone monitoring to the zone under "Pair".



- After each change to the "Pair" assignment, click on the "Generate Zone Configuration" button in order to activate the assignment.

	IN 1	IN 2
Pair 1	0 V	0 V
Pair 2	24 V	0 V
Pair 3	0 V	24 V
Pair 4	24 V	24 V

Tab. 6.1: Assignment of the input signals to the pair settings (depiction without inversion)

A zone with warning stage "Warning" and a zone with warning stage "Alarm" can be activated via the combination of digital inputs.

The high and low signals can each be inverted under "Device Settings" (chap. 6.2.2, p. 32).



If the camera is not connected to a control system, both digital inputs are set to "Low" by default. In that case, the zones must be assigned to "Pair 1" so that the zones can be depicted under "Acquisition & Validation" and triggered on image acquisition.

Several zones can be activated or deactivated with the "Enable" checkbox. Deactivated zones remain deactivated. They are only created in the project, but cannot be used without activation.

Digital output 1 is switched if the zone was exceeded with the warning stage "Warning".

Digital output 2 is switched if the zone was exceeded with the warning stage "Alarm".

The high and low signals can each be inverted under "Device Settings" (chap. 6.2.2, p. 32).

6.3.2 Setting

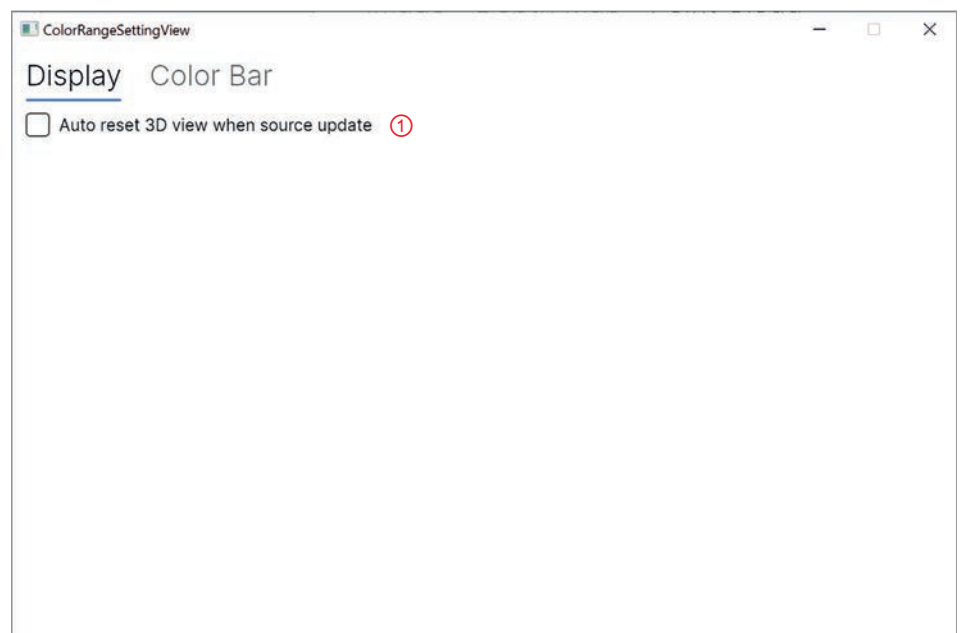


Fig. 35: Setting > Display

Pos.	Designation	Description
1	Auto reset 3D view when source update	If this option is selected, the alignment of the display is reset permanently.

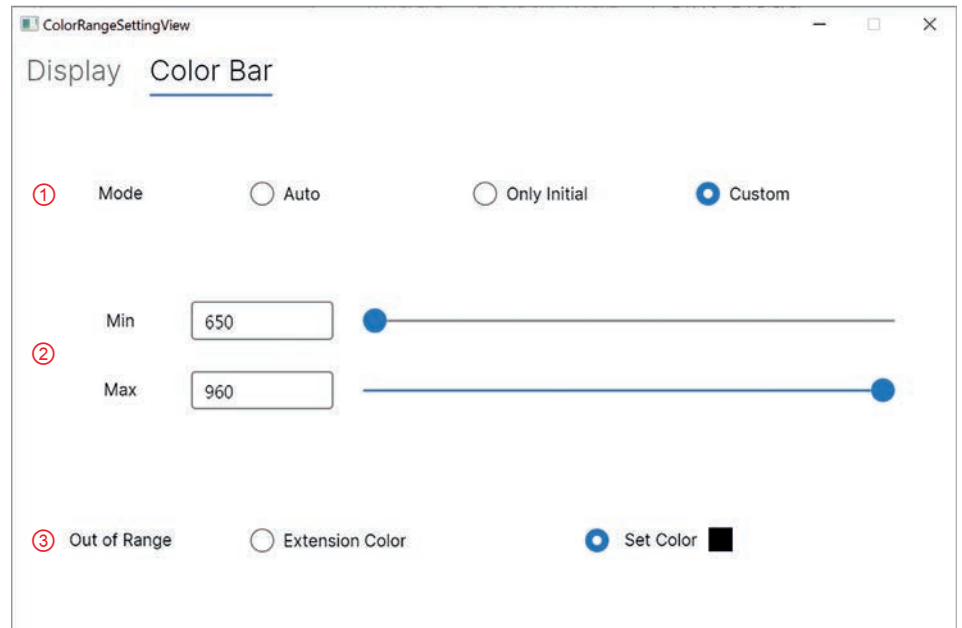


Fig. 36: Setting > Color Bar

Pos.	Designation	Description
1	Mode	<p>The following options can be selected in the "Mode" selection field:</p> <ul style="list-style-type: none"> – Auto (automatic): the colour palette is constantly adjusted to the minimum and maximum distance. This is useful if the camera is moving. – Only Initial: the colour palette is adjusted to the minimum and maximum distance only once, at the start. This setting is useful with a stationary camera. – Custom: the colour palette can be limited to an area of interest according to the minimum and maximum distance. This allows an area of interest to be depicted in detail and in colour.
2	Min/Max	<ul style="list-style-type: none"> – Setting of the minimum and maximum distance in "Custom" mode.
3	Out of Range	<p>The colour outside the measuring area can be defined in the "Out of Range" selection field:</p> <ul style="list-style-type: none"> – Extension Colour: the colour of the maximum distance is repeated for all areas behind. – Set Colour: the selected colour is displayed outside the maximum distance.

6.4 Acquisition & Validation

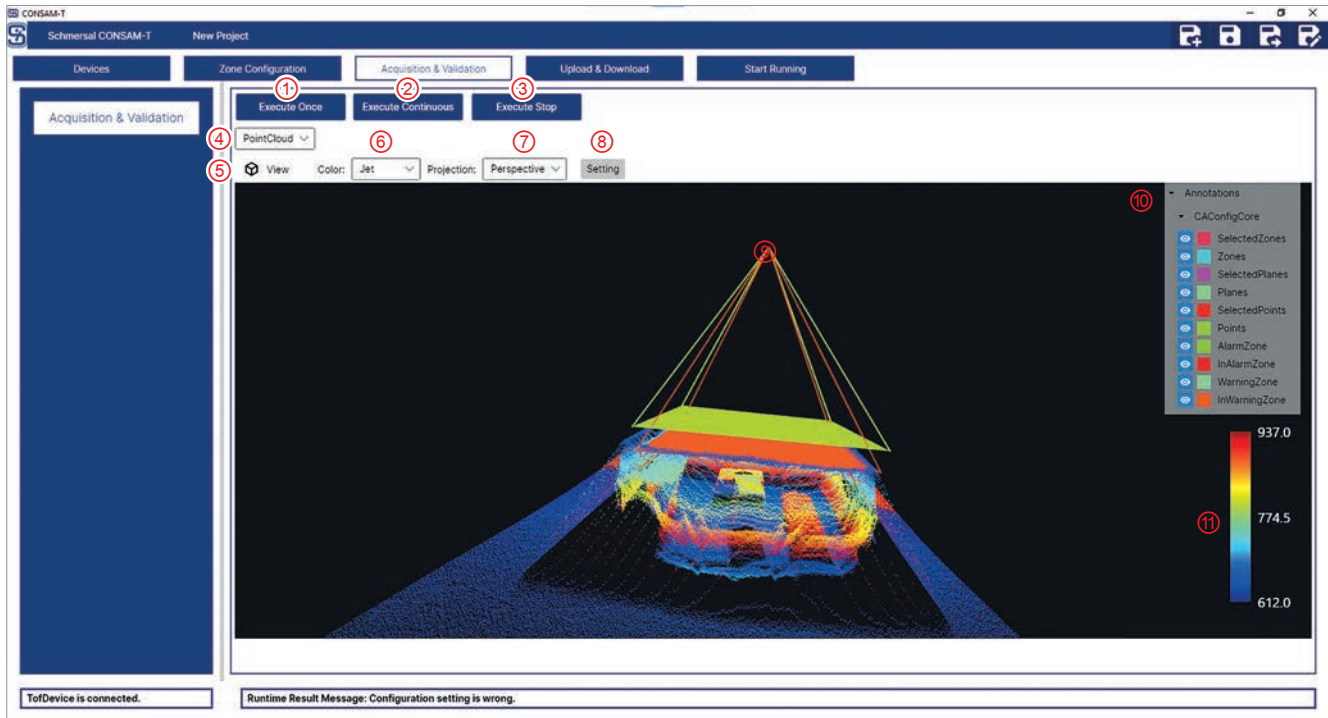


Fig. 37: Acquisition & Validation

Pos.	Designation	Description
1	Execute Once	One-off image acquisition
2	Execute Continuous	Continuous image acquisition to test zone switching.
3	Execute Stop	End image acquisition
4	Display mode	View type – Depth Map – Point Cloud
5	View	Predefined views, including the "Reset" view to reset to the original view.
6	Colour	Selection of different colour scales to colour the captured scene.
7	Projection	Depiction of the point cloud – Perspective: in the perspective depiction, all edge have a common vanishing point in the centre of the sight axis of the sensor. Objects that are located close to the sensor are depicted large, while objects farther away from the sensor are depicted small. – Orthographic: in the orthographic view, all objects appear at the same scale, parallel lines remain parallel.
8	Setting	Colour depiction setting The "Setting" button can be used to set the colour scale for distance depiction. The description can be found in chapter 6.3.2 "Setting" from page 46.
9	View Area	Rotate view: press and hold the left-hand mouse button Move view: press and hold the scroll wheel or centre mouse button Zoom view: rotate scroll wheel Save point cloud file: press right-hand mouse button
10	Annotations	Show or hide points, surfaces or zones.
11	Color Bar	The distance is depicted in different colours according to the distance between the object and the camera.

Image acquisition can be started in this menu, and configured zones can be tested.

- Click on the "Execute Continuous" button to start continuous image acquisition.

When zones are created and configured, they are displayed accordingly and can be tested.

If no zone are displayed, the configuration is incomplete — this can be identified by the "Runtime Result Message: Configuration setting is wrong" error message in the status bar.

- In that case, complete a complete configuration of the zones, as outlined in chapter 6.3.1 "Defining zones" from page 43.
- Assign the combination of digital inputs to each zone under "Pair".



- After each change to the "Pair" assignment, click on the "Generate Zone Configuration" button in order to activate the assignment.

6.5 Upload & Download

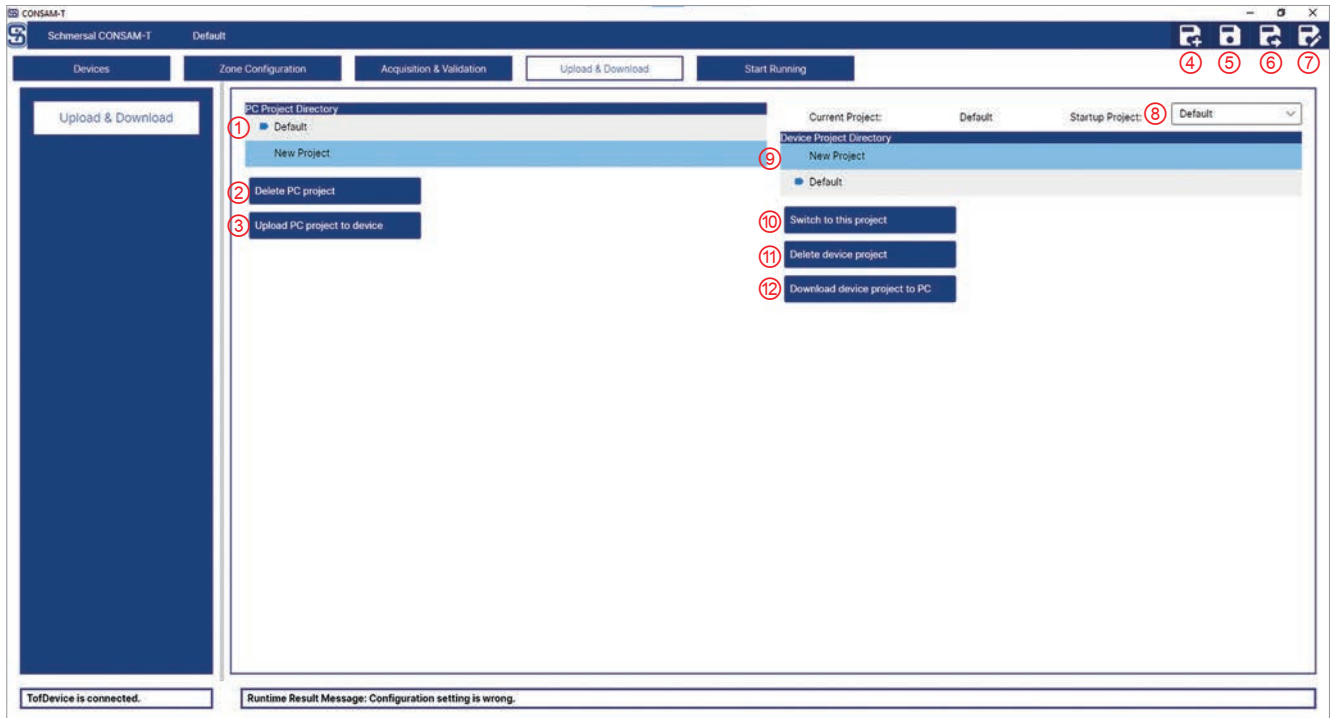



Fig. 38: Upload & download

Pos.	Designation	Description
1	PC Project Directory	Display projects saved on the PC
2	Delete PC project	Delete PC project
3	Upload PC project to device	Upload PC project to device
4	New	New
5	Save	Save
6	Save As	Save As
7	Edit	Edit
8	Startup Project	Selection of the project that is to be loaded on the camera after the start of the camera.
9	Device Project Directory	Projects saved on the camera
10	Switch to this project	Switch to this project
11	Delete device project	Delete device project
12	Download device project to PC	Download device project to PC

This menu allows projects to be managed on the PC and on the camera. Projects are used to save different settings. The project that is currently loaded is indicated by the  symbol.



Changed settings are not saved automatically. If the software is terminated or a project is newly created or loaded, previous settings are lost.

- Click on the "Save" button (5) to save the settings in a project.

6.5.1 Managing projects on the PC

Create project

- Save the settings, if necessary.
- Click on the "New" button (4) to create a new project.

A newly created project is activated automatically.

Save project

- Click on the "Save" button (5) to save changed settings in a project.

Save project to a different name

- Click on the "Save As" button (6) to save the settings under a different project name.

Load project

- Save the settings, if necessary.
- Click on the "Edit" button (7) to load a different project.

A new window opens.

- Select the project and click on the "Load Project" button to load a project once.
- In the "Startup Project" dropdown list, select the project that should be loaded when the software CONSAM-T is started.

Delete project

- Under "PC Project Directory" (1), select a project and click on the "Delete PC project" button (2) to delete a project.

Copy project to the camera

- Under "PC Project Directory" (1), select a project and click on the "Upload PC project to device" button (3) to copy a project to the camera.

6.5.2 Manage projects on the camera



The camera must be connected to CONSAM-T.

Set project start

- In the "Startup Project" dropdown menu (8), select which project should be loaded when the camera is started.

Load project

- Under "Device Project Directory" (9), select a project and click the "Switch to this project" button (10) to load another project.

Delete project

- Click on the "Delete device project" button (11) to delete a project.

Copy project to PC

- Click on the "Download device project to PC" button (12) to copy a project to the PC.

6.6 Start Running

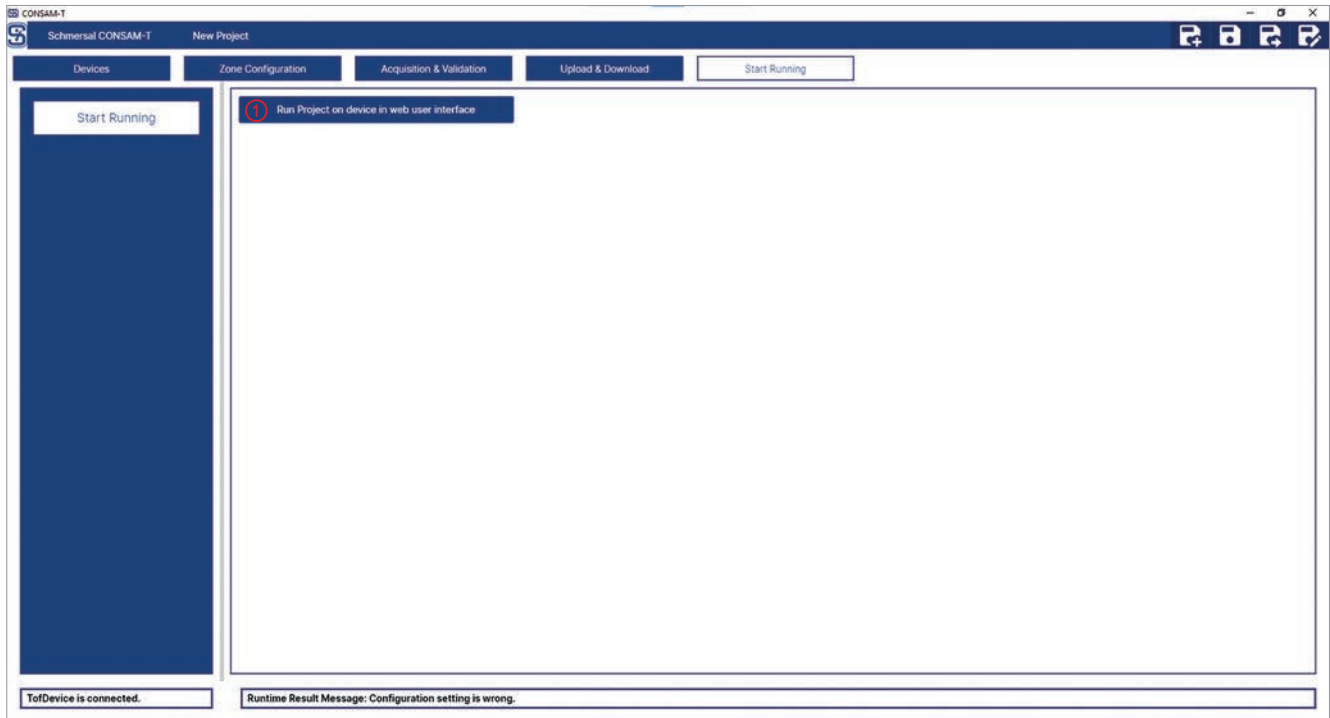


Fig. 39: Start Running

Pos.	Designation	Description
1	Run Project on device in web user interface	Run project on device in web user interface.

This menu is used to open the user interface of the AM-T100 OS operating system. If the camera is still connected to the CONSAM-T application software, the connection must be interrupted beforehand.

- Navigate to the "Devices > Device Connection" menu.
- Click on the "Connection" button to disconnect the connection to the camera.
- Navigate back to the "Start Running" menu.
- Click on the "Run Project on device in web user interface" button to open the user interface.

A browser window opens.

To connect the camera to the AM-T100 OS operating system, proceed as follows:

- Navigate to the "Platform > Camera" menu.
- Click on the "Connect" button to establish the connection to the camera.

A detailed description can be found in chapter 7 "AM-T100 OS operating system user interface" on page 53.

7 AM-T100 OS operating system user interface



The AM-T100 OS internal camera operating system is generic software that has been developed for different devices and applications. It includes menu items that are not intended for use with the AM-T100 camera.

7.1 Overview

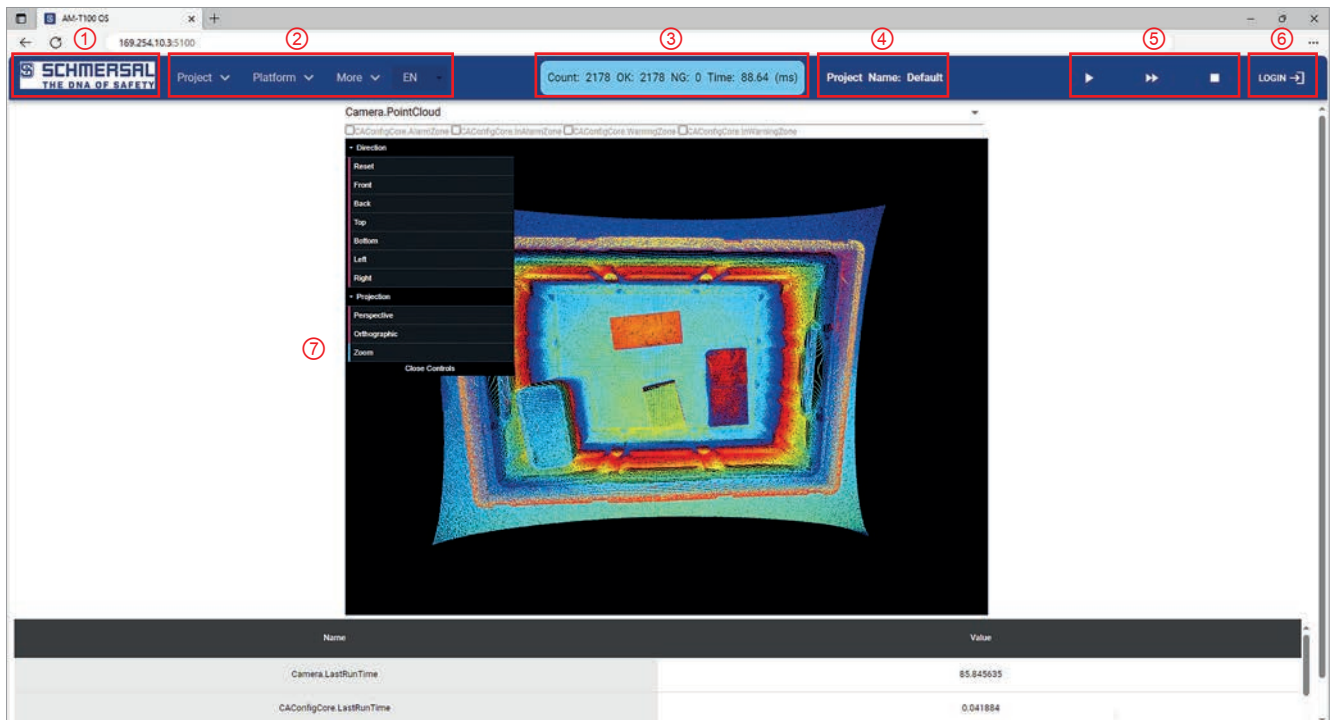


Fig. 40: Homepage

Pos.	Designation	Description
1	Schmersal logo	Link to start page
2	Main menu	Menu bar to select the main menu
3	Image counter	"Count": number of image acquisitions "OK": number of flawless image acquisitions "NG": number of faulty image acquisitions "Time": duration of an image acquisition
4	Project name	Display of project name
5	Control bar	Single image acquisition, continuous image acquisition, stop image acquisition
6	Login	Logging in provides access to the editor under "More > Editor" for software developers.
7	Main window	Display and changes in main window

7.1.1 Homepage



- Click on the Schmersal logo to go to the homepage.

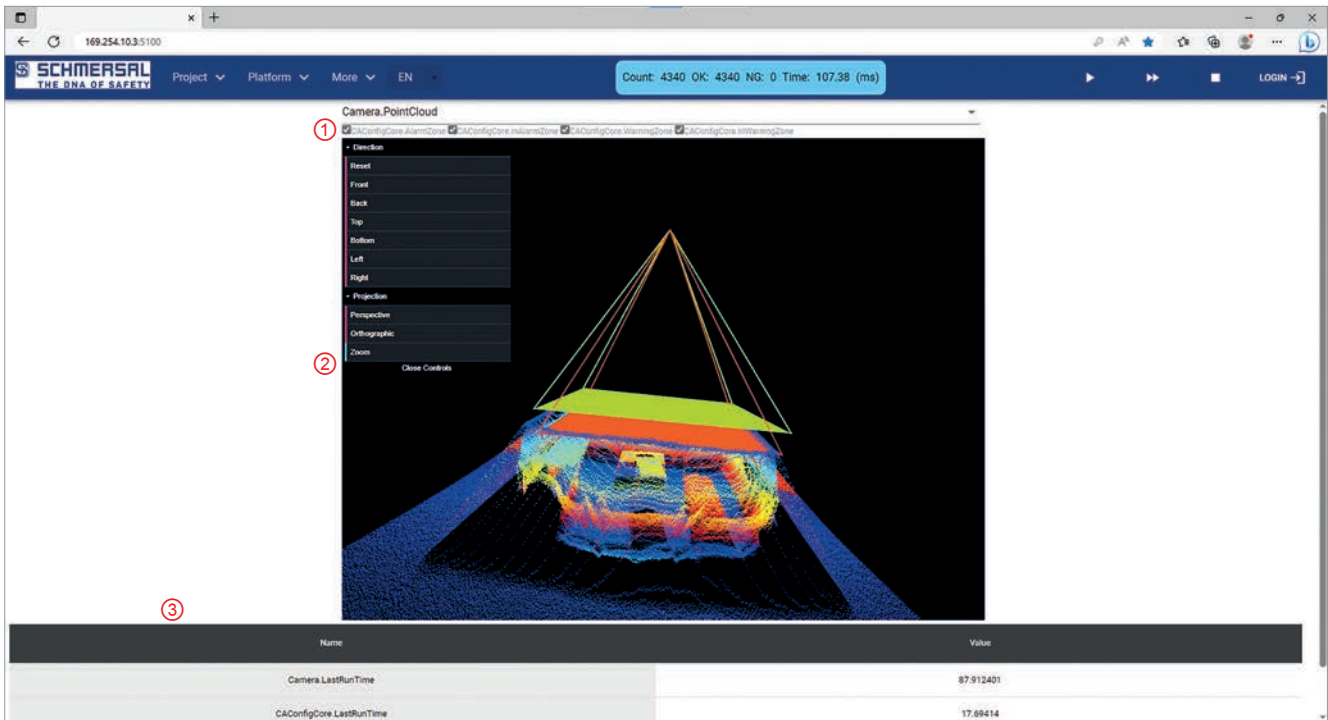


Fig. 41: Homepage

Pos.	Designation	Description
1	Camera.PointCloud	<ul style="list-style-type: none"> – CAConfigCore.AlarmZone: Depiction of the non-triggered zone (dark green area) – CAConfigCore.InAlarmZone: Depiction of the triggered zone (dark-red area) – CAConfigCore.WarningZone: Depiction of the non-triggered zone (light-green area) – CAConfigCore.InWarningZone: Depiction of the triggered zone (light-red area)
2	View Area	<p>View area</p> <p>Rotate view: press and hold the left-hand mouse button</p> <p>Shift view: press and hold the right-hand mouse button</p> <p>Zoom view: rotate scroll wheel</p>
3	Status values	<p>Camera.LastRunTime</p> <p>CAConfigCore.LastRunTime</p> <p>CAConfigCore.ResultMessage</p>

The point cloud can be displayed in this menu.

- Click on the "Continuous image acquisition" button in the control bar to start image acquisition. The point cloud is displayed.
- Click on the desired checkboxes (1) to display the zones defined in the project. If no zones are displayed, they must firstly be created on CONSAM-T, saved in the project and transferred to the camera. Ensure that the project is loaded.

7.1.2 Project

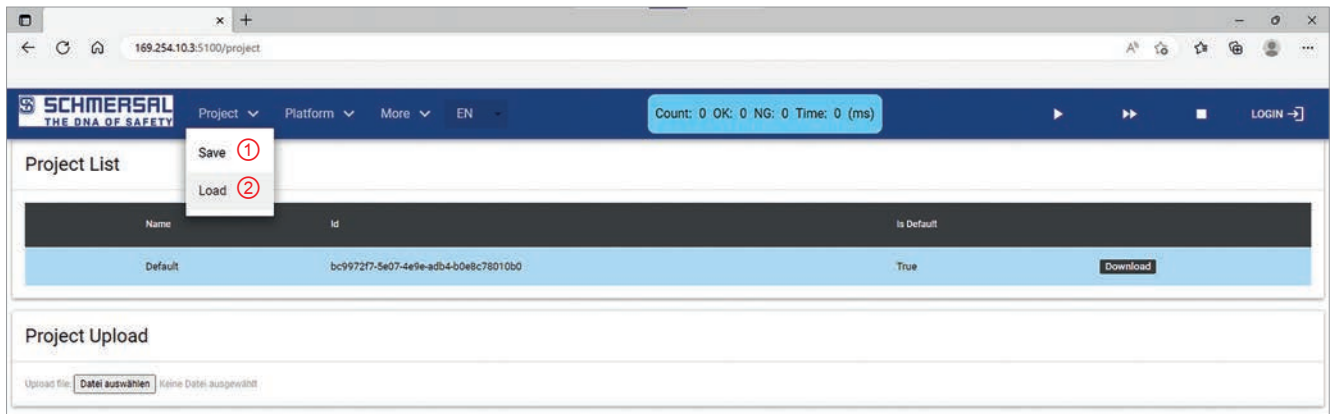


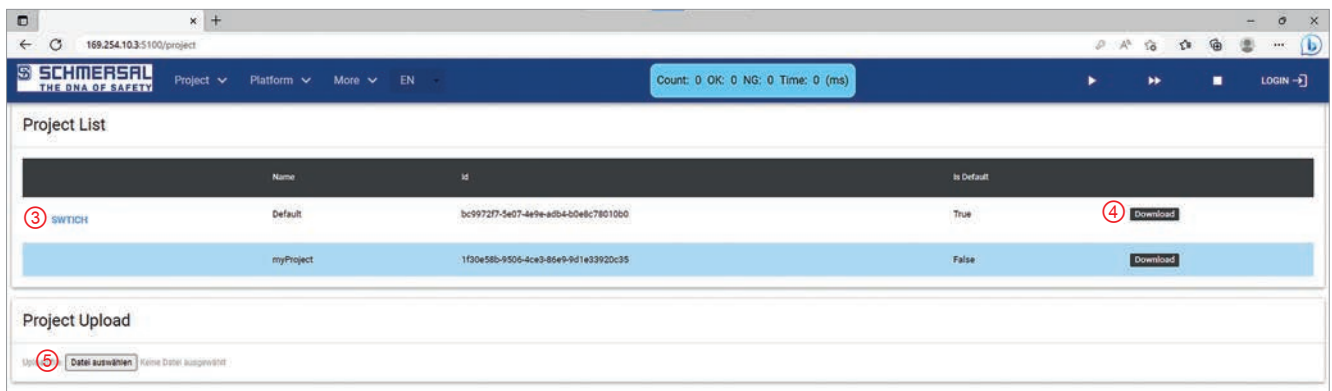
Fig. 42: Project

Pos.	Designation	Description
1	Save	Save changes in the loaded project file to the camera.
2	Load	Load a project file to the camera.

Save

- Select the "Save" menu item (1) to save changes in the loaded project file to the camera.

Load



- Select the "Load" menu item (2) to call the "Project" screen.

Load project

- Under "Project List", click on the "SWITCH" button (3) to activate a project. The current project is marked in blue.

Copy project to PC

- Under "Project List", click on the "Download" button (4) to copy a project to the PC.

Copy project to the camera

- Under "Project Upload", click on the "Select file" button (5) and select a project file. The project is automatically uploaded and activated.

7.1.3 Platform

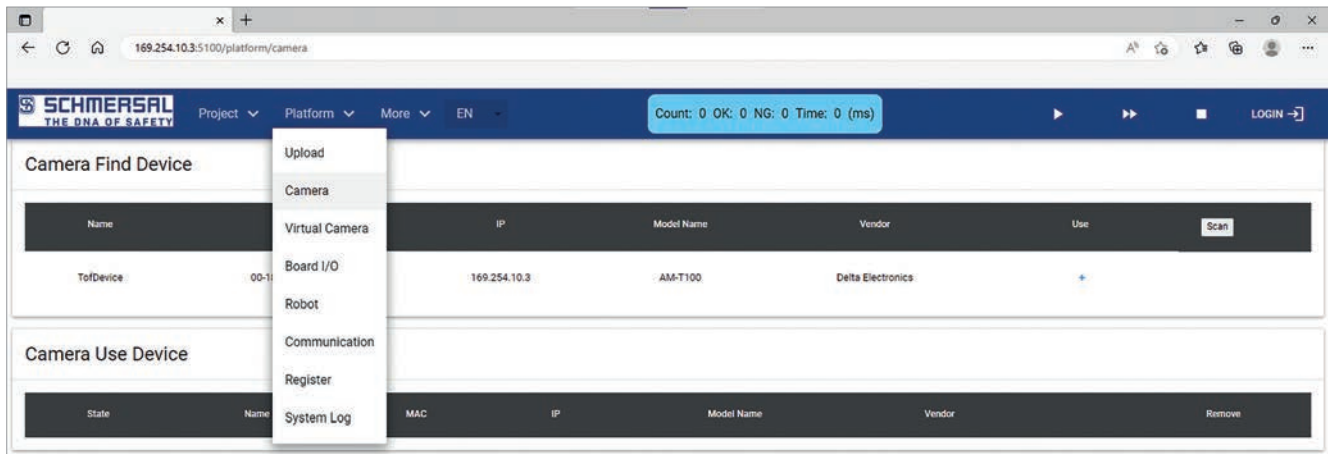


Fig. 43: Platform

Pos.	Designation	Description
1	Upload	"Download": create a configuration file in XML format for use with the SDK. "Upload: load a configuration file.
2	Camera	"Camera Find Device": search for available cameras on the network. "Camera Use Device": connect and disconnect a camera with the internal device software and show the connection status.
3	Virtual Camera	without function
4	Board I/O	without function
5	Robot	without function
6	Communication	without function
7	Register	without function
8	System Log	Display of system events.



The internal camera software is generic software that has been developed for different devices and applications. As a result, it contains menu items that are not intended for use with the camera.

Camera

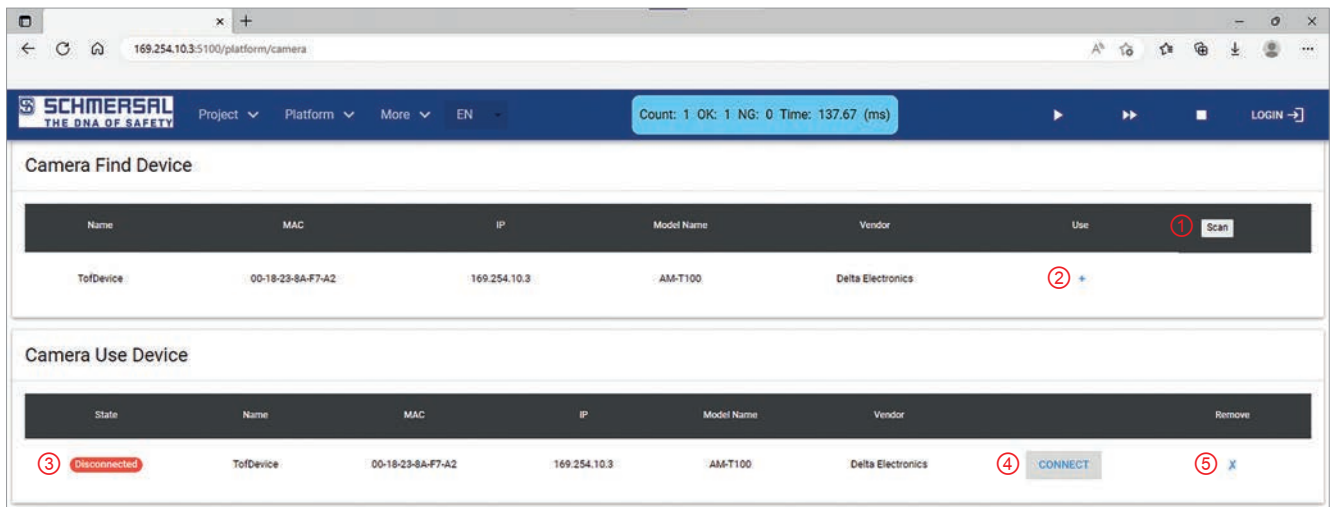


Fig. 44: Platform > Camera

In this menu, the camera is connected to the configuration software.

- Click on the "Scan" button (1) to search for available cameras on the network.
- Click on the "+" button (2) to add a camera to the "Camera Use Device" list.
- Click on the "Connect" button (4) to establish the connection to the camera. The connection status changes to "Connected" (3).
- Click on the "X" button (5) to remove the camera from the "Camera Use Device" list.

System Log

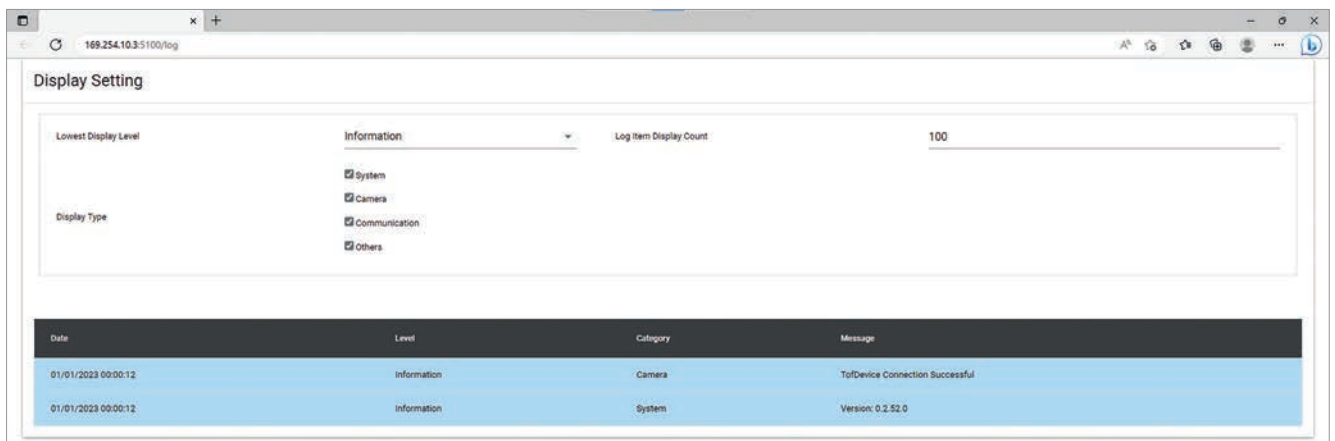


Fig. 45: Platform > System Log

System events are logged in this menu.

7.1.4 More

Configuration



Fig. 46: More > Configuration

Pos.	Designation	Description
1	Auto run on startup	Start continuous image acquisition after a restart.
2	Image update high speed mode	Display of the point cloud in the browser Enabled: While an image is being transmitted to the browser via Ethernet, new images in the image buffer are discarded during this period. The new images are analysed by the software but not displayed. Disabled: Every image from the image buffer is transmitted and displayed.

Editor

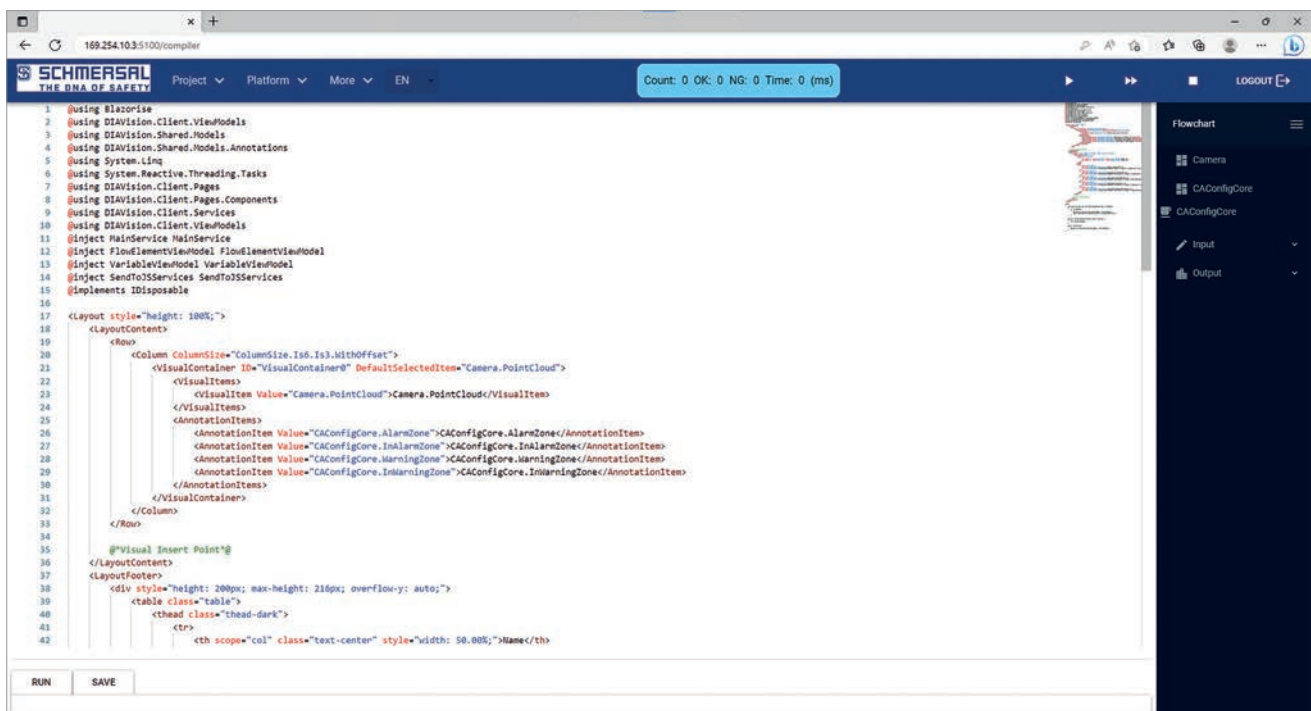


Fig. 47: More > Editor

Pos.	Designation	Description
1	Editor	Edit the homescreen
2	RUN	Load the saved XML file.
3	SAVE	Save the changed XML file.

Calling the "More > Editor" menu requires a login.

The homescreen can be edited and changed in the "More > Editor" menu.

About

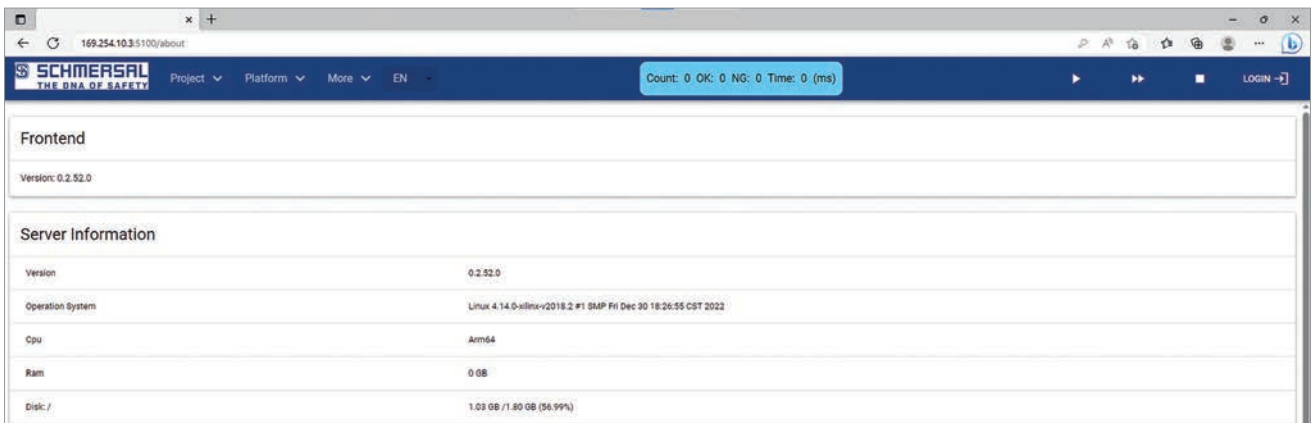


Fig. 48: More > About

All software properties are displayed in the "About" menu.

7.1.5 EN (Language)



Fig. 49: EN (Language)

The language can be changed in the "EN (Language)" menu.

7.1.6 Login

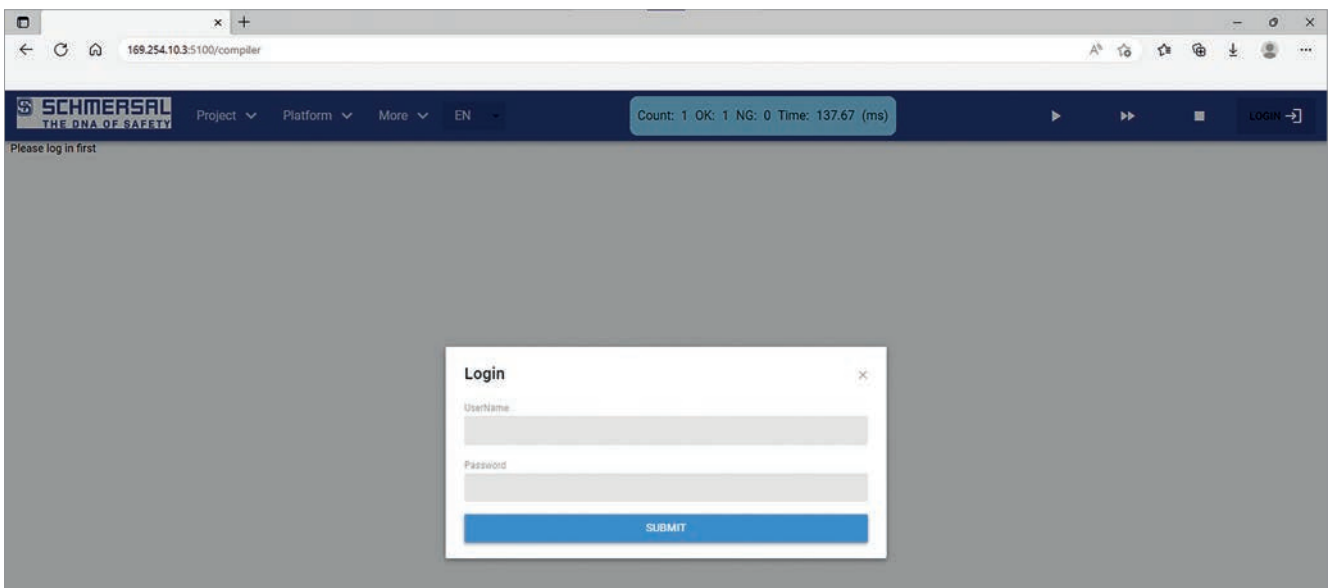


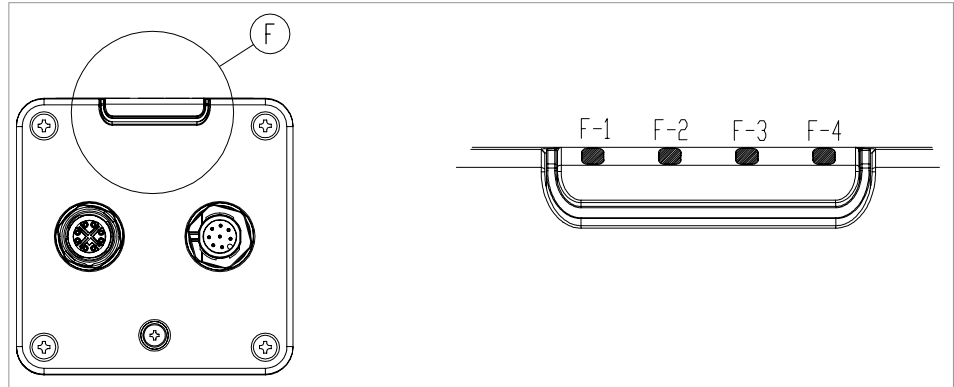
Fig. 50: Login

Access to the editor under "More > Editor" can be granted for software developers in this menu.

8 Diagnosis and troubleshooting

8.1 Diagnostic

The camera signals the operating status via the assigned LEDs on the back of the unit.



F	LED display
F-1	Power display (green)
F-2	No function
F-3	No function
F-4	Status display (green / red / orange)

Power display F-1

Color	OFF	Continuous light
Green	Power supply error	Power supply normal

Status display F-4

Color	flashing	Continuous light
Red	Error, camera not working, please check configuration	Error, camera not working. If restarting with factory settings is not possible, please contact Service.
Orange	Initialisation	Idle (waiting for connection)
Green	Capture	Ready (connected)

8.2 Troubleshooting



Error messages relating to the SDK are outlined in the separate SDK manual.

Camera

Fault	Possible solution
No power supply green LED does not light up	Check the power supply via the I/O cable or the PoE Ethernet cable. Is the PoE output consistent with the IEEE 802.3bt standard?
Temperature too high	Lower the ambient temperature and/or use the ACC-AM-MS-F mounting bracket with heat dissipating cooling fins.

CONSAM-T application software

Fault	Possible solution
No device connection. No device connection.	The boot-up process may last a few seconds. Wait for a few seconds and try searching for the camera again using the "Search for connected devices" button. Check power supply. Check network connection. Insert network cable. Network socket functional, LEDs flashing? The IP address of the camera is assigned via DHCP by default. After unlocking the PC, the camera is no longer found. Click on "Search for connected devices" to search for the camera again.
The camera is found, but cannot be added.	The "Add" button is not displayed under "Devices > Device Connection". Change the resolution or scale to 100%. Drag the left-hand navigation menu to make it narrower or scroll horizontally to the right at the bottom of the main window.
Please check for the connection status in the web user interface... The camera cannot connect.	Connect the camera as outlined in chapter 5.7 "Establishing the connect to the camera" on page 26.
Server is not ready. A connection could not be established as the destination computer refused the connection.	If access to the camera is not possible, the camera firmware can be re-installed. Navigate to "Devices > AM-T100 OS Update" and click on the "AM-T100 OS Update" button. The firmware update may take several minutes.
No image. Connection to camera successful, but no image acquisition.	Check power supply and network connection. Search for the camera with the "Search for connected devices" button under "Devices > Device Connection", add with the "Add" button and establish the connection with the "Connection" button. Click on the "Execute Once" or "Execute Continuous" button under "Acquisition & Validation" or on the "Generate Zone Configuration" button under "Zone Configuration".
Configuration setting is wrong. There is no zone configuration.	Configure the zones as outlined in chapter 6.3.1 "Defining zones" from page 43 and click on the "Generate Zone Configuration" button.
Filter size should be greater or equal to 3. The threshold value for the minimum pixel number of the zone sensitivity should be ≥ 3 .	Set a higher sensitivity ("Zone sensitivity min. pixel count") ≥ 3 under "Zone Configuration".
Getting digital input is error. An error occurred when calling the digital input.	

Fault	Possible solution
Setting digital output is error. The digital output setting is erroneous.	
Setting is wrong. No image acquisition.	
Recording log is error. An error occurred when writing log files or saving the PLY files.	Check storage location and access permissions.
{Warning/Alarm}{Zone Number} setting is wrong.	The zone exceeds the field of view (FoV). Or the minimum area XY projection of the XYZ zones is too small, example XYZ zone along optical axis.
{Warning/Alarm}{Zone Number} analysis is wrong. There is an error in the runtime process of the zone.	
{Warning/Alarm}{Zone Number} transformation is wrong. No point cloud detection.	
{Warning/Alarm}{Zone Number} overexposure {Alarm/Warning}{Zone Number} is over-exposed.	The signal at the camera sensor is too strong.
Menus are not shown or are incomplete.	The version of the CONSAM-T application software does not match the AM-T100 OS operating system version. Perform a AM-T100 OS Update.

AM-T100 OS operating system

Error message	Description
The camera cannot connect.	The camera is connected to CONSAM-T. Interrupt the connection, as outlined in chapter 6.2.1 "Device Connection" on page 31.
Server Connected Error / no connection to camera.	Switch the power supply off and on again to restart the camera. Check network connection. Insert network cable. Network socket functional, LEDs flashing?

9 Maintenance and cleaning

In the case of correct installation and intended use, the camera is maintenance-free. A regular visual inspection and functional test, including the following steps, is recommended:

- Check that the camera is firmly seated.
- Check the integrity of the cable connections.
If necessary, use connector caps.
- Remove dirt residue.
 - Clean the camera with a dry cloth. Do not use cleaning solutions containing acids or alkalis.
 - Cleaning with wet cloths could damage the glass coating and lead to additional contamination.



Damaged or defective components must be replaced.

10 Disassembly and disposal

10.1 Disassembly

The camera should be disassembled when de-energised only.

10.2 Disposal

The camera must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

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