

Visionary-T AP

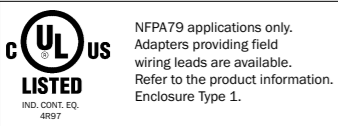
QUICK START

3D sensor

EN



SICK Visionary-T AP



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

Safety

- ▶ Visionary-T AP 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 device 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 device only within the set operating parameters.
- ▶ Regularly check that the device is functioning properly.
- ▶ The infrared beams used pose no danger to the human eye if the device is operated within the prescribed parameters (optical risk classification 0, EN 62471).
- ▶ Structural modifications to the device are strictly forbidden!
- ▶ During mounting, ensure there are no attachment parts in the detection volume of the device.
- ▶ The device must not be mounted behind a transparent screen since this will affect the system properties.

Scope of delivery

- ▶ Visionary-T AP (3D sensor)
- ▶ Quick start instructions

Note: API description, detailed product documentation and sample apps are available on supportportal.sick.com.

Product features

- ▶ Working distance up to at least 10 m
- ▶ Meets industrial requirements for data reliability
- ▶ 2-in-1: over 25000 depth values with integrated 2D live IR camera
- ▶ Easy mounting and commissioning
- ▶ 3D and 2D data collection with up to 50 fps
- ▶ Visionary-T AP as configurable Key App enabler: in combination with Key Apps intended for users who want to solve specific application without developing their own software solution.
- ▶ Visionary-T AP as programmable device: intended for programmers, who want to develop vision applications based on Visionary data and run it directly on a device

Overview

Visionary-T AP is a 3D and 2D sensor based on the time-of-flight (ToF) principle. It provides real time 3D and 2D data at up to 50 frames per second (fps).

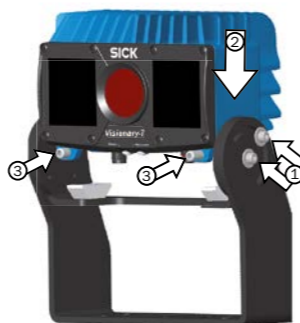
SICK AppStudio development environment is required to run Visionary-T AP as programmable device (license required)

SICK AppManager is required to run Visionary-T AP in combination with Key Apps as configurable device (license free)

To use the device, you need to follow the steps below:

1. Complete the mechanical and electrical setup.
2. Install and start SICK AppManager or AppStudio.
3. Connect the device to SICK AppManager or AppStudio.
4. Configure the device or start programming.

Mechanical and electrical setup



1. Fix the inner clamp to the outside edge (1). Attach the device (2) and secure it using the setscrews (3).
2. Prepare the mounting position in accordance with the dimensional drawing, see Appendix A.
3. Mount the device in the proper alignment for the desired detection volume. Ensure as far as possible that the detection volume is bordered by a flat boundary surface, see Appendix D.
4. Connect the Ethernet interface of the device directly to your computer or to the network to which your computer is connected.
5. Use the system plug of the device to connect the voltage supply and signal transmission, see Appendix C.

System requirements

Operating systems:

- ▶ Windows 10, 4 GB RAM,
 - ▶ Windows 8 Professional (32/64 bit), 4 GB RAM
 - ▶ Windows 7 Professional (32/64 bit), 4 GB RAM
- Min. Pentium i5, 2.6 GHz or comparable.

Free hard disk space: 450 MB.

Ethernet: 100 MBit/s or higher.

Additional GPU hardware may be required depending on visualization needs of the generated data.

Browser: Google Chrome (www.google.com/chrome) is recommended due to advanced support of WebGL and WebSockets.

Installing SICK AppManager or AppStudio

The SICK AppManager is a configuration tool for installing and redeploying the Key Apps. The SICK AppStudio development environment is used to program the device. Administrator rights are required on the PC to install the software.

License

AppManager is a license free tool. The download and use of SICK AppStudio requires a valid license. A one-year-license can be purchased on www.sick.com (part number 1610199).

Installation

1. Log in to the SICK Support Portal, supportportal.sick.com. Registration of a user account is required before logging in for the first time.
2. Download the latest version of SICK AppManager or AppStudio.
3. Run the installer and follow the instructions on the screen.

At the first use of SICK AppStudio, load or enter your personal license key to complete the installation. If the license dialog does not open automatically, open it by selecting License from the Help menu. SICK AppManager can be used directly after installation (no license key required).

Starting SICK AppStudio

1. Connect the device to the PC via Ethernet.
2. Set the PC to be on the same subnet as the device, but with a different IP address. The default IP address for the device is 192.168.1.10
3. Start SICK AppStudio. By default, the Connection wizard starts and scans for available devices.
4. Select the device in the Device list.
5. Click CONNECT.

Getting started with the device

The Visionary-T AP has a pre-installed app called v3s140_2_splitviewer, which shows a 2D intensity image and a 3D point cloud visualization. By default, the VisionaryViewer app runs as soon as the camera is powered on. The app can be used either with or without starting SICK AppStudio.

To open VisionaryViewer:

1. Open a web browser window.
2. Type the IP address of the 3D sensor in the address field. The default IP address is 192.168.1.10

Views

The VisionaryViewer app has only one page with two viewers:

- ▶ 2D viewer with an intensity image.
- ▶ 3D viewer with a point cloud visualization.

Image handling controls

The image handling controls are used to scale, move, and rotate the 3D image in the viewer. As an alternative to the buttons, use the mouse shortcuts described below.

Button	Name	Description
	Select	Hover over a region to display the coordinates and corresponding pixel intensities. Click and drag to change the dimensions of the region of interest.
	Move	Click and drag to move the image. Mouse shortcut: Press and hold SHIFT.
	Rotate	Click and drag to rotate the image. Mouse shortcut: Press and hold CTRL.
	Zoom	Click and drag upwards to zoom in and downwards to zoom out. Mouse shortcut: Use the mouse scroll wheel.

3D navigation control

Use the 3D navigation control in the lower left corner of the image viewer to change between orthographic 2D and 3D viewing angles:

- ▶ Click an arrowhead (X, Y or Z) to view an orthographic 2D projection of the object.
- ▶ Click the same arrowhead twice to flip the 2D projection, e.g. switch between the top and bottom view for the Z-axis.
- ▶ Press Home to restore the default viewing position.

View		Projection
Home		
Top view		
Right view		

Menus

The VIEW, COLOR and OPTIONS menus in the 3D viewer contain options for visualization of the pointcloud data.

Use X, Y, Z or INTENSITIES from the VIEW menu to select the different views for the data.

Use the COLOR menu to choose the desired color of the gradient.

Points from the Options menu displays the data with a point representation. Use the slider to change the size. Lighting and Surface are currently not used.

Using SICK AppStudio

Tutorials

Tutorials for general and device-specific topics are available to help the user get started with the programming of the device. The relevant tutorials for the Visionary-T AP are available on the SICK Support Portal, supportportal.sick.com.

Lua scripting

The embeddable scripting language Lua is used to create scripts in SICK AppStudio. See www.lua.org for more information about Lua.

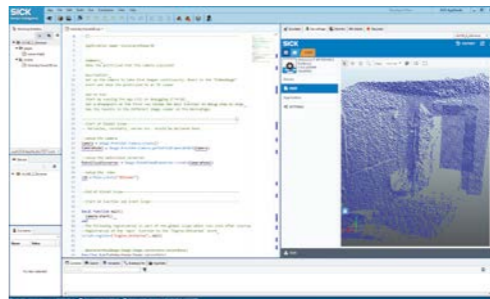
Auto completion

SICK AppSpace has a large API which includes functionality for hardware configuration, algorithms, result processing and result communication. The API is directly accessible from the Lua scripts:

1. Click a free place in the lua file.
2. Press Ctrl+Space to display a list of all accessible functions and commands for the device.

The API documentation for the device is available on the SICK Support Portal, supportportal.sick.com.

AppStudio interface

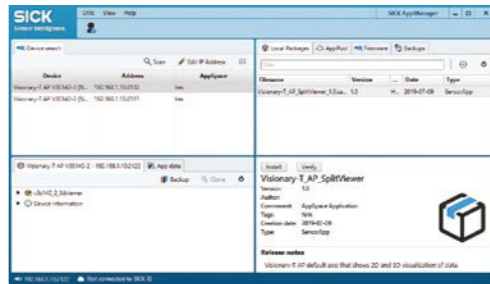


Starting SICK AppManager

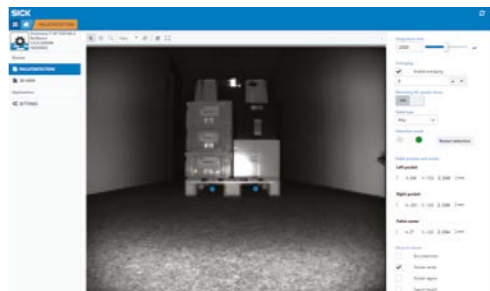
1. Connect the device to the PC via Ethernet.
2. Set the PC to be on the same subnet as the device, but with a different IP address. The default IP address for the device is 192.168.1.10.
3. Start SICK AppManager. By default the scan for connected devices starts.

Click a device in the Device list to connect.

AppManager interface



Example of a Key App interface deployed by AppManager



Software licenses

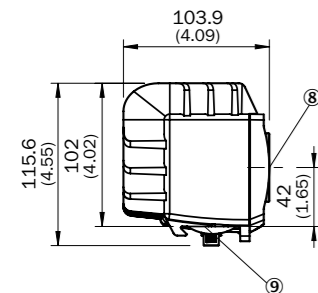
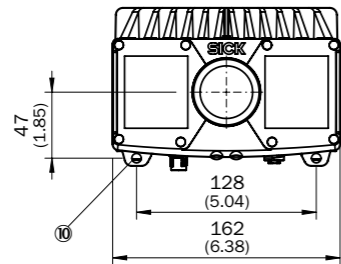
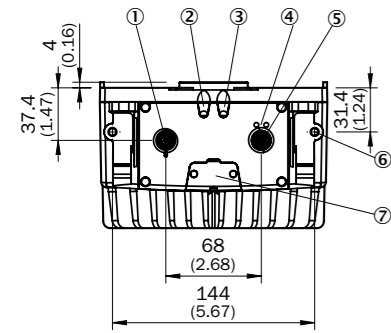
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The source code for these software components can be obtained from us on a data carrier within three years after distribution of the product (CD or DVD) by submitting a request to our customer service department at the following e-mail address: foss.compliance@sick.de

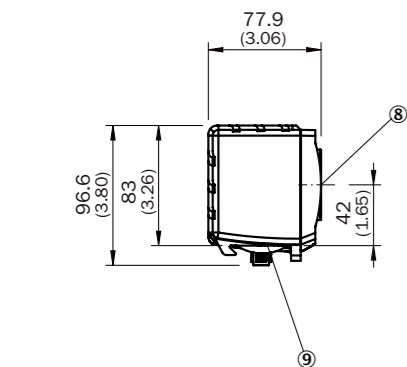
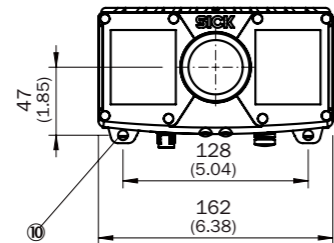
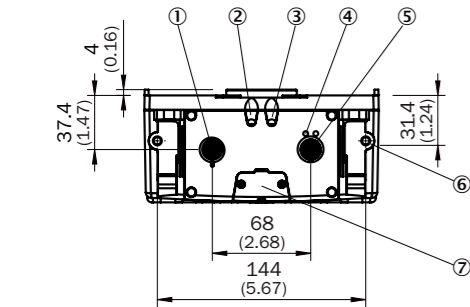
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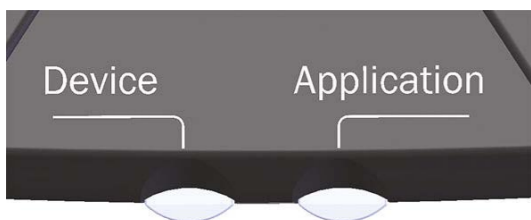
A Dimensional drawings in mm (inch)



- 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)



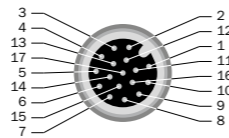
B LED definitions



Device	Description
Blue - flashing slowly	System start
Orange - flashing slowly	Device Warning
Red - flashing slowly	Error state
Green	Running / Ready

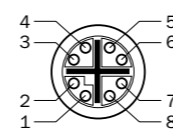
C Pin assignment

Voltage/ digital I/O /service



M12 male connector,
17-pin system plug

Gigabit Ethernet



M12 female connector,
8-pin X-coded

Pin	Signal	Description	Signal
1	GND	Reference potential	TRDO_P
2	24 V DC +/- 20% for integration times > 2.5 ms: 24 V DC +/- 15%	Supply voltage	TRDO_N-
3	CAN L	Reserved, not executed. DO NOT connect to VCC!	TRD1_P
4	CAN H	Reserved, not executed. DO NOT connect to VCC!	TRD1_N
5	TD+ (RS-422/485) Host	Reserved, not executed. DO NOT connect to VCC!	TRD3_P
6	TD- (RS-422/485) Host TxD (RS-232), Host	Reserved, not executed. DO NOT connect to VCC!	TRD3_N
7	TxD (RS-232), Aux	Only service	TRD2_P
8	RxD (RS-232) Aux	Only service	TRD2_N
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	-

D Detection volume

The detection volume of the device 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 and repeatability

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).

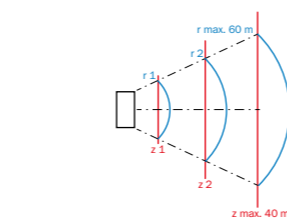


Abb. 1: Working distance, radial/absolute

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 - 100% remission)	Working distance absolute (z)	Range (Δx)	Range (Δy)
0.50 m	± 15 mm	± 2 mm	0.50 m	0.70 m	0.53 m
1.00 m	± 15 mm	± 3 mm	1.00 m	1.40 m	1.06 m
2.00 m	± 20 mm	± 6 mm	1.50 m	2.10 m	1.60 m
3.00 m	± 35 mm	± 10 mm	2.00 m	2.80 m	2.13 m
4.00 m	± 50 mm	± 20 mm	3.00 m	4.12 m	3.19 m
5.00 m	± 50 mm	± 25 mm	4.00 m	5.50 m	4.25 m
7.00 m	-	-	5.00 m	6.87 m	5.32 m
10.00 m	-	-	10.00 m	13.75 m	10.63 m
15.00 m	-	-	15.00 m	20.62 m	15.95 m
20.00 m	-	-	20.00 m	27.49 m	21.27 m
			40.00 m	54.98 m	42.54 m

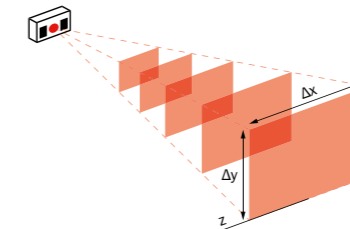


Abb. 2: Detection volume and 2D ranges

E Technical data

	Visionary-T AP
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	1.4 kg, without cooling fins; 1.9 kg, with cooling fins
Dimensions (L x W x H)	62 mm x 93 mm x 78 mm, without cooling fins 162 mm x 116 mm x 104 mm, with cooling fins
Ambient temperature (operation)	0 °C ... +45 °C, without cooling fins; 0 °C ... +50 °C, with cooling fins The maximum operating temperature is reduced by 5 °C in speed mode.
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 61000-6-2:2005-08
Protection class	III
Enclosure rating	IP67
LED class	Risk group 0 in accordance with EN 62471

¹ See tables for individual values

F Optional accessories

Part no.	Description	Part no.	Description
2077709	2x screws, 2x clamps	6051194	M12 cable, 2A, Ecolab, 3 m (CDB650)
2077710	Mounting kit (2-part) incl. clamps	2070425	M12 cable, 2A, Ecolab, 3 m
6049728	Ethernet cable 2 m, M12 / RJ45, X-coded	2070426	M12 cable, 2A, Ecolab, 5 m
6049729	Ethernet cable 5 m, M12 / RJ45, X-coded	1064114	CDB650-204, Split Box