QUICK START

Visionary-T CX/AG

3D camera

EN

SICK
Visionary-T

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Please find detailed addresses and further locations in all major industrial nations at **www.sick.com**

8022594/ZYK8/9PMS · Printed in Germany (2018-07-27)

Exclusion from liability

SICK uses standard IP technology in its products, for example IO-Link. The emphasis is placed on availability of products and services. SICK always assumes that the integrity and confidentiality of the data and rights affected by the use of the aforementioned products will be ensured by the customer.

In all cases, appropriate security measures, such as network separation, firewalls, virus protection, and patch management, must be taken by the customer based on the situation in question.

Safety

- Visionary-T CX/AG does not constitute personal protection equipment in accordance with the respective applicable safety standards for machines.
- The mounting, electrical installation and configuration of the device must only be carried out by professionally qualified personnel.
- When mounting and electrical installation work is being carried out, always comply with standard operating procedures, and applicable health and environmental regulations.
- The sensor must not be used in outdoor or explosion-hazardous areas!
- When installing the device, always consider the electrical connected loads.
- Replace faulty or damaged cables and male connectors immediately.
- Replace damaged or faulty components immediately and in consultation with SICK AG.
- When mounting the device, it is imperative that you use suitable mounting equipment and that you consider their specific tightening torques. The mounting equipment must be self-locking or secured appropriately.
- Ensure a constant voltage supply to the device within the set parameters.
- Operate the 3D camera only within the set operating parameters.
- Regularly check that the 3D camera is functioning properly.
- The infrared beams used pose no danger to the human eye if the 3D sensor is operated within the prescribed parameters (optical risk classification 0, EN 62471).
- Structural modifications to the 3D camera are strictly forbidden!
- During mounting, ensure there are no attachment parts in the detection volume of the 3D sensor.
- The 3D camera must not be mounted behind a transparent screen since this will affect the system properties.

Scope of delivery

- Visionary-T CX/AG (3D camera)
- Data card with SOPAS ET, device file, product information and documentation
- Quick start instructions

Product features

- Intended solely for outputting 3D image data via a Gigabit Ethernet interface
- Meets industrial requirements for data security and reliability
- Easy mounting and commissioning
- 3D data collection with up to 50 fps
- Can be used in any indoor space
- Convenient API connection for use of 3D camera in specialist applications
- The AG variant extends the functionality of the CX variant with serial preprocessing of the data (e.g., data reduction)

Overview

Visionary-T CX/AG are 3D cameras based on the time-of-flight (ToF) principle. They provide real time 3D data at up to 50 frames per second (fps).

The 3D cameras are configured, and their images visualized using the SOPAS ET software.

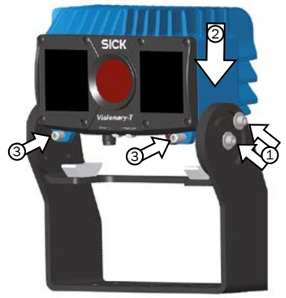
Different setups can be configured via SOPAS ET. These setups can be controlled via discrete inputs.

Once configured, it runs in stand-alone operation, and continuously provides the outputs via the configured interface.

To use the 3D cameras, you need to follow the steps below:

1. Complete the mechanical and electrical setup.
2. Install SOPAS ET.
3. Connect the 3D sensor to SOPAS ET.
4. Configure the 3D sensor.

Completing the mechanical and electrical setup and installing SOPAS ET



1. Fix the inner clamp to the outside edge (1). Attach the 3D sensor (2) and secure it using the setscrews (3).
2. Prepare the mounting position in accordance with the dimensional drawing **A**.
3. Mount the 3D camera in the proper alignment for the desired detection volume. Ensure as far as possible that the detection volume is bordered by a surface **C**.
4. Connect the Ethernet interface of the 3D sensor directly to your computer or to the network to which your computer is connected.
5. Use the system plug of the 3D sensor to connect the voltage supply and signal transmission **B**.
6. Install the SOPAS ET software by running the installation file from the data card provided (as administrator).
7. Follow the instructions of the installation program.

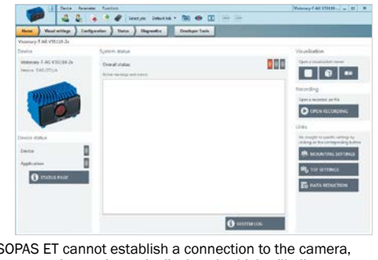
Connecting to SOPAS ET

SOPAS is a software platform for monitoring and configuring devices made by SICK AG. It can be installed on Windows computers and used on any device supported by SOPAS ET.

This is how to connect SOPAS ET to the 3D camera:

1. Ensure the 3D sensor is switched on and connected to the computer or the same network.
2. Start **SOPAS ET**.
3. SOPAS ET automatically attempts to identify connected devices when it starts. When the 3D sensor is in the same network segment, it is displayed in the list of devices found.
4. Click the camera in the list of available devices and add it to the project. This installs the required device file directly from the internal storage device.
5. Double click the 3D camera in the project list.

   The camera window opens.



- If SOPAS ET cannot establish a connection to the camera, the connection assistant is displayed, which will allow you to change the IP address.

  Note: The default IP address for the 3D camera is 192.168.1.10

- If the device is not listed, click **Search for devices** to open the connection assistant.

You can find additional information relating to the connection assistant in the online help for SOPAS ET.

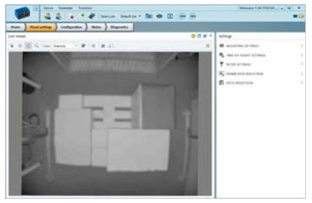
Pre-install device file (alternative installation)

1. Start **SOPAS ET** and open the **Device Catalog** tab.
2. Open the device driver manager (⚙) and click **Install**.
3. Select the **From a data card** option and search for the device file.
4. Select the file and follow the installation assistant's instructions.

Toolbar in the sensor application

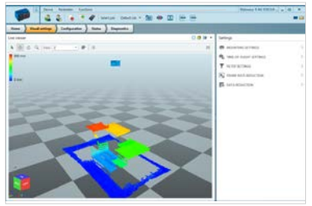
The visualization and control of the 3D sensor is carried out in SOPAS ET via the **Visual settings**, the **Configuration** and the toolbar. Two different display options are available here.

2D view



The 2D view shows a grayscale image of the captured scene and can help you to position the 3D camera correctly, or to focus it on specific objects.

3D view



The 3D view provides a three-dimensional point cloud visualization. The visualization depends on the specific sensor settings selected.

For the AG variant, the activated data reduction is also visualized.

SOPAS icons

Selection arrow
Select individual points from the cluster of points and mark them.

Move
Move the currently displayed image section left/right or up/down (or with the Shift key held down).

Rotate
Rotate the currently displayed image section around the current image center point (or with the Ctrl key held down).

Zoom
Enlarge or reduce the currently displayed image section (or scroll wheel forward/back).

Display options
Switch between the individual display forms of the collected points.

Reset
Reset the perspective to default.

Select viewing angle
Choose from various preset viewing angles by clicking the respective position highlighted on the cube.

Still image
Pause the playback to obtain a still image of the displayed image section.

Replay
Opens a new window to replay a *.ssr file stored on a data card.

Record
Record the stream to store it as a file on a data card.

Save 3D point cloud
Saves the 3D point cloud as a *.pcd file.

Stop/ store recording
Stops the recording of the stream and stores it on the data card.

Load file
Loads a stored scene from the data card in order to replay it.

Question mark
The "question mark" icon can be used to display more information and help for each parameter.

Save setup
Saves the configured setup permanently on the device.

Export visual settings
Saves the SOPAS display options.

Import visual settings
Loads the SOPAS display options.

Trigger next image
Displays the next triggered image in the trigger mode.

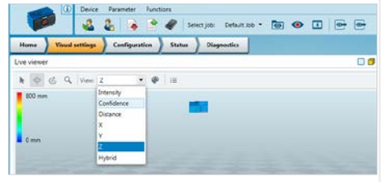
Configuring/visualizing the 3D sensor

1. Turn on the 3D camera and connect it to SOPAS ET (see "Connecting to SOPAS ET").
2. Click the "Visual settings" step to begin configuring the settings for your use case.

3. In the settings overview, click **Mounting settings** to open them:
   The center of the camera lens is the origin of the coordinates (x|y|z = 0|0|0).

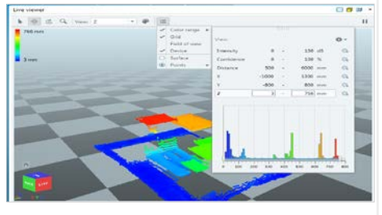
   Set the sensor alignment and position to the location of the sensor center point (1) to mark the physical zero point:
4. Now close the **Mounting settings**.
5. Click the Time-Of-Flight settings.

   Select the recording mode and, if necessary, adjust the integration time for your application.
6. Now close the Time-Of-Flight settings.
7. Configure the data filter in the **Filter settings**.
8. Configure the frame rate and, if necessary, the averaging method via **Reduce the frame rate**.
9. Open the display control.



10. Use the display control to adjust the output so you can achieve as clear outputs as possible under real conditions.

    Note: The displayed raster represents the floor (as x/y reference plane). The 3D camera is aligned to this via the configuration.



11. Check the output for clearly recognizable image fragments and make any necessary adjustments, for example to the confidence filter, to eliminate these fragments as much as possible.
12. Permanently save your settings in the device, or note the values so you can use them later for programming.

    Note: You can save the parameters using **Device** - **Export**, or load them using **Device** - **Import**.

13. To configure how the camera is controlled via the digital inputs, click "Configuration". You can activate the trigger mode here, and/or specify how the saved setups are controlled.
14. Open the other available views to obtain detailed information on the operational status and characteristics of the camera (temperature, operating hours counter, etc.).

Configuring/visualizing the 3D sensor

Note: The camera can be configured for further applications by programming the API interface (see API code samples and/or the separate API documentation on the data card).

15. Permanently save your setups and quit SOPAS ET when you have collected the required information and finished configuring the sensor.

- You can use the **Authorized Customer** or **Service** user levels to configure additional settings e.g., for the coexistence of several 3D cameras, or for the integration time.

SOPAS ET can also be used to carry out diagnoses and visualizations in order to verify the functionality of the 3D sensor.

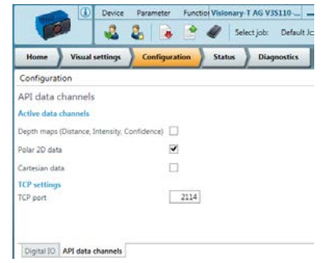
Note: You can find information on how to change the user level in the online help for SOPAS ET. The passwords for the user levels can be obtained from the manufacturer's customer service department.

Programming the application

Note: Only available for Visionary-T AG.

1. In the settings overview, click Data reduction.
2. Activate the desired reduction method.
3. Configure the data reduction by clicking on the Configuration menu.
   To use polar data reduction, you need to adjust the Mounting settings.

   Note: For detailed instructions, see "GUI_Configuration_Visionary-T" on the enclosed USB stick.
4. Activate the desired API channel via the configuration menu to make the reduced data available.



Programming the application

The Visionary-T CX/AG is normally integrated into customer-specific applications and communicated with via an API interface.

The settings selected under visualization in SOPAS ET can act as reference values and default settings.

A detailed description of the API interface and example codes for connecting to the 3D camera, I/O communication and further examples can be found on the data card provided.

The Visionary-T CX/AG provides continuous 3D data to the data interface. For this reason, ensure the communication interface is designed for large data quantities, and dimension the storage requirements accordingly.

Commissioning and maintenance

The 3D camera contains no inner parts that the user needs to have serviced.

- Check the screw connections and terminals regularly.
- Clean the housing using a soft cloth. Either use a dry cloth, or dampen it with lukewarm water and a small amount of mild cleaning agent.
- Clean the area between the cooling ribs regularly.

Additional information

You can find additional information on the 3D camera in the operating instructions or in the online help for SOPAS ET.

Please contact your local sales office in the event of any support queries.

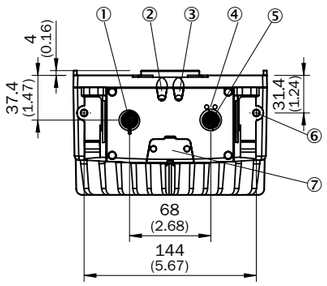
Additional information about products and orders can be obtained at:

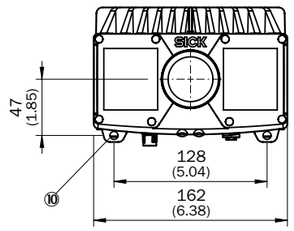
www.sick.com/Visionary-T

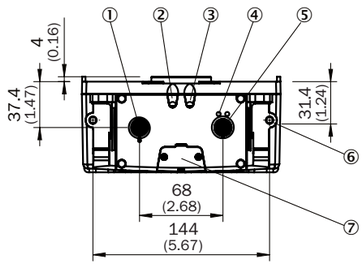
Software licenses

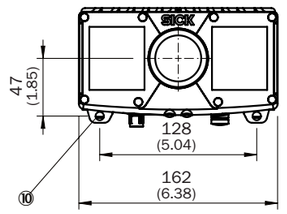
See content of data card for relevant software license topics.

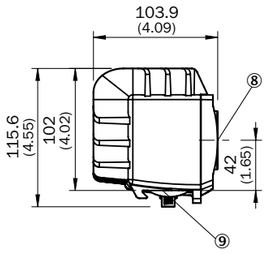
A Dimensional drawings in mm (inch)

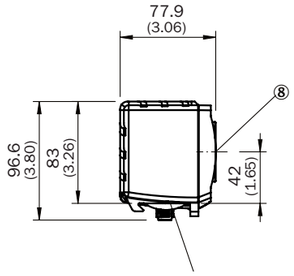








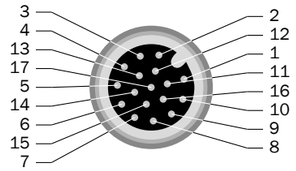




① Connection power / digital inputs/outputs / service
② Device display
③ Application display
④ Ethernet status display
⑤ Ethernet connection
⑥ M6 blind tapped holes, 7 mm deep (2x), for mounting
⑦ Service interface
⑧ Optical axis
⑨ Interface bracket
⑩ Mounting bracket (accessories)

B Connections

Voltage/ digital I/O /service (17-pin, M12, system plug)



Pin	Signal	Description
1	GND	Reference potential
2	24 V DC +/– 20% for integration times > 2.5 ms: 24 V DC +/– 15%	Supply voltage
3	CAN L	Reserved, not executed. DO NOT connect to VCC!
4	CAN H	Reserved, not executed. DO NOT connect to VCC!
5	TD+ (RS-422/485) Host	Reserved, not executed. DO NOT connect to VCC!
6	TD– (RS-422/485) Host TxD (RS-232), Host	Reserved, not executed. DO NOT connect to VCC!
7	TxD (RS-232), Aux	Only service
8	RxD (RS-232) Aux	Only service
9	SENS GND	Reference potential for electrically decoupled inputs
10	SENS IN1	Switching input, electrically decoupled
11	RD+ (RS-422) Host	Reserved, not executed. DO NOT connect to VCC!
12	RD– (RS-422/485) Host RxD (RS-232), Host	Reserved, not executed. DO NOT connect to VCC!
13	INOUT 1	Programmable digital I/O
14	INOUT 2	Programmable digital I/O
15	SENS IN2	Switching input, electrically decoupled
16	INOUT 3	Programmable digital I/O
17	INOUT 4	Programmable digital I/O

Pin	Flex color[1)]
1	Blue
2	Brown
3	Green
4	White
5	Pink
6	Yellow
7	Black
8	Gray
9	White + black
10	Violet
11	Gray + pink
12	Red + blue
13	White + green
14	Brown + green
15	White + yellow
16	Yellow + brown
17	White + gray

[1)] Only applies to SICK AG accessories (see operating instructions)

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

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

C Detection volume

The detection volume of Visionary-T CX/AG depends on:

- the configuration;
- the distance to a flat boundary surface, e.g., floor, ceiling, wall;
- the mounting angle relative to the boundary surface.

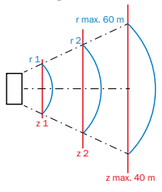
The maximum detection distance – and therefore the 3D detection volume – also depends on environmental influences such as:

- lighting conditions
- IR interference
- air particle concentration
- reflectivity (850 nm) of the objects in the detection zone
- object transparencies (e.g., windows)

Note: The reliability of the detection is reduced by heavily reflective or absorbent materials (e.g., mirrors, black surfaces). Heavily reflective and shiny materials cause multiple reflections and lead to measurement errors (artifacts) due to the principle of operation.

Absolute accuracy (z-axis) and repeatability (central detection volume) at 100% remission and without background light for integration times of 1 ms (0.5 m and 1 m distance) and 4 ms (all other distances)

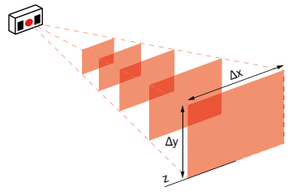
Working distance, radial/absolute:



Working distance radial (r)	Accuracy (100% remission)	Repeatability (1σ – 100% remission)
0.50 m	± 15 mm	± 2 mm
1.00 m	± 15 mm	± 2 mm
2.00 m	± 15 mm	± 2 mm
3.00 m	± 15 mm	± 3 mm
4.00 m	± 20 mm	± 3 mm
5.00 m	± 25 mm	± 4 mm
7.00 m	± 35 mm	± 7 mm
10.00 m	± 50 mm	± 15 mm
15.00 m	± 50 mm	± 30 mm
20.00 m	± 50 mm	± 50 mm

Working distance radial (r)	Accuracy (10% remission)	Repeatability (1σ – 10% remission)
0.50 m	± 15 mm	± 2 mm
1.00 m	± 15 mm	± 3 mm
2.00 m	± 20 mm	± 6 mm
3.00 m	± 35 mm	± 10 mm
4.00 m	± 50 mm	± 20 mm
5.00 m	± 50 mm	± 25 mm
7.00 m	–	–
10.00 m	–	–
15.00 m	–	–
20.00 m	–	–

Detection volume and 2D ranges



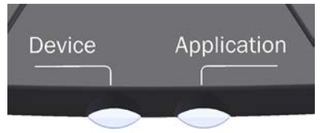
Working distance absolute (z)	Range (Δx)	Range (Δy)
0.50 m	0.70 m	0.53 m
1.00 m	1.40 m	1.06 m
1.50 m	2.10 m	1.60 m
2.00 m	2.80 m	2.13 m
3.00 m	4.12 m	3.19 m
4.00 m	5.50 m	4.25 m
5.00 m	6.87 m	5.32 m
10.00 m	13.75 m	10.63 m
15.00 m	20.62 m	15.95 m
20.00 m	27.49 m	21.27 m
40.00 m	54.98 m	42.54 m

D Technical data

	Visionary-T CX/AG
Working distance	0.5 m ... 60 m
Detection angle	69° x 56°
Example field of view	7 m x 5.3 m
Pixel count	176 x 144 pixels
Repeatability	≥ 2 mm, at a range of 1 m ≥ 7 mm, at a range of 7 m[1]
Light sensitivity	< 50 kLux (sunlight)
Connections	M12 17-pin (voltage supply), system plug digital IOs (24 V) M12 8-pin Gigabit Ethernet, X-coded
Supply voltage	24 V DC (+/–20%), < 2.5 ms integration time (+/–15%), > 2.5 ms integration time
Power consumption	≤ 22 W typically (without digital I/Os)
Peak current	3 A
Mounting height	variable
Mounting position	variable
Weight	~1.9 kg (1.4 kg)[1]
Dimensions (L x W x H)	162 mm x 116 mm x 104 mm (162 mm x 93 mm x 78 mm)[2]
Ambient temperature (operation)	0 °C ... +50 °C (0 °C ... +45 °C)[2]
Ambient temperature (storage)	–20 °C ... +70 °C
Shock resistance	According to EN 60068-2-27:2009
Vibration resistance	According to EN 60068-2-6 and 60068-2-64
Electromagnetic compatibility (EMC)	EN 61000-6-2:2005-08 EN 61000-6-4:2007-01
Protection class	III
Enclosure rating	IP67
LED class	Risk group 0 in accordance with EN 62471

[1] See table for individual values.
[2] The values are for housing variants with short cooling fins. The maximum operating temperature is reduced by 5 °C in speed mode.

E Status LEDs



Visionary-T CX and AG

Device	Application	Description
blue – flashing slowly	off	System start
–	blue	Data transmission: API channel deactivated and diagnostic channel active
–	blue – flashing slowly	Data transmission deactivated
orange – flashing slowly	blue	Device warning, e.g., temperature exceeds warning level
–	green	API channel, data transmission active
orange – flashing slowly	green	Device warning, e.g., temperature exceeds warning level, data transmission active
blue	off	Illumination off
red – flashing slowly	red	Max. operating temperature exceeded
green	blue – flashing slowly	Trigger mode active; waiting for trigger
green	blue – flashing slowly	Trigger mode active; waiting for trigger signal
–	blue – flashing slowly	Data transmission deactivated

Optional accessories

Part no.	Description
2077709	2x screws, 2x clamps
2077710	Mounting kit (2-part) incl. clamps
6049728	Ethernet cable 2 m, M12 / RJ45, X-coded
6049729	Ethernet cable 5 m, M12/ RJ45, X-coded
6051194	M12 cable, 2A, Ecolab, 3 m (CDB650)

Part no.	Description
2070425	M12 cable, 2A, Ecolab, 3 m
2070426	M12 cable, 2A, Ecolab, 5 m
1064114	CDB650-204, Split Box

System requirements

- Operating systems:
  Windows 10, 4 GB RAM
  Windows 7 Professional (32/64 bit), 4 GB RAM
  Windows 8 Professional (32/64 bit), 4 GB RAM
- Min. Pentium i5, 2.6 GHz or comparable
- Min. Intel HD Graphics 3000 (or NVIDIA NVS 3100M 512MB gDDR3) and OpenGL 2.0 Support
- Screen resolution 1024 × 768 or higher, at least 256 colors (65,536 colors recommended)
- Free hard disk space: 450 MB
- Ethernet: 100 MBit/s or higher