Visionary-S AP

3D machine vision

EN

Valid for the following part numbers:
1114319 and 1114320

NFPA79 applications only. Adapters providing field wiring leads are available. Refer to the product information. Enclosure Type 1.

IND. CONT. EQ. 4R97

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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 of this concept.

You can find more information about cybersecurity at:
www.sick.com/psirt

Safety

▶ The Visionary-S 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 camera is not suitable for use outdoors or in 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 of the laser illumination unit do not pose a danger to the human eye if the 3D camera is operated within the specified parameters (laser class 1, EN/IEC 60825-1:2007, IEC 60825-1:2014, EN 60825-1:2014+A11:2021).

▶ Structural modifications to the 3D camera are strictly forbidden!

▶ During mounting, ensure there are no attachment parts in the detection volume of the 3D camera.

⚠ **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 the event of incorrect use.

▶ Do not open the housing. Opening the housing may increase the level of risk.

▶ Applicable national regulations regarding laser protection must be observed.

Scope of delivery

▶ Visionary-S AP (3D camera)
▶ This product documentation

Product features

▶ Access to 3D/RGB image data
▶ Meets industrial requirements for data security and reliability
▶ Easy mounting and commissioning
▶ 3D data acquisition at up to 30 fps
▶ Can be used in any indoor space
▶ Visionary-S AP as a parameterizable Key App enabler: in combination with Key Apps, intended for users who want to solve certain application problems without having to develop their own software solution.
▶ Visionary-S AP as a programmable device: intended for programmers who develop machine vision applications based on Visionary data and want to run these directly on a device.

Overview

Visionary-S AP is a 3D color camera based on the stereo principle with structured lighting. The 3D camera delivers real-time 3D data at 30 frames per second (fps).

The SICK AppStudio development environment is needed (license required) for the programmable device version of Visionary-S AP.

To run Visionary-S AP as a parameterizable device in combination with a SensorApp, you need SICK AppManager (license-free).

Usage overview:

1. Complete mechanical and electrical setup.
2. Install SICK AppManager or SICK AppStudio.
3. Connect device with SICK AppManager or SICK AppStudio.
4. Parameterize device or start programming.

Performing the mechanical and electrical setup

1. Secure the inner clamp to the outside edge (1). Attach the 3D camera (2) and secure it using the fitting screws (3).
2. Prepare the mounting position as per dimensional drawing **A**.
3. Mount the 3D camera in the proper alignment for the desired detection volume **C**.
4. Connect the Ethernet interface of the 3D camera directly to the computer or to the network to which the computer is connected.
5. To establish the voltage supply and the signal transmission, use the system plug of the 3D sensor **B**.

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

Minimum Core i5, 2.6 GHz or equivalent

Free hard disk space: 450 MB

Ethernet: 100 MBit/s or higher

Depending on the visualization requirements for the generated data, additional graphics hardware may be required.

Browser: Google Chrome is recommended due to its extended support of WebGL and WebSockets.

Installation of SICK AppManager or SICK AppStudio

SICK AppManager is a configuration software for the installation and re-provisioning of SensorApps. The SICK AppStudio development environment is used to program the device. Administrator rights are required to install the software on a computer.

License

SICK AppManager is a license-free tool. A valid license is required to download and use SICK AppStudio. You can purchase a one-year license at www.sick.com (part number 1610199).

Installation

1. Log in to the SICK Support Portal at supportportal.sick.com. Register a user account before logging in for the first time.
2. Download the current version of SICK AppManager or SICK AppStudio.
3. Run the installation file. Follow the instructions.

When using SICK AppStudio for the first time, enter or load your personal license key to complete the installation. If the license dialog box does not open automatically, select the "License" option in the "Help" menu. SICK AppManager can be used immediately after installation (no license key required).

Starting SICK AppStudio

1. Connect the device to the computer via Ethernet.
2. Configure the computer so that it is on the same subnet as the device but has a different IP address. The default IP address for the device is 192.168.1.10.
3. Start SICK AppStudio. The connection wizard then starts automatically and scans for available devices.
4. Select the device from the list of available devices.
5. Click CONNECT.

First steps with the device

The Visionary-S AP comes with the preinstalled application Visionary_S_AP_SplitViewer, which displays a 2D intensity image and a 3D point cloud visualization. The SplitViewer app runs automatically immediately after switching on the device. The app can be used independently of SICK AppStudio or parallel to SICK AppStudio.

Open SplitViewer:

1. Open a web browser.
2. Enter the IP address of the device in the address field. The default IP address is 192.168.1.10.

Control elements for image manipulation

The control elements for image manipulation are used to interact with the image in the viewer (resizing, moving).

In addition to the buttons, there are also shortcut links available.

Button	Designation	Description
▸	Select	To display the coordinates and the respective pixel intensities, point at an area with the mouse. To change the size of the ROI, click and drag the area.
✥	Move	Click and drag to move the image. Key combination: Press and hold the SHIFT KEY.
↻	Rotate	Click and drag to rotate the image. Key combination: Press and hold CTRL.
🔍	Zoom	Click and drag upwards to zoom in. Click and drag downwards to zoom out. Key combination: Use the mouse scroll wheel.

3D navigation control

To switch between orthographic 2D and 3D viewing angles, use the 3D navigation control in the bottom left corner of the viewer.

▶ To display a 2D projection of the object, click on an arrowhead (X, Y or Z).
▶ To rotate the 2D projection (e.g. switch between the top and bottom view of the Z axis), double-click the same arrowhead.
▶ To return to the original display position, click on HOME.

View	Projection
Start	
Top view	
View from the right	

Menus

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

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

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

The "Points" menu item in the "Options" menu displays data in a point representation. Use the slider to change the size. The "Lighting" and "Surface" options are not currently used.

Using SICK AppStudio

Tutorials

Tutorials on general and device-specific topics are available to assist users with programming the device. The relevant tutorials for the Visionary-S AP are available at supportportal.sick.com in the SICK Support Portal.

Lua scripts

The embedded script language "Lua" is used to generate scripts in SICK AppStudio. You can find additional information on "Lua" at www.lua.org.

Autocomplete

SICK AppSpace provides a comprehensive API with functions for hardware parameterization, algorithms, result processing and result communication. The API can be accessed directly via the Lua scripts:

1. Click on an empty spot in the Lua file.
2. To display a list of all accessible functions and commands for the device, press CTRL+spacebar.

The API documentation for the device is available at supportportal.sick.com in the SICK Support Portal.

**SICK AppStudio interface**
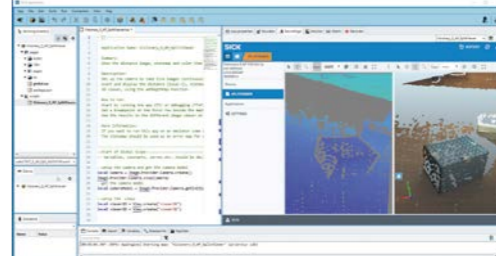
Starting SICK AppManager

1. Connect the device to the computer via Ethernet.
2. Configure the computer so that it is on the same subnet as the device but has a different IP address. The default IP address for the device is 192.168.1.10.
3. Start SICK AppManager. The system then scans for available devices by default.
4. To establish the connection, click on the device in the list of available devices

SICK AppManager interface
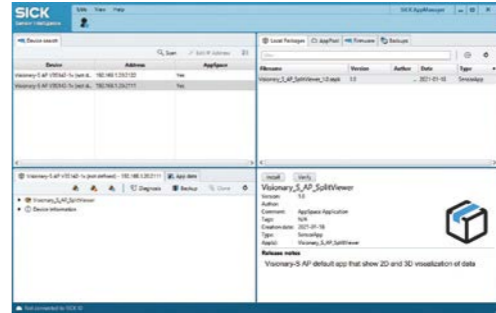
Starting SICK AppManager

Example Key App interface provided by SICK AppManager
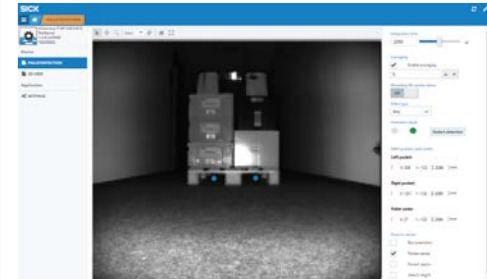
Service and maintenance

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 areas between the cooling ribs regularly.

Additional information

More information can be found on the product page.

The page can be accessed via the SICK Product ID: pid.sick.com/{P/N}/{S/N}

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if specified).

The following information is available depending on the product:

• Data sheets
• This document in all available language versions
• CAD files and dimensional drawings
• Certificates (e.g., declaration of conformity)
• Other publications
• Software
• accessories

For additional information on the 3D camera, visit supportportal.sick.com or see the online help for SOPAS ET.

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

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This program is provided for general use without warranty of any kind. This warranty disclaimer also extends to the implicit assurance of marketability or suitability of the program for a particular purpose.

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For the license text, see www.sick.com/licensetexts. Printed copies of the license texts are also available on request.
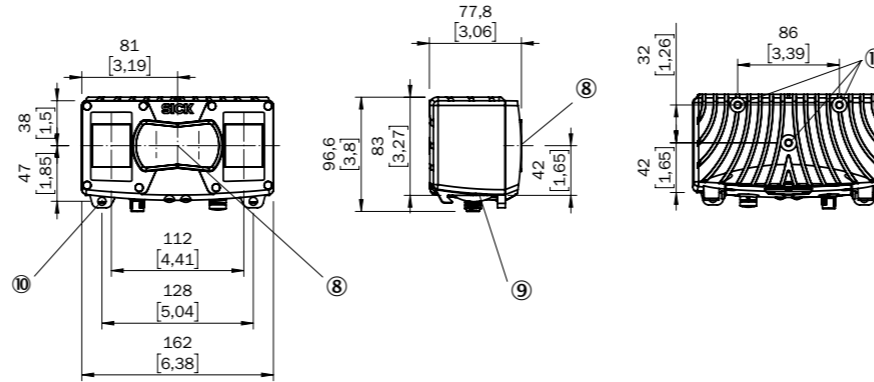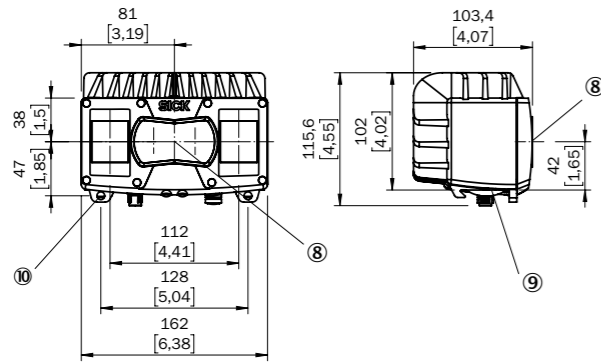
A — Dimensional drawings in mm [inch]
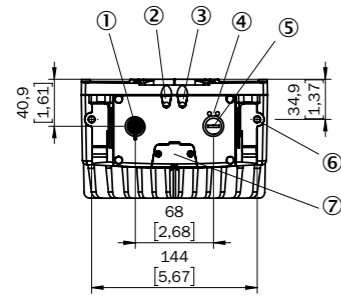
① Power connection/digital inputs and outputs/service
② Device indicator
③ Application indicator
④ Ethernet status indicators
⑤ Ethernet port
⑥ M6 threaded hole, 7 mm deep (2x), for mounting
⑦ Service interface
⑧ Coordinate system origin
⑨ Bracket interface
⑩ Bracket attachment
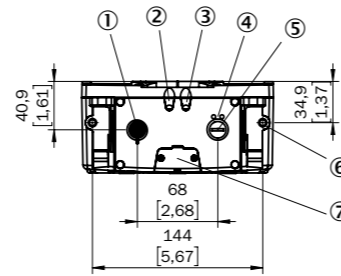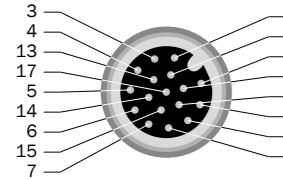
① Power connection/digital inputs and outputs/service
② Device indicator
③ Application indicator
④ Ethernet status indicators
⑤ Ethernet port
⑥ M6 threaded hole, 7 mm deep (2x), for mounting
⑦ Service interface
⑧ Coordinate system origin
⑨ Bracket interface
⑩ Bracket attachment
⑪ M6 threaded hole, 10 mm deep (3x), for mounting

D — Technical data

	Visionary-S AP
Working distance	0.5 m ... 6.5 m
Detection angle	~60° x 50°
No. of pixels for 3D	640 x 512 pixels
No. of pixels for RGB	640 x 512 pixels
Light sensitivity	< 40 klx (sunlight)
Maximum frame rate [1]	~30 fps
Enclosure rating	IP67
Supply voltage [2]	24 V +/− 15%
Power consumption [2]	19 W / 1.6 A (max.)
Processor (internal) [3]	4xARM Cortex A72, 1.2 GHz
Weight [4]	1.7 kg (2.2 kg)
Dimensions (L x W x H) [4]	162 x 93 x 78 mm (162 x 116 x 104 mm)
Ambient temperature (operation) [3]	0 °C ... +40 °C (0 °C ... +50 °C)
Ambient temperature (storage)	−20 °C ... +70 °C
Interface	Gigabit Ethernet (TCP/IP)
Length of cable	max. 10 m
Protection class	III
Laser protection [5]	Class 1 (λ: 808 nm, P₀ ≤ 4 mW, t ≤ 10 ms); EN/IEC 60825-1:2007, IEC 60825-1:2014, EN 60825-1:2014+A11:2021
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

[1] Certain settings require lower frame rates.
[2] Voltage supply must be able to bridge a brief power outage of 20 ms as specified in IEC 60204-1.
[3] Part of the processor resources are required for internal processing. The current processor load is displayed in the CPU monitor in SICK AppStudio.
[4] The values are for housing variants with long cooling fins.
[5] Conforms to 21 CFR 1040.10 except for deviations per Laser Notice No. 56 of May 8, 2019, and subsequent versions.

B — Connections

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

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 for the cables listed here (see optional accessories).

Pin	Signal	Description
1	GND	Reference potential
2	24 V DC +/− 15% for 10 m cable length: 24 V DC + 15 /− 5%	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	Digital input, HW Trigger IN, 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	Digital input, electrically decoupled
16	INOUT 3	Programmable digital I/O
17	INOUT 4	Programmable digital I/O, flash synchronization

Gigabit Ethernet (8-pin, M12, X-coded)
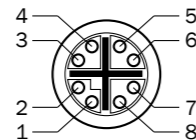
Pin	Signal
1	TRD0_P
2	TRD0_N
3	TRD1_P
4	TRD1_N
5	TRD3_P
6	TRD3_N
7	TRD2_P
8	TRD2_N

C — Detection volume

The detection volume depends on the:

▶ Configuration;
▶ 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
▶ Remission properties (808 nm) of the objects in the detection zone
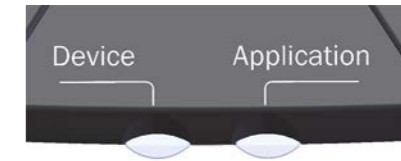▶ Object transparencies (e.g., windows)

Note: The reliability of the detection is reduced by heavily reflective or absorbent materials (e.g. mirrors, black surfaces).

Absolute measurement accuracy (Δz-axis) and repeatability (σz) at 90% remission factor and without background light

Working distance (z)	Measurement accuracy[1] Δz	Repeatability[1] σz
0.50 m	< 1.5 mm	± 0.25 mm
1.00 m	< 2.5 mm	± 0.6 mm
1.50 m	< 3.0 mm	± 1.5 mm
2.00 m	< 4.5 mm	± 2 mm
2.50 m	< 6.0 mm	± 4 mm

[1] Average in the middle of the field of view at 90% remission factor at 25 °C

Detection volume and 2D measuring ranges
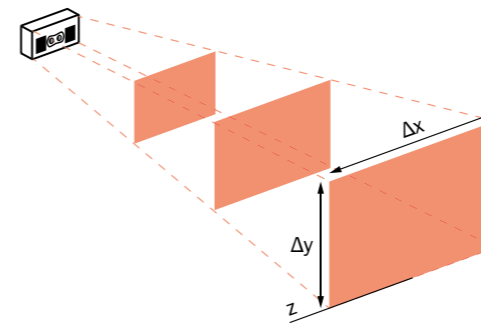
Absolute working distance (z)	Measuring range (Δx x Δy)	Pixel size
0.50 m	~ 45 cm x 45 cm	~ 1 mm x 1 mm
1.00 m	~ 100 cm x 90 cm	~ 2 mm x 2 mm
1.50 m	~ 160 cm x 130 cm	~ 3 mm x 3 mm
2.00 m	~ 220 cm x 180 cm	~ 4 mm x 4 mm
2.50 m	~ 280 cm x 230 cm	~ 5 mm x 5 mm

E — Status LEDs

Visionary-S AP

Device	Description
Blue – flashing slowly	System start
Green	In operation
Orange – flashing slowly	Device warning
Red – flashing slowly	Error condition

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
2106258	Ethernet cable 2 m, M12 / RJ45, X-coded	2070426	M12 cable, 2A, Ecolab, 5 m
2106259	Ethernet cable 5 m, M12 / RJ45, X-coded	2070427[1]	M12 cable, 2A, Ecolab, 10 m
2106260	Ethernet cable 10 m, M12 / RJ45, X-coded	2102509	M12 cable, angled, 2A, Ecolab, 3 m
2094783	Ethernet cable 2 m, angled, M12 / RJ45, X-coded	2102510	M12 cable, angled, 2A, Ecolab, 5 m
2094784	Ethernet cable 5 m, angled M12 / RJ45, X-coded	1064114	4Dpro connectivity CDB/CDB650
2094785	Ethernet cable 10 m, angled, M12 / RJ45, X-coded		

[1] Assuming a voltage supply of 24 V +15% / −5%.