Visionary-T Mini CX

3D machine vision



SICK Visionary-T Mini CX

Valid for the following part number:

LISTED







Enclosure Type 1.

wiring leads are available Refer to the product inform

wetherlands Phone +31 (0) 30 204 40 00 New Zealand Phone +64 7 7 +64 9 415 0459 0800 222 278 - tollfree +43 (0) 2236 62288-0 +32 (0) 2 466 55 66 +47 67 81 50 00 +55 11 3215-4900 +48 22 539 41 00 Canada +1 905.771.1444 +40 356-17 11 20 +420 234 719 500 +65 6744 3732 +56 (2) 2274 7430 +421 482 901 201 +86 20 2882 3600 +386 591 78849 South Africa Phone +27 10 060 0550 +45 45 82 64 00 South Korea Phone +82 2 786 6321/4 +358-9-25 15 800 +33 1 64 62 35 00 +34 93 480 31 00 +49 (0) 2 11 53 010 +46 10 110 10 00 +30 210 6825100 ı +41 41 619 29 39 Hong Kong +852 2153 6300 +886-2-2375-6288 +36 1 371 2680 +66 2 645 0009 +90 (216) 528 50 00 +91-22-6119 8900 United Arab Emirates Phone +971 (0) 4 88 65 878 +972 97110 11 United Kingdom Phone +44 (0)17278 31121 +39 02 27 43 41 +81 3 5309 2112 +1 800.325.7425 +603-8080 7425 +65 6744 3732 +52 (472) 748 9451

Detailed addresses and further locations at www.sick.com

Disclaimer

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

Cybersecurity

To protect against cybersecurity threats, it is necessary to continuously monitor and maintain a comprehensive and holistic cybersecurity concept. A suitable concept comprises organizational, technical, procedural, electronic, and physical levels of defense and provides suitable measures for different types of risks Products and solutions from SICK must be viewed as a component

You can find more information about cybersecurity at:

Safety

- ▶ Visionary-T Mini CX does not constitute personal protection equipment in accordance with the respective applicable safety
- ▶ The mounting, electrical installation and configuration of the device must only be carried out by professionally qualified
- ▶ When mounting and electrical installation work is being carried out, always comply with standard operating procedures, and applicable health and environmental regulations.
- ▶ The camera is not suitable for use in explosion-hazardous areas.
- ▶ When installing the device, always consider the electrical connected loads
- ▶ Replace faulty or damaged cables and male connectors
- ► 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
- ▶ Operate the 3D vision camera only within the set operating
- ▶ Regularly check that the 3D vision camera is functioning properly.
- ▶ The infrared beams of the laser illumination unit do not pose a danger to the human eye if the 3D vision camera is operated within the specified parameters.
- ▶ Structural modifications to the 3D vision camera are strictly
- ▶ During mounting, ensure there are no attachment parts in the detection volume of the 3D vision camera.
- ▶ The 3D vision camera must not be mounted behind a transparent screen since this will affect the system properties
- \blacktriangleright If heat dissipation is inadequate, the housing temperature can exceed the specified range. Ensure an adequate heat dissipation (see accessories) and, if necessary, adjust the device configura-
- ▶ The 3D vision camera can be affected by external light sources. or interfere with other sensors (e.g., laser scanners) due to the active laser illumination unit.

⚠ CAUTION

Optical radiation: Laser class 1

The accessible beam from the laser illumination unit integrated into the device does not pose a danger when exposed directly for up to 100 seconds. It may pose a hazard to the eyes and skin in

- ▶ Do not open the housing. Opening the housing may increase the
- ▶ Applicable national regulations regarding laser protection must

Scope of delivery

- ► Visionary-T Mini CX (3D vision camera)
- ▶ Ouickstart

Product features

- Output of 3D image data via a Gigabit Ethernet interface
- ▶ Meets industrial requirements for data security and reliability
- Easy mounting and commissioning
- 3D data acquisition at up to 30 frames per second (fps).
- ► Convenient API connection for using the 3D vision camera in specialist applications
- ► Configuration and activity recording via the SOPAS Engineering Tool (SOPAS ET) on a computer

Overview

Visionary-T Mini CX is a 3D vision camera based on the timeof-flight (ToF) principle. It provides real time 3D data at up to 30 frames per second (fps).

The SOPAS ET software can be used to configure the 3D vision camera and visualize the data

SOPAS ET can be used to define and configure different setups.

Once configured, the 3D vision camera runs in stand-alone operation. It continuously provides the outputs via the configured

To use the 3D vision camera, perform the following steps:

- 1. Complete the mechanical and electrical setup. Install SOPAS ET.
- 3. Connect the 3D vision camera to SOPAS ET.
- 4. Configure the 3D vision camera.

Completing the mechanical and electrical setup and installing SOPAS ET

Mount the device using the accessories provided **F**.

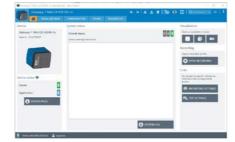
- 1. Prepare the mounting location in accordance with the dimensional drawing A.
- Mount the 3D vision camera in the proper alignment for the desired detection volume Ensure that the detection volume is bordered by a surface D. To avoid optical interference, ensure that the 3D vision camera is not on the same optical axis as other optoelectronic sensors when mounting it.
- Connect the 3D vision camera via the Ethernet interface directly to your computer, or to the network to which your computer is connected.
- Use the system plug of the 3D vision camera to connect the voltage supply and signal transmission B.
- Install SOPAS ET by running the installation file (as
- Follow the instructions of the installation program.

Connecting to SOPAS ET

SOPAS ET is a software program of SICK AG. It has been developed for Windows systems for monitoring and configuring devices.

Connecting SOPAS ET to the 3D vision camera:

- Ensure the 3D vision camera is switched on and connected to the computer or the same network.
- Start SOPAS ET.
- SOPAS ET automatically attempts to identify connected devices when it starts. If the 3D vision camera is in the same network segment, the camera is displayed in the list of devices found.
- Click the 3D vision camera in the list of available devices. Add the 3D vision camera to the project. The required device file can be installed directly from the internal storage device of the 3D camera.
- Double-click the 3D vision camera in the project list. The device window opens.



Connecting to SOPAS ET

- the connection assistant, which can be used to change the
 - Note: The default IP address for the 3D vision camera is
- If the device is not listed, click Search for devices to open the connection wizard

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

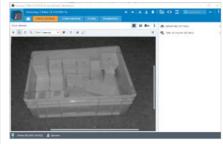
Pre-installing the device driver (alternative installation)

- Start SOPAS ET. Open the Device Catalog tab.
- Open the device driver manager (*). Click on Install.

Toolbar in the sensor application

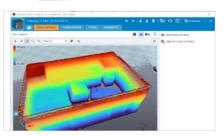
The visualization and control of the 3D vision camera is carried out in SOPAS ET via the Visual settings, the Configuration, and the

2D view



can help you to position the 3D vision camera correctly, or to bring specific objects into the field of view.

3D view



The visualization depends on the specific camera settings selected. The color scale and color range in both the 2D and 3D viewer can be customized in the view options

SOPAS icons

Select individual points from the cluster of points and mark

Move the displayed image section left or right as well as up (Also: Shift + Left Click + Move).

©

Rotate the displayed image section around the current image center point

(Also: scroll wheel forward/back).

≔ noints

Switch between the individual display forms of the collected

ñ

Select different pre-configured viewing angles. To select a viewing angle, click the respective arrowhead

Interrupts the replay of the camera data, for example to store a still image.

Toolbar in the sensor application

Log into the device

SOPAS parameters.

Save setup

data card

Save 3D point cloud

Trigger next image

Question mark

camera

Write camera parameters.

- After logging in, you can edit camera parameters and access detailed status information

camera

- Note: The parameters can be saved using
- 12. Open the other available views to obtain detailed informa-
- tion on the operational status and characteristics of the camera (temperature, operating hours counter, etc.).
- the sensor is complete, we recommend permanently saving the setup. SOPAS ET can then be closed.

specific applications and communicated with via an API

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

connecting to the 3D camera, I/O communication, and further examples are available on the product page.

The Visionary-T Mini CX provides continuous 3D data to the data interface. For this reason, ensure the communication interface is designed for large data quantities, and ensure adequate storage space is available

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

- ► 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
- ▶ Ensure adequate heat dissipation to guarantee the availability of the device in continuous operation (see accessories

Additional information

More information can be found on the product page.

It can be accessed via the SICK Product ID:

pid.sick.com/{P/N}/{S/N}

label (if specified)

- · CAD files and dimensional drawings
- · Certificates (e.g., declaration of conformity)
- · Other publications
- Software

For additional information, visit supportportal sick, com or see

aueries.

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SICK uses open source software which is published by the rights holders under a free license. Among others, the following license types are used: GNU General Public License (GPL version 2, GPL version 3), GNU Lesser General Public License (LGPL), MIT

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an inquiry to our customer service department at the following foss.compliance@sick.de

You can obtain the source code for these software components

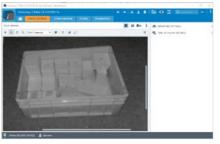
from us within three years of delivery of the product by sending

copies of the license texts are also available on request.

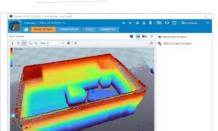
- ▶ If SOPAS ET cannot establish a connection to the camera,
 - 192.168.1.10

- Select the From a data card option. Search for the device file
- 4. Select the file. Follow the instructions of the installation wizard.

toolbar. Two different display options are available for this.



The 2D view shows a grayscale image of the captured scene. This



The 3D view provides a three-dimensional point cloud visualization

(Also: Ctrl +Left Click + Move).

Display options

Enlarge or reduce the currently displayed image section

Rotate

Reset the perspective to default. Select viewing angle

Log out of the device Log out to prevent unauthorized access to the camera Read device parameters

Reads the current camera parameters. Updates the

Transfers the current SOPAS parameters to the camera

Starts and stops the stream recording, which is saved as

Save setup.
Saves the configured setup permanently on the device.

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

Displays the next triggered image in the trigger mode.

The "guestion mark" icon can be used to display additional

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

information and help for each parameter.

Configuring and visualizing the 3D vision

SOPAS ET can, amongst other things, be used to carry out

via the Authorized Customer or Service user level.

service department.

see "Connecting to SOPAS ET")

settings for your use case

1000

10, 11

1 00 mg 1 0 mg 2 100 mg 0

coordinates (x|y|z = 0|0|0).

Now close the Mounting settings.

Open the display control.

as well as the recording cycle of the data.

Configure the data filter in the Filter settings.

8. Use the display control to adjust the output so you can

using the Mounting settings.

100

diagnostics and visualizations. You can configure further settings

Switch on the 3D vision camera. Connect it to SOPAS ET

Click the "Visual settings" step to begin configuring the

3. In the settings overview, click on Mounting settings:

The center of the disc with the status LEDs is the origin of the

Edit the parameters to transform the camera data into the

5. Use the image and recording settings to configure the format

Note: The displayed raster represents the floor (as x/v

reference plane). The 3D camera is aligned to this

You can find information on how to change the user

level in the online help for SOPAS FT. The passwords for the user levels can be obtained from the customer 10. We recommend permanently saving the settings.

Device - Export or loading using Device - Import.

Configuring and visualizing the 3D vision

9. If noticeable image artifacts are present, you can if neces-

sary adjust the filter or image and capture settings. This

enables you to eliminate the artifacts as far as possible.

- 11. "Configuration" can be used to configure the actuation of the digital outputs via the camera
- 13. After entering the required information and configuration of

Programming the application

The Visionary-T Mini CX is normally integrated into customer-

A detailed description of the API interface and example codes for

Service and maintenance

cleaning agent.

 $\{P/N\}$ corresponds to the part number of the product, see type

{S/N} corresponds to the serial number of the product, see type

- The following information is available depending on the product:
- · Data sheets · This document in all available language versions

Accessories

the online help for SOPAS ET. Please contact your local sales office in the event of any support

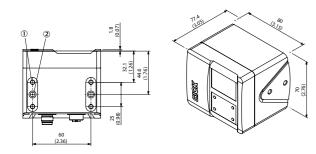
license, zlib license and licenses derived from the BSD license.

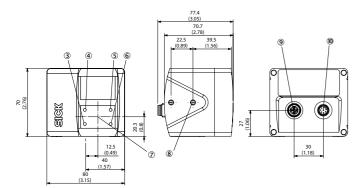
particular purpose.

email address:

For the license text, see www.sick.com/licensetexts, Printed

Dimensional drawings in mm (inch) A period is used as the separator.





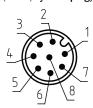
Labeling of dimensional drawing

Ü	
1	Threaded mounting hole, M5, 7.5 mm depth (4x)
2	Fit ø 5H7, 7 mm depth (2x)
3	Device status LED
4	Application 1 status LED
5	Ethernet status LED ឺ
6	Application 2 status LED 📤 ¹
7	Sensor coordinate origin
8	Threaded mounting hole, M5, 5.5 mm depth (4x)
9	"Ethernet" connection, 8-pin M12 female connector, X-coded
10	"Power/Serial/I/O" connection, 8-pin M12 male connector, A-coded

¹The Application 2 status LED is off during system start and lights up permanently green when in operation.

Connections

Voltage/digital I/O/service (8-pin, M12, system plug)



Pin	Signal	Description
1	24 V DC -30% +25%	Supply voltage
2	INOUT31	Programmable digital I/O
3	GND	Reference potential
4	INOUT4 ¹	Programmable digital I/O
5	INOUT1 ¹	Programmable digital I/O
6	INOUT51	Programmable digital I/O
7	INOUT61	Programmable digital I/O
8	INOUT21	Programmable digital I/O

¹Maximum current per digital output: 100 mA. Maximum total current for all digital outputs 500 mA. Voltage drop at output for 100 mA: < 2 V. Short-circuit protected

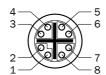
Pin	Flex color 11
1	Brown
2	White
3	Blue
4	Black
5	Gray
6	Pink
7	Violet
8	Orange

Pin	Flex color 21 (angled cable)
1	White
2	Brown
3	Green
4	Yellow
5	Gray
6	Pink
7	Blue
8	Red

¹Only applies for the cables listed here (see optional acces-

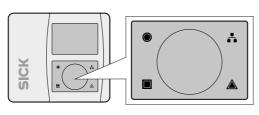
Connections

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	

Status LEDs



Device	Application 1	Description
Green	Off	System start
Green	Off	Data transmission: API channel deactivated and ready for data transmission
Green	Blue	Data transmission: API channel deactivated - SOPAS active
Green	Green	Data transmission: API channel active
Orange - flashing slowly	All	Device warning, e.g., temperature exceeds warning limit
Red - flashing slowly	Red	Max. operating temperature exceeded or short-circuit
Red – flashing quickly	Red	Illumination fault

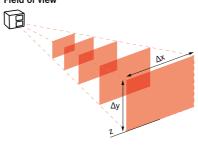
Working range

The working range and detection volumes of Visionary-T Mini CX depend on the following factors:

- ▶ Distance to a flat boundary surface, e.g., floor, ceiling, wall
- ► Mounting bracket relative to the boundary surface

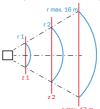
The maximum detection distance - and therefore the 3D detection volume - also depends on environmental influences:

- ► lighting conditions
- ► IR interference
- ▶ air particle concentration
- reflectivity (850 nm) of the objects in the detection zone
- ▶ object transparencies (e.g., windows)
- ▶ The optical axis may be tilted at up to 1.5° relative to the front of the housing (typically 0.3° ... 0.8°)



Axial working distance (z)	Measuring range (Δx)	Measuring range (∆y)
0.2 m	0.3 m	0.2 m
0.5 m	0.7 m	0.6 m
1.0 m	1.4 m	1.2 m
1.5 m	2.1 m	1.7 m
2.0 m	2.8 m	2.3 m
3.0 m	4.2 m	3.5 m
4.0 m	5.6 m	4.6 m
5.0 m	7.0 m	5.8 m
6.0 m	8.4 m	6.9 m
8.0 m	11.2 m	9.2 m
10.0 m	14.0 m	11.5 m
13.0 m	18.2 m	15.0 m

Absolute measurement accuracy/repeatability Radial/Absolute working distance:



90% remission factor

Working distance radial (r)	Measurement accuracy	Repeatability 1σ	Intensity
0.5 m	± 3 mm	± 0.8 mm	76 dB
1.0 m	± 3 mm	± 0.8 mm	64 dB
2.0 m	± 3 mm	± 1 mm	52 dB
4.0 m	± 7 mm	± 2 mm	40 dB
7.0 m	± 10 mm	± 5 mm	31 dB
8.0 m	± 13 mm	± 7 mm	28 dB
10.0 m	± 20 mm	± 15 mm	26 dB
13.0 m	± 50 mm	± 48 mm	20 dB

10% remission factor

Working distance radial (r)	Measurement accuracy	Repeatability 1σ	Intensity
0.2 m	± 3 mm	± 0.8 mm	72 dB
0.5 m	± 3 mm	± 0.8 mm	56 dB
1.0 m	± 3 mm	± 1.5 mm	44 dB
2.0 m	± 3 mm	± 4 mm	33 dB
4.0 m	± 10 mm	± 12 mm	21 dB
7.0 m	± 20 mm	± 50 mm	11 dB

Note: The specified numerical values are typical values for individual pixels and apply in the central 80% of the detection area, at room temperature, without ambient light, and at a frame rate of 25 fps.

At distances > 9 m, the reliability of the measured values will be lower and individual pixels or pixel groups may exhibit defective measured values. The measurement accuracy may degrade by up to

+-10 mm (typically +-5 mm) over the entire ambient operating temperature.

Technical data

	Visionary-T Mini CX
Working distance ¹	up to 16 m
Detection angle	70° x 60°
Maximum frame rate	30 fps
Pixel count	512 x 424 pixels
Repeatability ²	\pm 0.8 mm, at a distance up to 1 m \pm 5 mm, at a distance up to 7 m
Ambient light immunity ³	50 klx
Connections	System plug, M12, 8-pin, A-coded
	Gigabit Ethernet, M12, 8-pin, X-coded
Supply voltage	24 V DC (-30% +25%)
Power consumption	≤ 12 W typically (without digital I/Os)
Peak current	2 A
Weight	520 g
Dimensions (L x W x H)	80 mm x 70 mm x 77 mm
Ambient operating temperature ⁴	-10 °C +50 °C
Camera housing temperature ⁵	-10 °C +65 °C
Storage temperature	-20 °C +80 °C
Impact load	IEC 60068-2-27:2008 (30 g / 11 ms)
Vibration load	IEC 60068-2-6:2008, IEC 60068-2-64:2008 (5.0 g / 10 Hz 500 Hz)
Electromagnetic compatibility (EMC)	IEC 61000-6-4:2018, EN IEC 61000-6-4:2019, IEC 61000-6-2:2005, EN 61000-6-2:2005, IEC 61000-6-2:2016, EN IEC 61000-6-2:2019
Protection class	III
Enclosure rating ⁶	IP65, IP67
Laser protection 7	Class 1 (\(\): 850 nm, P < 17 mW, t < 25 ns); IEC/EN 60825-1:2007, IEC 60825-1:2014, EN 60825-1:2014+A11:2021
Camera coexistence mode 8	Automatic
Switch-on delay ⁹	~20 s
Image acquisition time	< 10 ms
Interfaces	Gigabit Ethernet

¹ Depends on the infrared remission properties of the target object

Accessories

Part no.	Description
2124497	Visionary mounting kit
2127749	Visionary heat sink
2106258	Ethernet cable 2 m, M12 / RJ45, X-coded
2106259	Ethernet cable 5 m, M12 / RJ45, X-coded
2106260	Ethernet cable 10 m, M12 / RJ45, X-coded
2094783	Ethernet cable, angled, orientation of coding: 180°, 2 m, M12 / RJ45, X-coded
2094784	Ethernet cable, angled, orientation of coding: 180°, 5 m, M12 / RJ45, X-coded
2094785	Ethernet cable, angled, orientation of coding: 180°, 10 m, M12 / RJ45, X-coded
6020663 ¹	M12 system cable, 2 m
6020664 ¹	M12 system cable, 5 m
6048434 ¹	M12 system cable, 10 m
20962182	M12 system cable, angled, orientation of coding: 315°, 2 m
20962192	M12 system cable, angled, orientation of coding: 315°, 5 m
2114689²	M12 system cable, angled, orientation of coding: 315°, 10 m
1 Cable with fle	x color 1

² Cable with flex color 2

G **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
- ▶ Minimum Pentium i5, 2.6 GHz or equivalent
- ► Minimum Intel HD Graphics 3000 (or NVIDIA NVS 3100M 512 MB gDDR3) and OpenGL 2.0 Support
- ► Screen resolution 1,024 × 768 or higher, at least 256 colors (65,536 colors recommended)
- ▶ Free hard disk space: 450 MB
- ▶ Ethernet: 100 MBit/s or higher

² See table for individual values.

³ Sunlight up to a measuring distance of 2.0 m.

 $^{^4}$ After a warm-up time of 45 minutes (at \geq -10 $^{\circ}$ C ambient temperature) and a frame rate of > 25 fps, the camera can also be operated at ambient

⁵ If no adequate heat dissipation (mechanical connection, ventilation etc.) is present, heat sinks (see accessories) can keep the housing temperature below the maximum of 65 °C.

⁶ Prerequisites: The cables plugged into the electrical connections must be screwed tight. Unused electrical connections are sealed off with a

 $^{^{7}}$ Conforms to 21 CFR 1040.10 except for deviations per Laser Notice No. 56 of May 8, 2019, and subsequent versions. 8 Multiple cameras can reduce the repeatability by a factor of $\sqrt{\text{(number of superimposed measuring ranges)}}$.

 $^{^{\}rm 9}$ The switch-on delay can increase considerably at ambient temperatures of 0 $^{\rm \circ}\text{C}.$