en

QUICKSTART

TriSpector1000

3D vision

SICK
Sensor Intelligence.

Product information

The TriSpector1000 is an industrial 3D sensor that uses laser triangulation on objects to produce 3D images. The TriSpector1000 acquires multiple height profiles to build a 3D image of the object.

Embedded 3D image analysis tools are applied to the 3D images. The results are sent to a control system via external interfaces.

For further information, see *www.sick.com/TriSpector1000*.

About this document

This document contains instructions and descriptions that support the set up and operation of the TriSpector1000.

This document is available in English and German online. Type the part number of the document in the search field of the web page *www.sick.com*. Operating Instructions number English/German: 8018319/8018318.

TriSpector1000 variants

The TriSpector1000 is available with three different field of view (FoV) sizes and two different window materials. PMMA is a plastic material used as an alternative material to glass in food processing environments. See section E for field of view specifications.

TriSpector1008 (Small FoV)

Window material	No.
Glass	1075604
PMMA	1060426

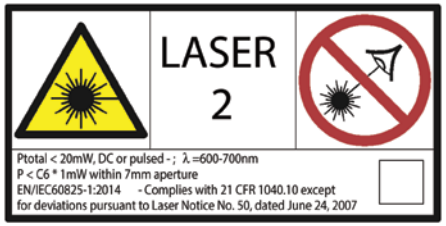
TriSpector1030 (Medium FoV)

Window material	No.
Glass	1072923
PMMA	1060427

TriSpector1060 (Large FoV)

Window material	No.
Glass	1075605
PMMA	1060428

Laser safety



The laser warning label is located on the black side panel on the side opposite side of the connectors.

⚠ WARNING

The laser will be automatically activated as soon as the TriSpector1000 is powered on. Avoid direct exposure to the laser beam.

⚠ CAUTION

Temporary irritating optical influence (glare, flash blindness, after-image) on the human eye can not be excluded, in particular in combination with low ambient light level. Do not aim the laser at the eyes of a person.

⚠ CAUTION

If the TriSpector1000 is mounted in a system or a casing, so that the laser safety notice signs are hidden, additional signs must be placed beside the exit aperture of the laser beam on the system casing. Additional signs are not included in the delivery.

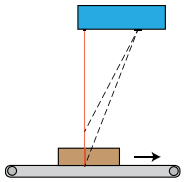
The TriSpector1000 is a laser product complying to the standards EN/IEC 60825-1:2014 and EN/IEC 60825-1:2007. It also complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007. The legal regulations on laser safety for the laser class of TriSpector1000 must be adhered to.

The TriSpector1000 is a class 2 laser device (2M according to EN/IEC 60825-1:2007) where eye protection is normally allowed by human aversion responses to bright light e.g. the blinking reflex. However, viewing the output is hazardous if the user views through magnifiers or suppresses aversion responses. To sustain laser class 2 (2M) no maintenance is necessary. Operation using procedures other than those specified herein may result in hazardous radiation exposure.

Mount

Mount the TriSpector1000 in a position above the surface to be scanned.

See section E for field of view diagrams and mounting distances. The default scan direction is as shown by the figure below. If a scan is performed in the opposite direction, the acquired image will be mirrored.



Mounting requirements

For optimal performance:

- Observe the ambient conditions for the operation of the TriSpector1000 (e.g. ambient temperature, ground potential), see section H for specifications.
- Ensure adequate heat transfer from the device, e.g. via the mounting bracket to the mounting base, or by means of convection.
- Use a stable bracket with sufficient load bearing capacity and suitable dimensions for the TriSpector1000.
- Minimize shock and vibration.
- Ensure a clear view of the objects to be detected.

Electrical installation

⚠ DANGER

Risk of injury/damage due to electrical current

The TriSpector1000 housing must be grounded and the complete system should be installed as an electrically shielded installation.

Incorrect grounding of the TriSpector1000 can result in equipotential bonding currents between the TriSpector1000 and other grounded devices in the system. This can lead to hazardous voltages being applied to the metal housing, cause devices to malfunction or sustain irreparable damage, and damage the cable shield as a result of heat rise, thereby causing cables to catch fire.

- Ensure that the ground potential is the same at all grounding points.
- If the cable insulation is damaged, disconnect the power supply immediately and have the damage repaired.

Only electricians with appropriate training and qualifications are permitted to perform electrical installation. Observe the following safety measures:

- Standard safety requirements must be met when working in electrical systems.
- Only connect and disconnect electrical connections when power is off. Otherwise, the devices may be damaged.
- Ensure that loose cable ends are isolated.
- Connect unused input pins to GND.
- Wire cross sections of the supply cable from the customer's power system should be designed and protected in accordance with the applicable standards.
- Make sure that the power I/O cable is protected by a separate slow-blow fuse with a maximum rating of 2.0 A. The fuse must be located at the beginning of the wire at the 24 V power supply side.
- The 24 V power supply must meet the requirements of SELV+LPS relating to "UL/EN60950-1:2014-

08" or "CAN/CSA-C22.2 No.223-M91(R2008)-Power supplies with Extra-Low-Voltage class 2 outputs" or "UL1310 (6th Edition)-standard for class 2 power units".

- All circuits/signals connected to the TriSpector1000 must be designed as SELV circuits (SELV = Safety Extra Low Voltage).

Encoder

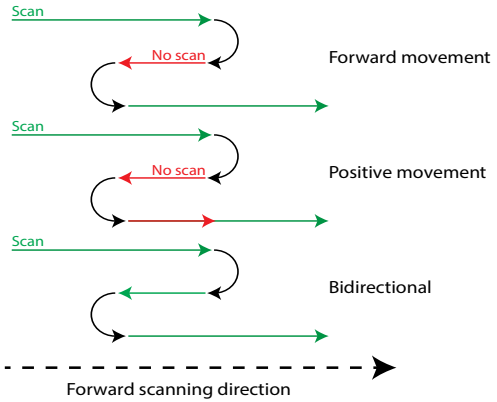
NOTICE

It is strongly recommended to use an encoder for measuring applications, e.g. shape measuring and volume measuring. If no encoder is used, analysis results may be inaccurate due to object movement speed variations.

The encoder must fulfill the following requirements:

- The encoder must be an incremental encoder.
- The encoder must have a TTL/RS422 interface. In the case of strong magnetic fields in proximity to the TriSpector1000 a recommended encoder (no. 1068997) must be used to ensure optimal performance.
- The connection requires two encoder channels (A/A¯ and B/B¯) to keep track of movement and direction.

The TriSpector1000 has a two directional (up/down) encoder pulse counter. The forward (up) scanning direction is defined as clockwise encoder shaft movement, as seen from the tip of the shaft. See the CURRENT SPEED parameter in the IMAGE workflow step for movement speed. There are five encoder pulse counter modes: direction up/down, position up/down and motion.



PC installation

The SOPAS Engineering Tool (ET) software for PC is used to connect and configure the TriSpector1000 and other SICK devices.

To install SOPAS ET:

1. Download SOPAS ET (version 3.3 or newer) from www.sick.com.
2. Run the downloaded installation file.
3. Follow the instructions on the screen.

PC system requirements

For adequate SOPAS ET performance use a PC with Intel Core I5 540M (2.53 GHz, 4GB RAM) or better, and a screen resolution of at least 1024x768.

Graphics card: Intel® HD Graphics video card (or NVIDIA® NVS 3100M 512MB GDDR3), or better. Make sure to use the latest graphic card drivers.

Ethernet connection is required, 100 Mbit/s or better, 1 Gbit/s or faster is recommended for best performance during configuration of the TriSpector1000 via SOPAS ET.

SD card (optional): SICK microSD memory card (no. 4051366 or 4077575)

A mouse with at least three buttons (or scroll wheel) is recommended.

Reset parameters to default

To reset all SOPAS ET parameters including IP address, select LOAD FACTORY DEFAULTS from the FUNCTIONS menu.

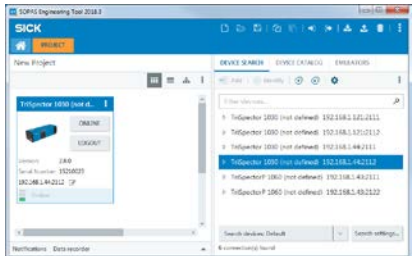
To reset all parameters except IP address, select LOAD APPLICATION DEFAULTS from the FUNCTIONS menu.

SOPAS ET main window

NOTICE

At the first use, the TriSpector1000 will require a SICK Device Driver (SDD). When adding the device a prompt will appear with instructions on how to install the driver. When prompted for SDD installation source, choose DEVICE UPLOAD.

The SOPAS ET main window is split into two panes, the project view to the left and a list of available devices to the right. To add the TriSpector1000 to the project, select the device on port 2112 and click the ADD button.

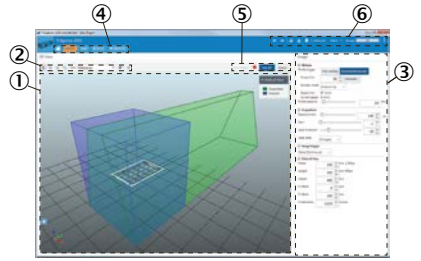


Double-click the product icon to open the device window and start the configuration.

If there are IP address connection issues, click the Edit icon in the device tile to make adjustments. The default IP address is 192.168.0.30.

SOPAS ET device window

The TriSpector1000 is configured through the SOPAS ET device window.



①. Image area
②. Image handling controls
③. Parameter pane
④. Workflow steps
⑤. Controls for image view, image recording (red), and FORCE TRIGGER
⑥. SOPAS ET functions panel

Image handling controls

The image handling controls are used to manipulate tool regions and perspective when viewing images. As an alternative to the buttons, you can use a mouse with a scroll wheel, as described below.

Button	Name	Description
	Select	Click and drag to change region size and position. Shortcut command: CTRL + Q.
	Move	Click and drag to move the image. Shortcut command: CTRL + W. SHIFT + press and hold the mouse scroll wheel.
	Rotate	Click and drag to rotate the image. Shortcut command: CTRL + E. Press and hold the mouse scroll wheel.
	Zoom	Click and drag upwards to zoom in and downwards to zoom out. Shortcut command CTRL + R. Use the mouse scroll wheel.
	Menu	Contains image view settings.

Use the 3D navigation control in the lower left corner of the image viewer to switch between different viewing angles. Click an arrowhead (X, Y or Z) to view a 2D projection of the object. Click the same arrowhead twice to flip the 2D projection (for example, to switch between the top and bottom view for the Z-axis).

Image view controls

The image view controls are used to switch between the Live 3D image, the Job image or the Sensor view. Different image view controls are available in different workflow steps.

Image view	Description
Job	Shows the job image stored with the SAVE JOB IMAGE button.
Live-3D	Displays the latest scanned image.
Sensor	Displays object as perceived by the image sensor. Use this view to adjust image acquisition settings.

Image recording

Click the image recording button to save images to disk. These images make it possible to use the Emulator and configure the tools offline. The image recording is done in parallel with the analysis.

Workflow

To configure the TriSpector1000, follow the workflow steps in the parameter pane. It is possible to change workflow step at any time.

1. Image

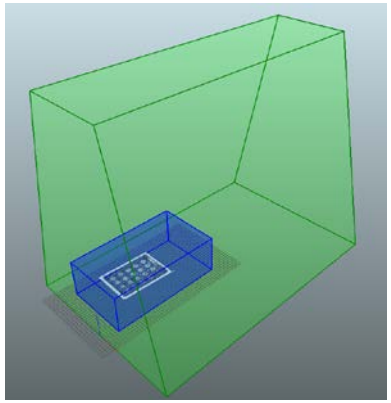
The Image workflow step is used to set up image acquisition for good image quality.

Perform a scan

The TriSpector1000 builds the image by acquiring a number of laser line profiles of a moving object.

Use an encoder if motion is not constant. The encoder settings are located in the Motion section in the Image workflow step. Click the Calculate button for assistance with encoder calculation. Move the object under the TriSpector1000 laser line to perform a scan.

Set field of view



Two regions are shown in the Image workflow view.

The green region is the field of view where image acquisition is possible. The length of the green region is determined by the Profile distance parameter.

The blue region is the user selected field of view, used for image analysis. The blue region is the area in which the camera acquires height map data for image analysis. The field of view can be adjusted to optimize performance. A smaller field of view will allow for a higher scan frequency.

Use the Select control from the image handling controls to resize the blue area to cover the object to be analyzed, or use the value boxes in the Field of view section.

The image acquisition field of view is set to maximum by default.

Adjust image settings

To adjust the image settings to get a good image:

1. Click the Sensor button located above the image area to see the laser profile which can be used as reference when adjusting the exposure time and gain. See section F for examples.
2. Click the Live 3D button and perform a scan.
3. In the Image workflow step, Acquisition section, adjust the sliders until the 3D live view looks good.
4. Use the Laser threshold parameter in the Image workflow step to specify the cut off point for 3D image acquisition.
5. Repeat the procedure if necessary.

Configure trigger settings

The Image Trigger section is used to determine when image acquisition starts.

Set the Image Trigger parameter to None (Continuous) to acquire images continuously.

Select Object trigger to define a plane on a certain height. The image acquisition starts when an object is above the specified plane.

Select Command Channel to trigger the image acquisition from the command channel.

To trigger the TriSpector1000 by digital I/O, for instance by using a photoswitch or a PLC, set the parameter to Trigger on I/O 3. When using this setting, image acquisition can be delayed by time or distance from the signal input. The TriSpector1000 triggers on a rising edge. The trigger pulse must be at least 50 µs. The TriSpector1000 ignores succeeding pulses during image acquisition.

If you click Force trigger (see section SOPAS ET device window), an image acquisition is started. If an acquisition is already ongoing, it will be interrupted and re-started.

2. Task

The Task workflow step contains functions to configure image analysis. Use the Save job image button to save an image for tool setup and configuration. The tool buttons will appear after pressing Save job image.

Click the eye symbol (👁) in the parameter pane to switch visual representation on/off for each tool. If applicable, click one more time to show the region of the tool. Selecting a tool will always show the visual representation for the tool.

Each tool has a Settings section for tool parameter adjustments and a Result section for tool output, processing time and tool OK/NOK criteria. Multiple tools (maximum 32) can be applied, but you can only use one Shape tool per configuration. The tools are divided into three groups: Find, Inspect, and Measure.

Button	Tool	Description
	Find	Group icon.
	Shape	Locates a 3D shape in an image. Repositions inspection tools according to the position of the shape.
	Blob	Locates clusters of points within a defined height interval and cluster size. This makes it possible to measure volume, area, angle, and bounding box. The Blob tool can be inverted to find holes in the height map instead.
	Plane	Automatically locates a flat surface in the field of view. Adjust the Percentile parameter to set the span of height data points used to find a plane.
	Fix Plane	Manually set a reference plane in the field of view.
	Peak	Locates the point with the maximum or minimum height value.
	Point	Manually set a reference point in the field of view.
	Edge	Locates an edge in a given search direction.

Button	Tool	Description
	Inspect	Group icon
	Area	Estimates surface coverage by counting points within a defined 3D region, or within a specified intensity interval inside the region.

Button	Tool	Description
	Measure	Group icon
	Angle	Measures the angle between two planes.
	Distance	Measures the distance between two tool key points.

Blob tool example

The following steps describe how to perform an image analysis that finds clusters within a height interval.

1. Perform a scan of the object to be analyzed.
2. Go to the Task workflow step. Create a job image by clicking the Save job image button. This will also switch to the job image view.
3. A shape tool is required if the object changes position between scans. In the Find tool group, click the Shape button to apply a shape tool to the job image.
4. Use the image handling controls to move and resize the shape tool to cover the shape to be located. Make sure not to include any extraneous shapes, e.g. conveyor belt surface. Leave some extra space between the object and the shape tool borders. Use the Masks function to exclude non-relevant features of the object.
5. In the Find tool group, click the Blob button to apply a blob tool to the job image. Adjust the parameters in the Task workflow step belonging to the blob tool if necessary.
6. Use the image handling controls to move and resize the blob tool to cover the area containing the blobs. Adjust the height range to only include relevant data.
7. Click the Live 3D button. The tools created in the job image are applied to the live images. The blob tool will be repositioned with the located shape. If a volume calculation is to be performed, a Fix Plane should be added first to be used by the blob tool as reference. The evaluation criteria for the blob tool (OK/NOK) can be set under the Results section, e.g. correct number of blobs.
8. If the blob tool fails to locate desired blobs, more settings can be found under the Advanced section in the Task workflow step.

3. Results

The Results workflow step contains settings for result processing and output handling. Note that a bold red underscore in the input fields indicates syntax error.

Blob tool condition example

The Conditions section allows creation of conditions that give true or false results. The following steps describe how to create a custom condition based on a blob tool to check the coordinates of blobs with certain angles.

1. Click the New button and name the condition. This example uses the name BlobAnglePlusMinus10Degrees.
2. Click +Result → Tools → Blob 0 → First blob → blobAngle.
3. Type <10 after the text that appears, click +Func

→ Logic → And. Repeat step 2 and type >-10 after the text that appears.

The BlobAnglePlusMinus10Degrees condition will return a true value if the first blob located by the Blob tool has an angle between -10° and 10°.

Use the Digital outputs section to specify which results that are sent to the available outputs. This feature must be enabled in the Interfaces tab. An output can be set to signal on a specific condition, for example on when the BlobAnglePlusMinus10Degrees condition returns a true value.

Use the Ethernet output string section to define a result string, e.g. boolean tool decision or tool output. This feature must be enabled in the Interfaces tab. In this example the coordinates of the first blob are returned if the BlobAnglePlusMinus10Degrees evaluates as true. If the condition evaluates as false, zero coordinates are returned.

Tool result symbols

Image area/Tool	Parameter pane	Description
⊗	✗	Result not OK.
✓	✓	Result OK.
!	!	Result invalid.
⊖		Result not found.

4. Interfaces

The Interfaces workflow step contains settings for connections to external interfaces.

I/O Definitions: Configure the digital in- and outputs.

Ethernet: Set the parameters of the Ethernet interface.

Serial: Set the parameters of the serial interface.

Job Selection Input: To make it possible to select job via digital input signals, define the signal for each job. Note that the input signals must be kept high during the whole session, not only when the job is initiated.

Multiple configurations

Image, task and result configurations can be saved individually to allow multiple configurations. Use the Select job button in the SOPAS functions panel to manage and select configurations.

If configurations are to be used again later it is important to save configurations to flash with the Save parameters permanently button in the SOPAS functions panel before disconnecting power from the device.

Fieldbuses

The Trispector1000 has native EtherNet/IP support.

Use the fieldbus module CDF600-2200 from SICK to connect the TriSpector1000 to a ProfiNet network.

Command channel

Both Ethernet and the serial interface can be used as command channel. The serial interface is available on the Power I/O socket, as described in section D.

The command channel features an ASCII protocol for configuration of settings.

The following is a subset of commands that are available. A full list of commands is available via *supportportal.sick.com*.

Command	Reply
<stx>get job<etx>	Name of current configuration.
<stx>set job "jobName"<etx>	Set job to "jobName".
<stx>set laser on<etx>	Turn laser on.
<stx>set laser off<etx>	Turn laser off.
<stx>trigger<etx>	Trigger the image acquisition.
<stx>get tool "toolName" <setting name><etx>	Value of a specified setting for "toolName".
<stx>set tool "toolName" <setting name> <value><etx>*	Set value of a specified setting for "toolName".
<stx>set exposure <value><etx>*	Set value for camera exposure.
<stx>set gain <value><etx>*	Set value for camera gain.
<stx>set imageTriggerMode<etx>*	Set image trigger mode. Modes: "Input", "None", "Object", "Command".
<stx>set laserThreshold <value><etx>*	Set value for laser threshold.
<stx>set profileDistance <value><etx>*	Set value for profile distance.
<stx>set profileTriggerMode<etx>*	Set profile trigger mode. Modes: "Encoder", "FreeRunning"
<stx>set pulsesPerMM <value><etx>*	Set value for pulses per millimeter.
<stx>set speed <value><etx>*	Set value for speed.
<stx>set triggerDelayTime <value><etx>*	Set value trigger delay time.
<stx>set triggerDelayTrack <value><etx>*	Set value for trigger delay track.
<stx>set triggerDelayMode <value><etx>*	Set trigger delay mode. Modes: "ms", "mm".

* Use get instead of set to see current value/mode.

Tool result output

General

Result	Output
OverallDecision	OK/Not OK/Invalid/ Neutral/Not found

All tools

Result	Output
Decision	OK/Not OK/Invalid/ Neutral/Not found

Shape

Result	Output
Rotation	Rotation in degrees.
Position	Position coordinates (x,y,z).
Score	Score value (0-100).

Blob

Result	Output
NumBlobs	Number of blobs detected.
OverallVolumeDecision	OK/Not OK. Blob volume threshold (all blobs).
First blob/blobs[]: - index - cogX - cogY - cogZ - width* - length* - cx* - cy* -boundsAngle* - area - blobAngle* - volume* - volumeDecision	 Index of blob in list. X-centre of blob. Y-centre of blob. Z-height of X/Y-centre. Width of bounding box. Lenght of bounding box. X-centre of bounding box. Y-centre of bounding box. Bounding box angle (±90° from x-axis). Blob area in mm². Blob angle (±90° from x-axis). Volume in cm³. OK/Not OK. Blob volume threshold (per blob).

* If activated in tool.

Area

Result	Output
Coverage	Percentage of coverage.
Area	Area in mm².

Plane

Result	Output
Score	Score value (0-100).
Tilt	Angle to z-axis in degrees.

Plane and Fix plane

Result	Output
Cx, Cy, Cz, Nx, Ny, Nz	Equation of the plane through center point + normal.
P_x, P_y, P_z, P_d	Equation of the plane through P_x*x + P_y*y + P_z*z + P_d = 0.

Angle

Result	Output
Angle	Angle in degrees.

Distance

Result	Output
Distance	Distance in mm.

Peak

Result	Output
x, y, z	Peak position (x, y, z).

Point

Result	Output
x, y, z	User defined position (x, y, z).

Edge

Result	Output
MidPointX, MidPointY, MidpointZ	Centre of line segment.
DirectionX, DirectionY,DirectionZ	3D vector of the line segment.

Functions and operators

TriSpector1000 supports a set of operators and functions for result handling. The categories of operators and functions are mathematical, logical and strings.

Logical operators

Operator	Syntax	Result type	Description
<	x < y	BOOL	Smaller than.
>	x > y	BOOL	Greater than.
<=	x <= y	BOOL	Smaller than or equal to.
>=	x >= y	BOOL	Greater than or equal to.
=	x =y	BOOL	Equal to.
~=	x ~= y	BOOL	Not equal to.
and	x and y	BOOL	Logical and.
or	x or y	BOOL	Logical or.
not	not(x)	BOOL	Logical not of a boolean x.

Logical functions

Operator	Syntax	Result type	Description
any	any(array)	BOOL	Check if any array element is true.
all	all(array)	BOOL	Check if all array elements are true.
count	count(array)	NUM	Count all true values in a boolean array.
contains	contains(array,x)	BOOL	Check if a value x is present in an array.
element	element(array,index)	Any	Get an element out of an array by index.
array	array(x1, ...)	Any	Create an array of list elements, array index starts at zero.
size	size(array)	NUM	Calculate size of an array.

Mathematical operators

Operator	Syntax	Result type	Description
+	x + y	NUM	Addition.
-	x - y	NUM	Subtraction.
-	-x	NUM	Negation.
*	x * y	NUM	Multiplication.
/	x / y	NUM	Division.
^	x^y	NUM	Exponentiation.
.	x.y	NUM	Decimal.

Mathematical functions

Operator	Syntax	Result type	Description
min	min(x1, ...)	NUM	Find the minimum value in a list of elements or an array.
max	max(x1, ...)	NUM	Find the maximum value in a list of elements or an array.
sum	sum(x1, ...)	NUM	Sum all elements in a list or array.
abs	abs(x)	NUM	Absolute value of (x).
round	round(x, dec)	NUM	Round x to an integer or to a fixed number of decimals.
mod	mod(x,y)	NUM	Calculate modulo of x.
sqrt	sqrt(x)	NUM	Calculate the square root of x.
sin	sin(x)	NUM	Calculate the sine of x in radians.
cos	cos(x)	NUM	Calculate the cosine of x in radians.
tan	tan(x)	NUM	Calculate tangent of x in radians.
asin	asin(x)	NUM	Calculate the arcsine of x in radians.
acos	acos(x)	NUM	Calculate the arccosine of x in radians.
atan	atan(x)	NUM	Calculate the arctangent of x in radians.
deg	deg(rad)	NUM	Convert radians to degrees.
rad	rad(deg)	NUM	Convert degrees to radians.
pow	pow(x,y)	NUM	Calculate x to the power of y (x^y).
exp	exp(x)	NUM	Calculate e (constant) to the power of x (e^x).
ln	ln(x)	NUM	Calculate the natural logarithm of x.
log10	log10(x)	NUM	Calculate the logarithm of x (base 10).

String operators

Operator	Syntax	Result type	Description
""	"x"	STR	String representation.
..	x .. y	STR	Concatenation of strings x and y.
=	x = y	BOOL	Check if two strings x and y are equal, with wildcard functionality.

String functions

Operator	Syntax	Result type	Description
matches	matches(str, pattern, mode)	BOOL	Check if a string matches a regular expression. The mode variable can be set to "unicode" or "binary", the default setting is "unicode".
hasSubString	hasSubString (str,substr)	BOOL	Check if a string contains a substring. Case sensitive.
find	find(str,substr)	NUM	Check if a string contains a substring. Returns index of the first character of a found substring. Case sensitive.
length	length(str)	NUM	Calculate the length of a string in bytes.
substr	substr(str, start,end)	STR	Get a substring from a string.
token	token(str,d)	Array	Create an array of a string of tokens with delimiter d.
prefix	prefix(str,filler, len)	STR	Fill the beginning of a string with a filler character up to a specified length.
postfix	postfix(str, filler, len)	STR	Fill the end of a string with a filler character up to a specified length.

String wildcards

Operator	Syntax	Description
*	*S	Any string precedes a certain string. Equal to regular expression ".*".
?	?S	Any character precedes a certain string. Equal to regular expression ".?".

License text

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Czech Republic
Phone +420 2 57 91 18 50
Chile
Phone +56 2 2274 7430
China
Phone +86 20 2882 3600
Denmark
Phone +45 45 82 64 00
Finland
Phone +358-9-2515 800
France
Phone +33 1 64 62 35 00
Germany
Phone +49 211 5301-301
Hong Kong
Phone +852 2153 6300
Hungary
Phone +36 1 371 2680
India
Phone +91 22 4033 8333
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New Zealand
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0800 222 278 – tollfree
Norway
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Poland
Phone +48 22 539 41 00
Romania
Phone +40 356 171 120
Russia
Phone +7 495 775 05 30
Singapore
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Slovakia
Phone +421 482 901201
Slovenia
Phone +386 591 788 49
South Africa
Phone +27 11 472 3733
South Korea
Phone +82 2 786 6321
Spain
Phone +34 93 480 31 00
Sweden
Phone +46 10 110 10 00
Switzerland
Phone +41 41 619 29 39
Taiwan
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Thailand
Phone +66 2645 0009
Turkey
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United Arab Emirates
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United Kingdom
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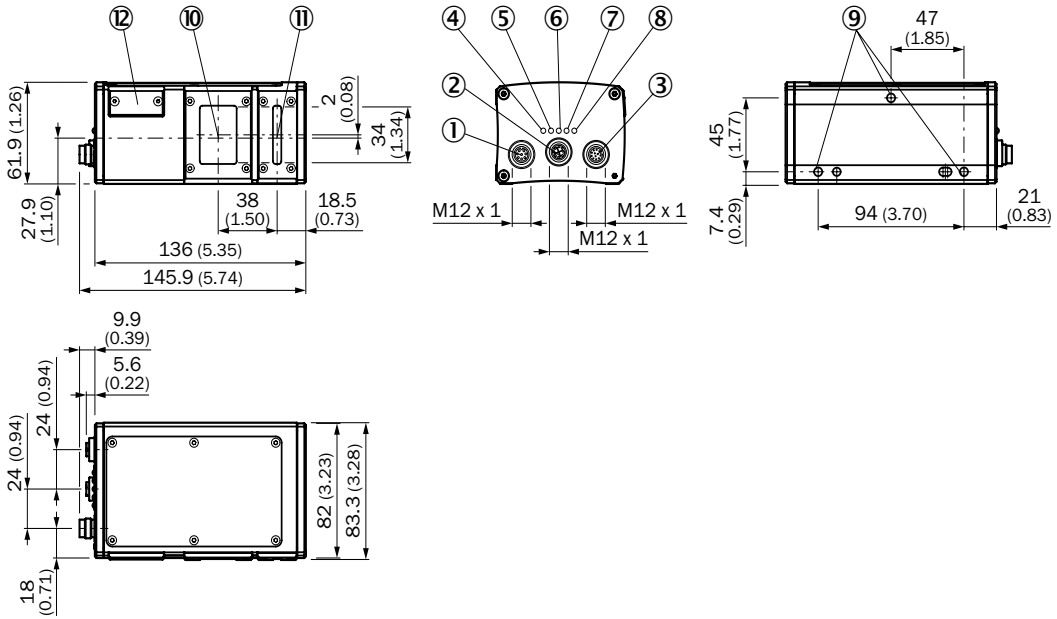
Phone +84 945452999

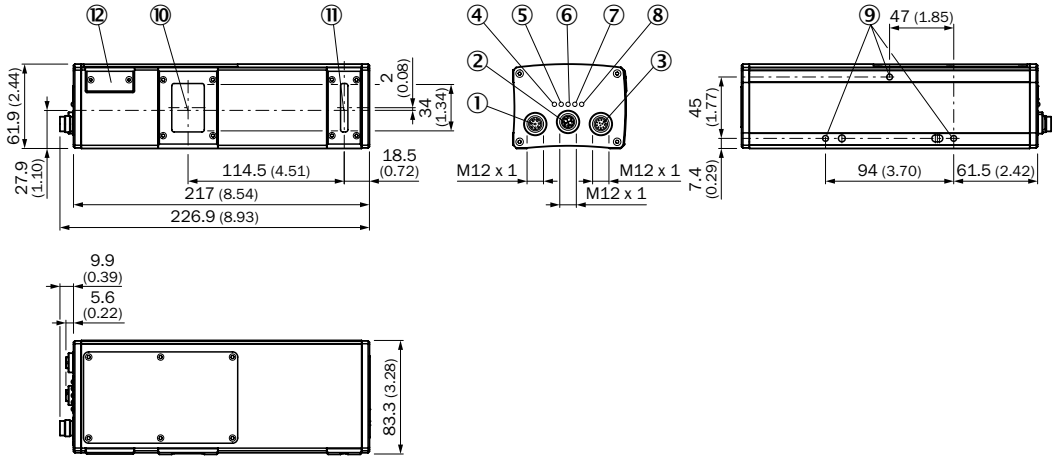
Detailed addresses and additional representatives and agencies at **www.sick.com**

A. Dimensional drawings

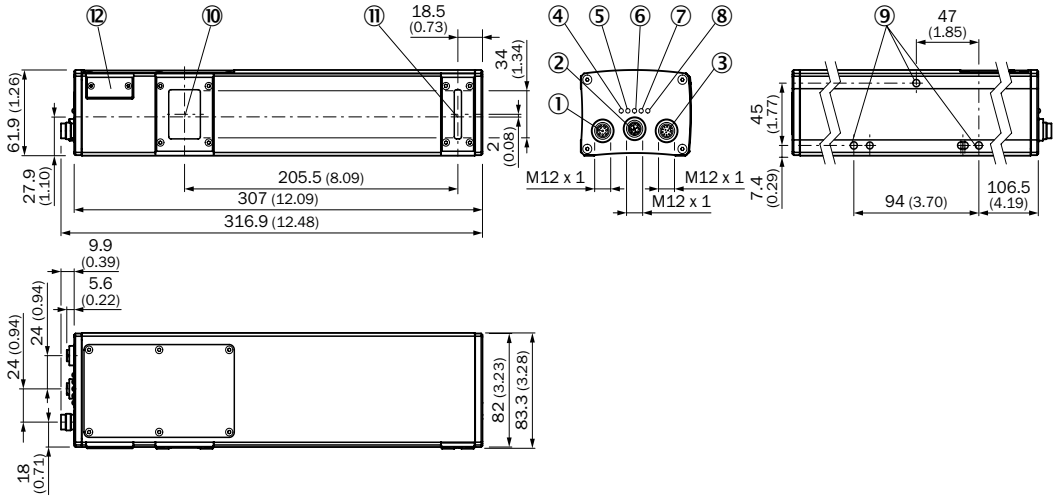
1. TriSpector1008 (Small FoV)



2. TriSpector1030 (Medium FoV)



3. TriSpector1060 (Large FoV)

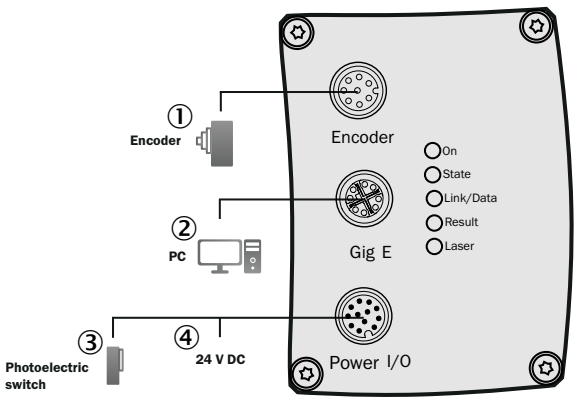


① Connector Encoder (thread inside)
② Connector Gigabit Ethernet (Gig E)
③ Connector Power I/O (thread outside)
④ LED; On
⑤ LED; State
⑥ LED; Link/Data
⑦ LED; Result
⑧ LED; Laser
⑨ Fastening threads (M5x8.5 length)
⑩ Optical receiver (center)
⑪ Optical sender (center)
⑫ SD-card

B. LED definitions

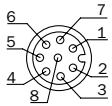
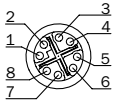
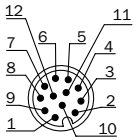
Name	Color	Function
On	Green	Power on
State	Green	Ready for trig input and image acquisition
Link/Data	Green	Gigabit Ethernet (Gig E) Link: LED on Activity: LED blink
Result	Green	Overall result pass
	Red	Overall result fail
	Blue	Result not found
Laser	Green	Laser on

C. Connection diagram



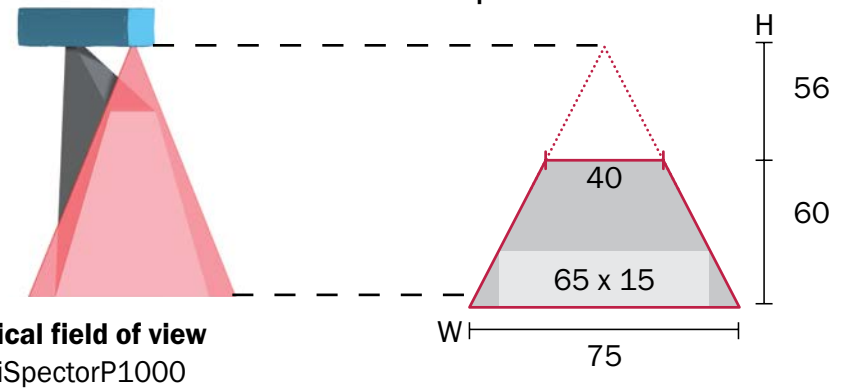
① Encoder
② PC/Network
③ Photoelectric switch
④ 24 V DC, power source

D. Pin assignment

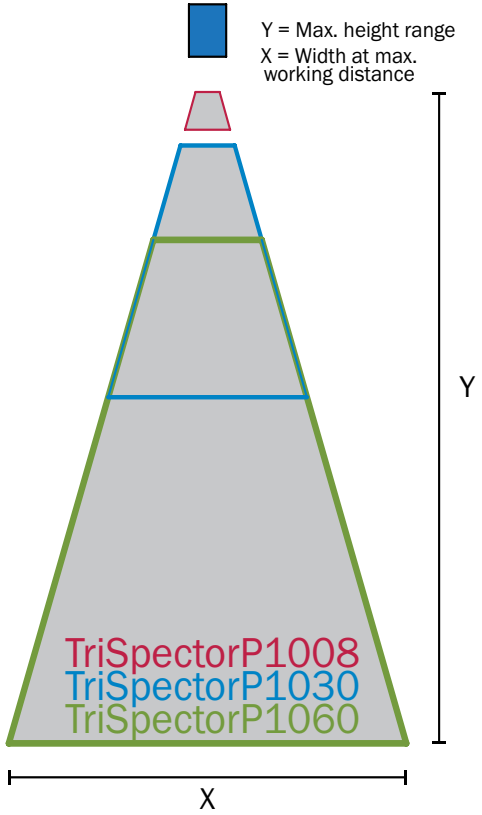
	Encoder I/O	Gigabit Ethernet	Power I/O
	 M12 socket, 8-pin A-coded	 M12 socket, 8-pin X-coded	 M12 plug, 12-pin A-coded
Pin	**Signal**	**Signal**	**Signal**
1	A/ - RS422 inverted input	GETH_L1+	24 V Power supply input
2	A - RS422 non-inverted input	GETH_L1-	GND (Power / Signal)
3	B/ - RS422 inverted input	GETH_L2+	24 V - I/O 3, Trigger in
4	B - RS422 non-inverted input	GETH_L3+	24 V - I/O 4, Configurable
5	(Not connected)	GETH_L3-	24 V - I/O 2, Input
6	(Not connected)	GETH_L2-	24 V - I/O 5, Configurable
7	GND (Power / Signal)	GETH_L4+	24 V - I/O 6, Configurable
8	24 V Power supply output	GETH_L4-	24 V - I/O 1, Input
9	-	-	24 V - I/O 7, Configurable
10	-	-	Reserved
11	-	-	RS-232 Rx
12	-	-	RS-232 Tx
		(EIA / TIA568-B)	

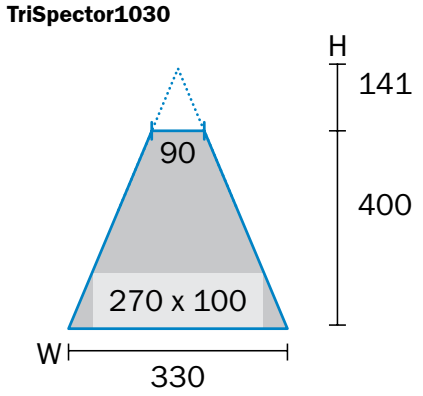
E. Field of view diagrams

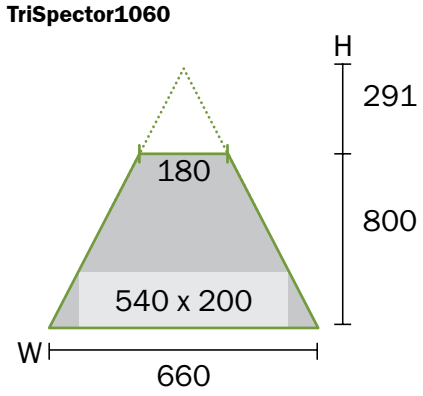
Maximum guaranteed image acquisition area in mm (inch). The brighter areas represent typical image acquisition area.



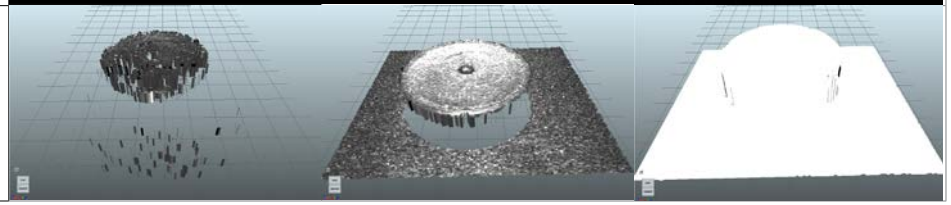
Typical field of view
TriSpectorP1000







F. Laser line exposure time

View	Short exposure time	Normal exposure time	Long exposure time
Sensor view			
Live 3D view			

When adjusting laser line exposure time, the optimal exposure time yields a gray line in 2D sensor image representation. A slightly brighter line is preferrable to a slightly darker line.

A solid white laser line indicates too long exposure time and will result in an overexposed image.

See the images above for examples of 2D sensor images and Live 3D images depicting too short exposure time, normal exposure time and long exposure time (from left to right).

H. Technical data

Attribute	Value
Features	
Tasks	Positioning, inspection, measurement
Technology	3D, line scan, image analysis
Working distance (measured from front window)	1008: 56...116 mm range 1030: 141...541 mm range 1060: 291...1091 mm range
Width at minimum working distance	1008: 40 mm 1030: 90 mm 1060: 180 mm
Width at maximum working distance	1008: 75 mm 1030: 330 mm 1060: 660 mm
Maximum height range	1008: 60 mm 1030: 400 mm 1060: 800 mm
Light source	Visible red light (laser, 660 nm)

Attribute	Value
Laser class	2 (EN/IEC 60825-1:2014) 2M (EN/IEC 60825-1:2007) Complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007
Laser fan angle	45° ±2°
Imaging angle	1008/1030: 65° 1060: 67°
Offline support	Emulator
Toolset	Angle, Area, Blob, Distance, Fix Plane, Plane, Peak, Point, Shape
Performance	
Typical height resolution (Near field/Far field)	1008: 20/50 µm 1030: 40/280 µm 1060: 80/670 µm
Maximum performance	2000 3D profiles/s
Maximum number of profiles	2500 per image

Attribute	Value
3D profile resolution	1008: 0.049 mm/px 1030: 0.215 mm/px 1060: 0.43 mm/px
Interfaces	
Operator interface	SOPAS
Configuration software	SOPAS
Communication interfaces	Gigabit Ethernet (TCP/IP), serial (RS-232), configurable digital I/O
Digital inputs	3 x, non-isolated
Digital in-/outputs	4 x, non-isolated, configurable
Encoder interface	RS-422/TTL (DBS36E-BBCP02048)
Maximum encoder frequency	300 kHz
Fieldbuses	
EtherNet/IP	Via Gigabit Ethernet port
ProfiNet	Via serial interface connected to SICK module CDF600-2200.
Mechanics/electronics	
Power I/O	M12 plug, 12-pin A-coded
Gigabit Ethernet	M12 socket, 8-pin X-coded
Encoder	M12 socket, 8-pin A-coded
Connector material	Brass, nickel-plated
Supply voltage	24 V DC, ± 20 % SELV + LPS according to EN 60950-1:2014-08 or Class 2 according to UL1310 (6th Edition)
Supply current	1.5 A maximum; external fuse required
Power consumption	11 W maximum
Ripple	< 5 Vpp
Current consumption	400 mA with no output loads
Enclosure rating	IP 67
Safety	EN 60950-1:2014-08
Protection class	III
EMC	Immunity: EN 61000-6-2:2005 Emission: EN 61000-6-3:2007

Attribute	Value
Weight (not including cables)	1008: 900 g 1030: 1300 g 1060: 1700 g
Dimensions (L x W x H)	1008: 136 mm x 62 mm x 84 mm 1030: 217 mm x 62 mm x 84 mm 1060: 307 mm x 62 mm x 84 mm
Optics	Fixed
Ambient data	
Shock load	15 g / 6 ms (EN 60068-2-27)
Vibration load	5 g, 10 Hz...150 Hz (EN 60068-2-6)
Ambient operating temperature	0 °C ... +40 °C (See section „Mount“ on page 1 for information regarding adequate heat dissipation)
Ambient storage temperature	–20 °C ... +70 °C
Permissable relative air humidity	0% ... 90%, non-condensing

Input switching levels	
Input levels	Up to 30 V Stresses beyond this over-voltage level can cause permanent damage to the device
Input threshold levels	High: > 15.0 V Low: < 5.0 V
Hysteresis	> 1.0 V
Input current	High < 3.0 mA Low < 0.1 mA

Output switching levels	
Voltage level high	High: > Voltage Supply - 3.0 V (Voltage Supply = 19.2 V...28.8 V) Low: < 2.0 V
Source/sink output current	≤ 100 mA @ 24 °C
Overcurrent protection	< 200 mA
Capacitive load	≤ 100 nF
Inductive load	≤ 1H (with use of external free-wheeling diode, otherwise permanent damage to the device can occur)