

VLC100

Camera system for area monitoring



GB

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1 About this document

Please read this chapter carefully before working with this documentation and the VLC100 camera system.

1.1 Function of this document

These operating instructions are designed to address the *technical personnel of the machine manufacturer* or the *machine operator* in regards to safe mounting, electrical installation, operation and maintenance of the VLC100 camera system.

1.2 Target group

These operating instructions are addressed to *planning engineers, machine designers* and *operators* of plants and systems which are to be protected by one or several VLC100 camera systems. It also addresses people who integrate the VLC100 into a system, initialize its use, or who are in charge of servicing and maintaining the device.

1.3 Depth of information

These operating instructions contain the following information on the VLC100 camera system:

- mounting
- electrical installation
- care and maintenance
- fault diagnosis and troubleshooting
- part numbers
- conformity and approval

Note We also refer you to the SICK homepage on the Internet at www.sick.com.

Here you will find information on:

- application examples and application reports that supplement the application examples in chapter 6.
- these operating instructions in different languages for viewing and printing
- EC declaration of conformity

1.4 Scope

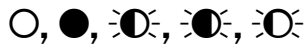
These operating instructions are original operating instructions.

Notes These operating instructions are applicable to the VLC100 camera system with software version 11.07 (see type label).

1.5 Symbols used

Recommendation Recommendations are designed to give you some assistance in your decision-making process with respect to a certain function or a technical measure.

Note Refer to notes for special features of the device.



LED symbols describe the status of an LED. Examples:

- The LED is off.
- The LED is illuminated constantly.
- ◐ The LED flashes evenly (0.5 seconds on, 0.5 seconds off).
- ◑ The LED goes off briefly (0.9 seconds on, 0.1 seconds off, ...).
- ◒ The LED flashes with a short duty cycle (0.9 seconds off, 0.1 seconds on, ...).



In combination with the LED symbols, these symbols identify which LED is described:

- ✓● The "Ready" LED is illuminated constantly.
- ⚠◐ The LED "Monitoring field interrupted" flashes.
- ⊘○ The "Error" LED is off.

➤ **Take action ...** Instructions for taking action are shown by an arrow. Read carefully and follow the instructions for action.



WARNING

Warning!

A warning indicates an actual or potential risk or health hazard. They are designed to help you to prevent accidents.

Read carefully and follow the warning notices!

2 On safety

This chapter deals with your own safety and the safety of the equipment operators.

- Please read this chapter carefully before you work with the VLC100 or the machine into which the VLC100 has been integrated.

2.1 General safety notes



WARNING

The VLC100 is not a safety component as per the Machinery Directive!

You are not allowed to use the VLC100 camera system for the purpose of machine safety.

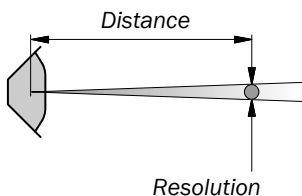
- Mounting, connection and commissioning of the camera system are only allowed to be undertaken by specialist personnel.
- Read these operating instructions and follow the instructions on the topics of usage, mounting, connection and integration into the machine controller.
- Protect the device from humidity and contamination.

2.2 Correct use

The VLC100 camera system is an opto-electronic sensor for the electro-sensitive detection of objects, animals or persons. A correctly mounted reflective tape is required for operation.

The resolution of the VLC100 camera system in the monitoring field plane reduces with increasing distance. Depending on the required resolution, the possible monitoring field dimensions change:

Tab. 1: Maximum monitoring field dimensions as a function of the resolution



Resolution [mm]	Maximum distance [m]	Monitoring field dimensions [m]		
		Minimum	Maximum	Note
6	0.85	0.40 × 0.40	0.60 × 0.60	On dimensioning of the monitoring field, the ratio of the lengths of the sides must be considered (see section 4.1 “Checking the monitoring field dimensions” on page 13 ff.)
8	1.13		0.80 × 0.80	
10	1.56		1.10 × 1.10	
12	1.70		1.20 × 1.20	
14	1.98		1.40 × 1.40	
16	2.26		1.60 × 1.60	
18	2.54		1.80 × 1.80	
20	2.83		2.00 × 2.00	

The camera system is only intended for use in industrial environments. When used in residential areas it can cause radio interferences.

If the device is used for any other purposes or modified in any way – also during mounting and installation – any warranty claim against SICK AG shall become void.

2.3 Environmental protection

The VLC100 camera system has been designed to minimize environmental impact. It uses only a minimum of power and natural resources.

- At work, always act in an environmentally responsible manner.

2.3.1 Disposal

- Always dispose of unserviceable or irreparable devices in compliance with local/national rules and regulations with respect to waste disposal (e.g. European waste code 16 02 14).

Note We would be pleased to be of assistance to you on the disposal of these devices. Contact us.

2.3.2 Separation of materials



WARNING

Only qualified safety personnel are allowed to separate materials!

Caution is required when dismantling devices. There is a risk of injuries.

Before you send the devices for appropriate recycling, it is necessary to separate the different materials in the VLC100.

- Separate the housing from the rest of the parts (in particular the circuit board).
- Send the separated parts for recycling as appropriate:

Components	Disposal
Product	
Housing	Metal recycling (aluminium)
Circuit boards, cable, connector and electrical connecting pieces	Electronic recycling
Packaging	
Cardboard, paper	Paper/cardboard recycling
Polyethylene packaging	Plastic recycling

Tab. 2: Overview on disposal by components

3 Product description

This chapter provides information on the special features and properties of the VLC100 camera system. It describes the construction and the operating principle of the device, in particular the different operating modes.

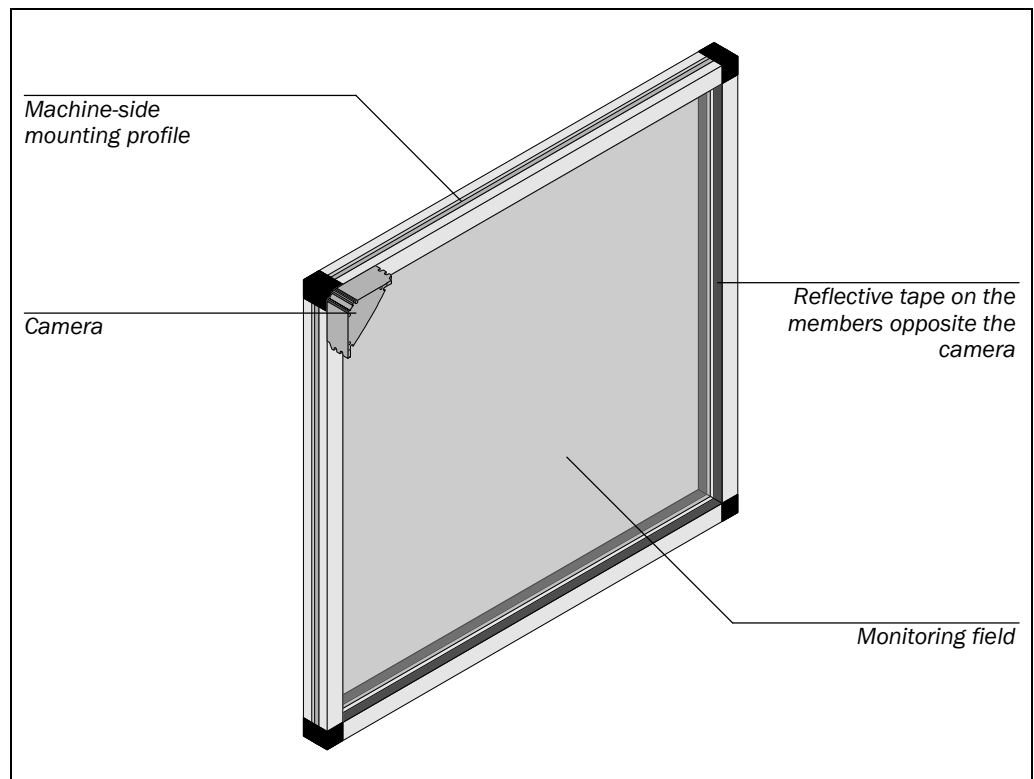
➤ Please read this chapter before mounting, installing and commissioning the device.

3.1 Special features

- facility for connecting a reset button
- status display with LEDs

3.2 Operating principle of the device

Fig. 1: Operating principle of the VLC100



The VLC100 camera system comprises a camera as well as a reflective tape with which the contour to be monitored is defined.

The camera monitors the area bounded by its field of view and the reflective tape – the monitoring field – for interruptions. If the VLC100 detects an interruption of the monitoring field, the camera signals this by complementary switching of the switching outputs Q and \bar{Q} :

Tab. 3: Complementary switching of the outputs Q and \bar{Q}

Monitoring field	Display	Switching output Q	Switching output \bar{Q}
Free	✓ ● Green	LOW	HIGH
Interrupted	✓ ● Green, ⚠ ● Yellow	HIGH	LOW

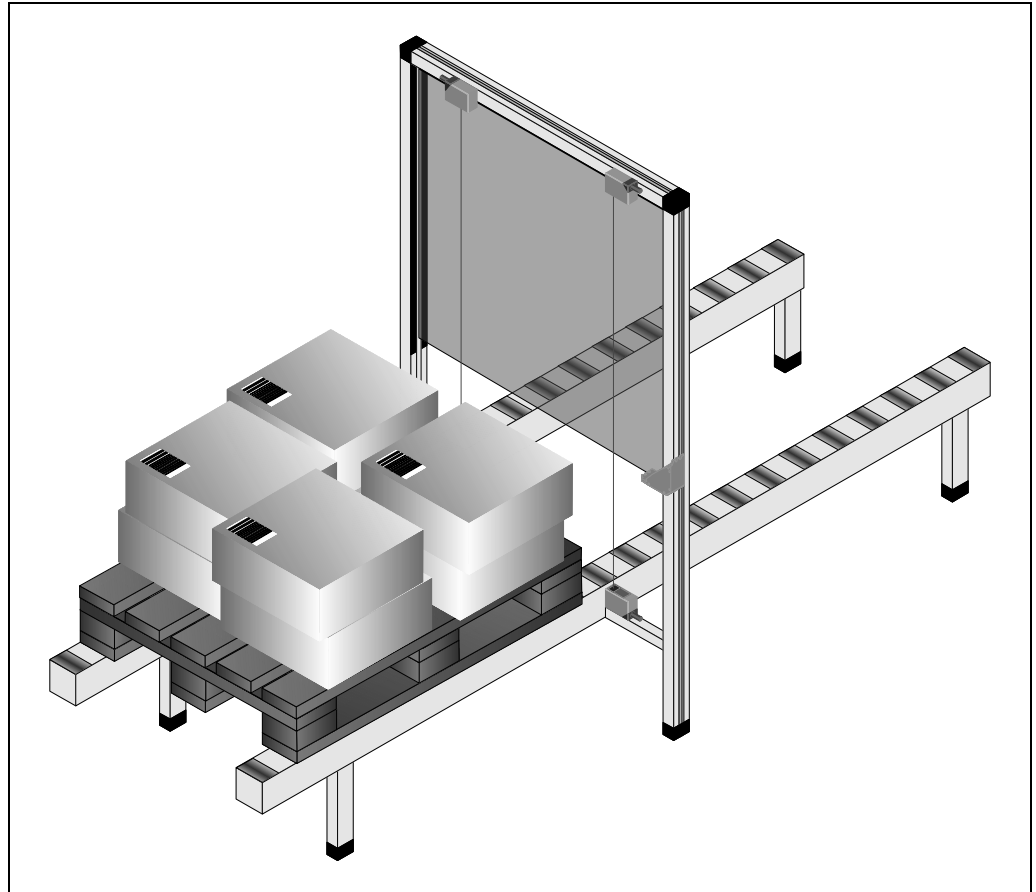
Please refer to chapter 10 “Technical specifications” on page 33 for the data sheet. Dimensional drawings are included on page 36.

3.3 Application example

Note The mounting of the device is only shown schematically in the following figures for reasons of simplicity.

For correct mounting, pay attention to the notes in chapter 4 “Mounting” on page 13.

Fig. 2: Application example:
VLC100 on controlling the
entry of pallets



The VLC100 camera system operates correctly only if the following conditions are met:

- camera and reflective tape must be mounted in a way that objects penetrating into the monitoring field are safely identified by the VLC100,
- the necessary monitoring field dimensions must not exceed the permitted ratio for the lengths of the sides (see section 4.1 “Checking the monitoring field dimensions” on page 13).

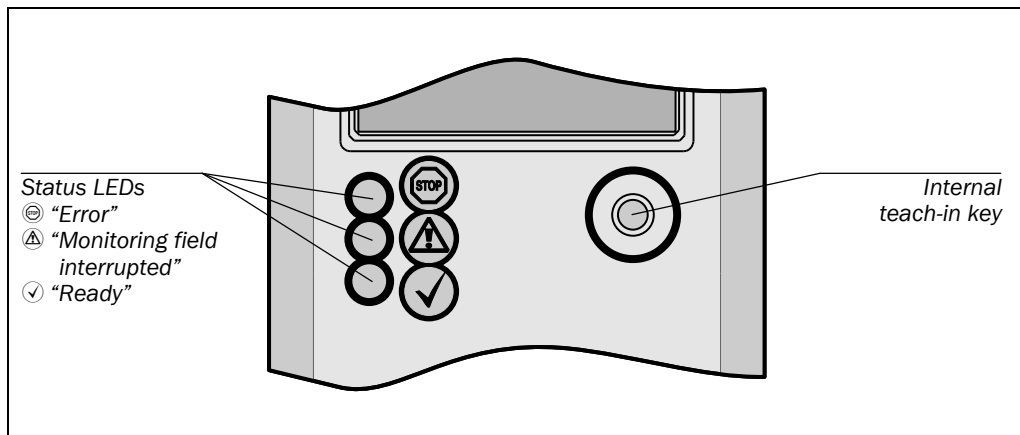
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3.4 Status indicators

The light emitting diodes (LEDs) on the VLC100 signal its operating status.

3.4.1 Status LEDs of the VLC100

Fig. 3: Status LEDs of the VLC100



Tab. 4: Meaning of the status LEDs of the VLC100

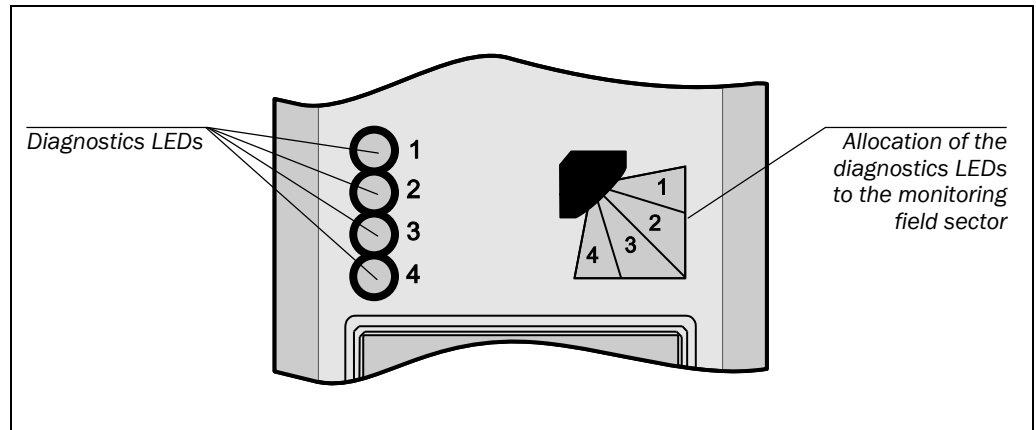
Display	Color	Meaning
☑ ●	Green	Device ready
⚠ ○	Yellow	Monitoring field clear, switching outputs: Q = HIGH, \bar{Q} = LOW ¹⁾
⚠ ●		Monitoring field interrupted, switching outputs: Q = LOW, \bar{Q} = HIGH ¹⁾
⊖ ☹	Red	Warning ➤ Carry out a fault diagnosis (see chapter 9 “Fault diagnosis” on page 31).
⊖ ☹		Error ➤ Carry out a fault diagnosis (see chapter 9 “Fault diagnosis” on page 31).
⊖ ●		No valid configuration taught-in (default delivery status) ➤ Perform the teach-in procedure (see section 7.1 “Teach-in” on page 27). Or: “Lock-out” (see page 31), switching outputs: Q = LOW, \bar{Q} = LOW

¹⁾ During the power-up sequence (initialisation), both switching outputs are LOW (0 V, invalid status). As soon as the device has reached a valid status, the switching outputs switch complementary.

3.4.2 Diagnostics LEDs of the VLC100

The camera indicates diagnostic information with the aid of four LEDs.

Fig. 4: Diagnostics LEDs of the VLC100



Tab. 5: Meaning of the diagnostics LEDs

Display	Meaning
● 1 ... ● 2 ... ● 3 ... ● 4	Power-up sequence ²⁾ : After switching on the VLC100 and after each teach-in, the power up sequence runs. Starting with the diagnostics LED 1, the next diagnostics LED illuminates after one second and so on until all 4 diagnostics LEDs are illuminated.
○	Monitoring field sector clear
●	Interruption of the monitoring field in the allocated monitoring field sector (see Fig. 4). A monitoring field sector represents one quarter of the field of view of the VLC100.
☉	Teach-in mode (see section 7.1 "Teach-in" on page 27)
☉	Warning (see chapter 9 "Fault diagnosis" on page 31)
☉	Error (see chapter 9 "Fault diagnosis" on page 31)

²⁾ During the power-up sequence (initialisation), both switching outputs are LOW (0 V, invalid status). As soon as the device has reached a valid status, the switching outputs switch complementary.

4 Mounting

This chapter describes the preparation and completion of the installation of the VLC100 camera system. Mounting requires the following steps:

- checking the monitoring field dimensions (see below),
- mounting of the camera (see page 14),
- mounting of the reflective tape (see page 19).

The following steps are necessary after mounting:

- completion of the electrical connections (see chapter 5 on page 22),
- checking the correct function of the camera system, e.g. by briefly reaching into the monitoring field.

4.1 Checking the monitoring field dimensions

- The ratio of the lengths of the sides of the monitoring field must not exceed 2:1. Otherwise the camera system may not operate correctly.
- The longest optical distance between camera and reflective tape opposite must be between 400 mm and 2200 mm at all positions.
- If you require a larger monitoring field than is possible with a single VLC100, you can mount two VLC100 in parallel in opposite directions (see 6.2 “Application with two VLC100” on page 26).
- The resolution of the camera system reduces with increasing distance.

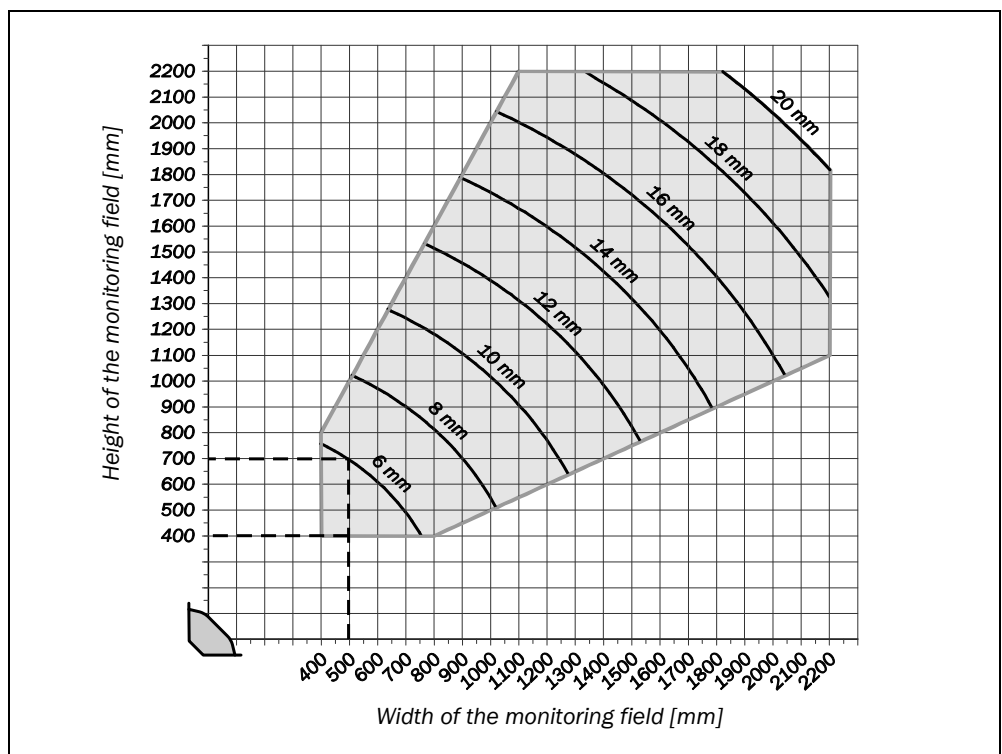
How to determine the appropriate monitoring field dimensions:

- Based on the required resolution and one side of the monitoring field, read the permissible length of the other side. The corner point of the monitoring field must be inside the gray area on the diagram.

Fig. 5: Determining the monitoring field dimensions

Example usage:

With a required resolution of 6 mm and a width of 500 mm, the monitoring field is allowed to be between 400 and 700 mm high.

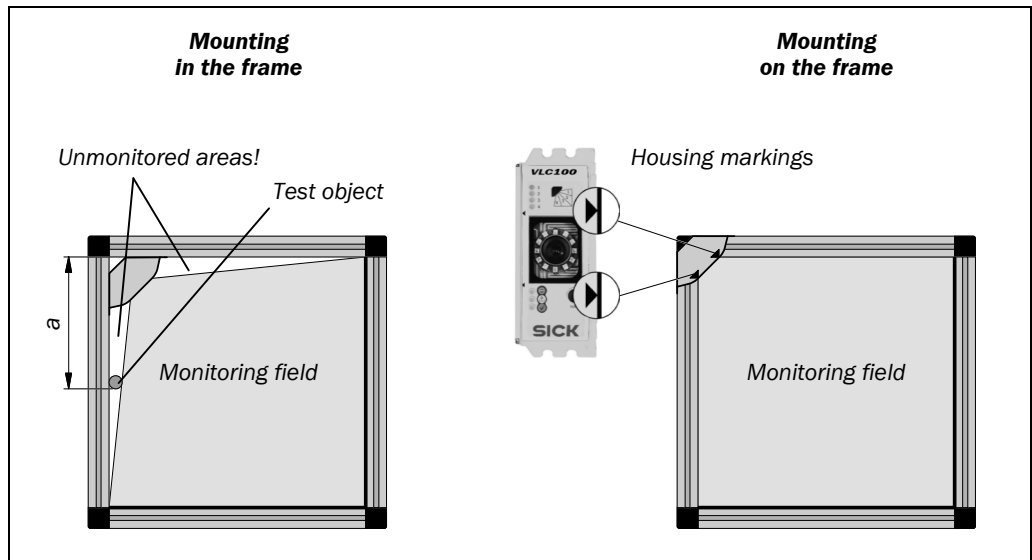


4.2 Avoiding unmonitored areas

On mounting in a frame there will be unmonitored areas due to the mounting principle. This situation can result in the failure to detect objects. You can identify the unmonitored areas with the aid of a test object.

In the case of mounting in the frame, the unmonitored area reaches from the inside of the mounting corner to the position at which the test rod is safely detected (see Fig. 6).

Fig. 6: Avoiding unmonitored areas due to mounting on a frame



Tab. 6: Length of the unmonitored area in the case of mounting in a frame

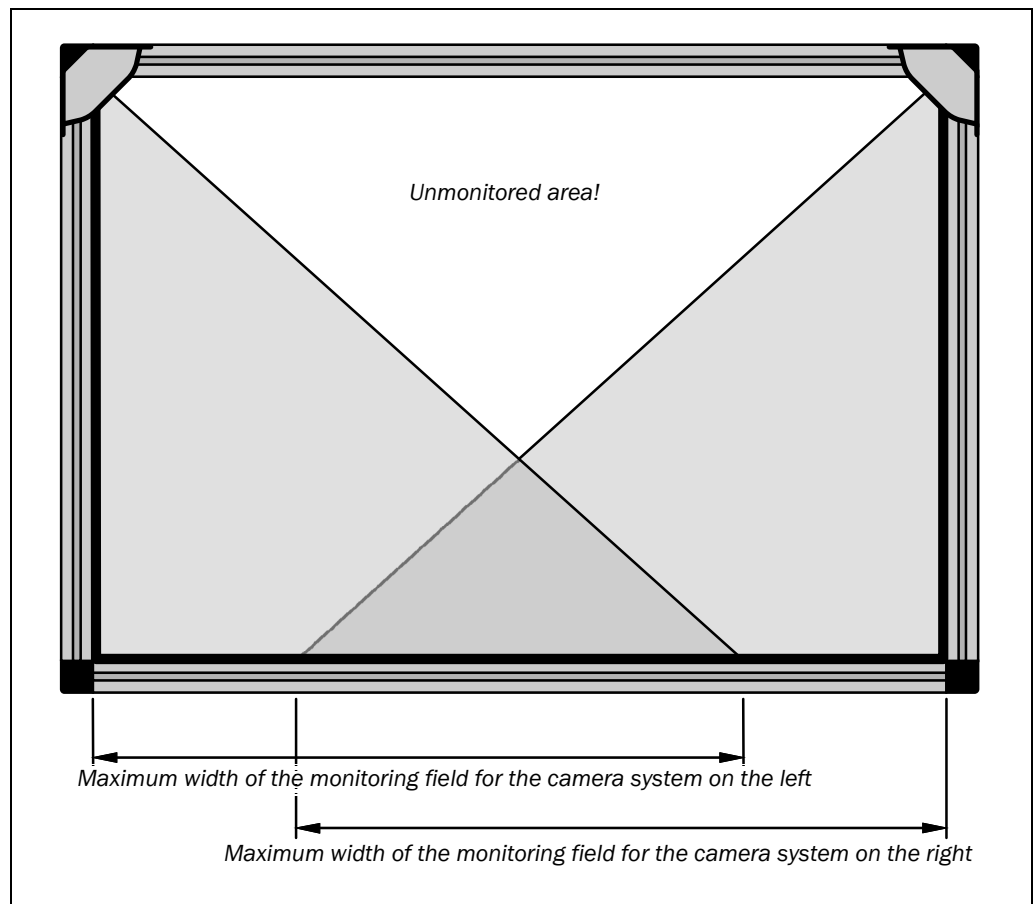
Resolution [mm]	6	8	10	12	14	16	18	20
Length a of the unmonitored area [mm]	233	224	215	206	197	188	179	170

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During mounting, please observe the maximum width for the monitoring field!

If, during mounting, the maximum width of the monitoring field width for one or two camera systems is exceeded, the camera will not see the reflective tape opposite. As a result an unmonitored area will be produced.

Fig. 7: Unmonitored area caused by mounting mistake: maximum width of the monitoring field exceeded

**Prevent the mutual interference of systems mounted in close proximity!**

If two VLC100 are so arranged that they entirely or partially look at the same reflective tape, the two cameras may interfere with each other. This can disrupt the function of the system.

➤ Take suitable measures to prevent mutual interference:

- If the two cameras are used in different applications:
 - reverse the direction in which one of the systems looks,
 - choose a different mounting method (see section 4.3 “Steps for mounting the camera system” on page 16),
 - mount non-reflective field of view guards.
- If the two cameras are used in the same application, then synchronize the two systems (see section 5.4 “Connection of two VLC100 with synchronization” on page 24).

4.3 Steps for mounting the camera system



WARNING

Special features to note during mounting:

- Avoid unmonitored areas as described in the previous section.
 - Always mount the camera on a flat surface.
 - Always mount the camera on a metal surface and ensure good mechanical contact. In this way you will ensure adequate heat dissipation from the device.
 - During mounting, ensure that camera and reflective tape are aligned correctly. The VLC100 accepts a defined lateral tolerance (see section 4.3.3 “Mounting the reflective tape” on page 19).
 - Take suitable measures to attenuate vibration if the shock requirements are above the values given in section 10.1 “Data sheet” on page 33.
 - Secure the two fixing screws against unintentional loosening.
-

The most common mounting options are:

- mounting on a frame
- mounting in a frame

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4.3.1 Mounting on a frame

- Notes**
- Always mount the camera with at least two screws and use the fastening openings on two opposite sides of the housing.
 - Secure the two fixing screws against unintentional loosening.
 - Always use washers under the screws (cf. figure).
 - To mount the camera use sliding nuts suitable for the profile system used or the mounting kit available as accessory (see chapter 11 “Ordering information” on page 38).
 - Pay attention to the thickness of the flange on the camera when selecting a suitable screw length (see section 10.2 “Dimensional drawings” on page 36).

Fig. 8: Example: mounting with sliding nuts on different thickness profiles

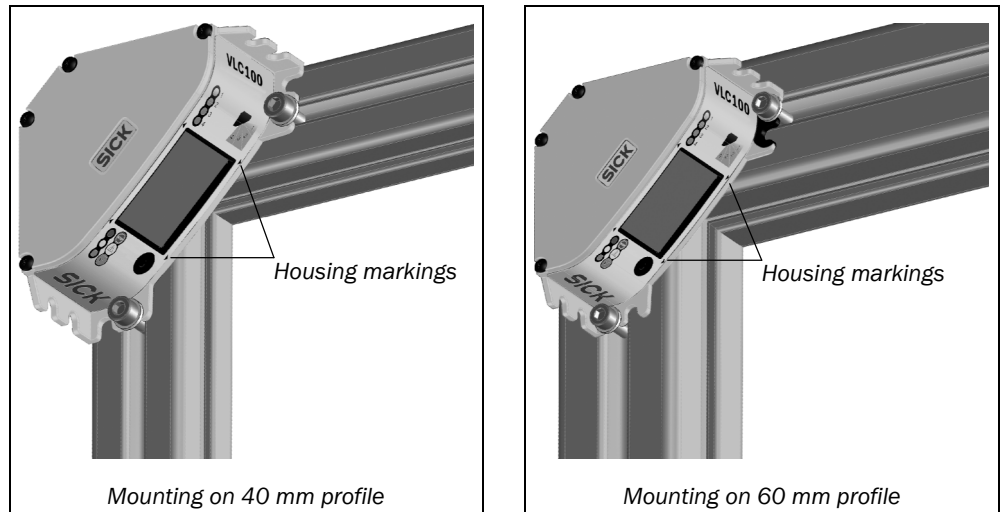
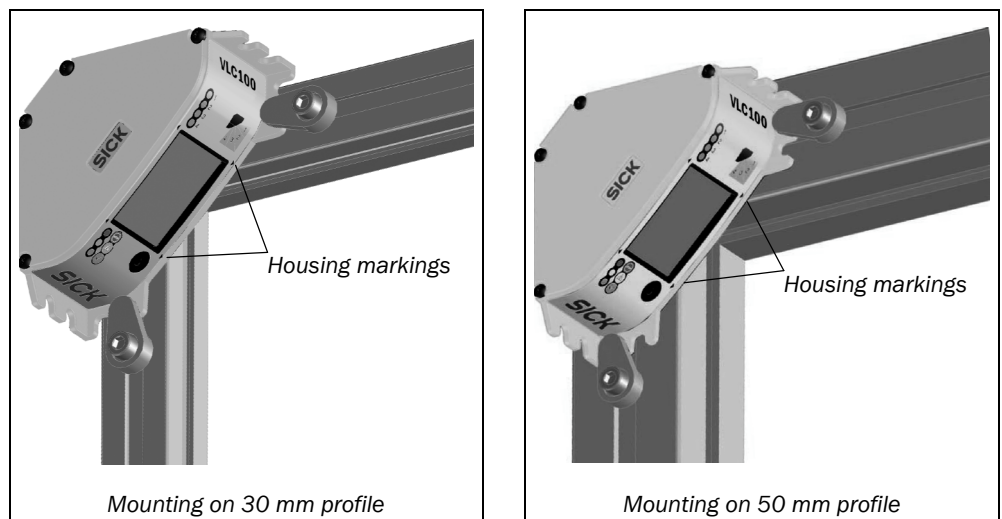


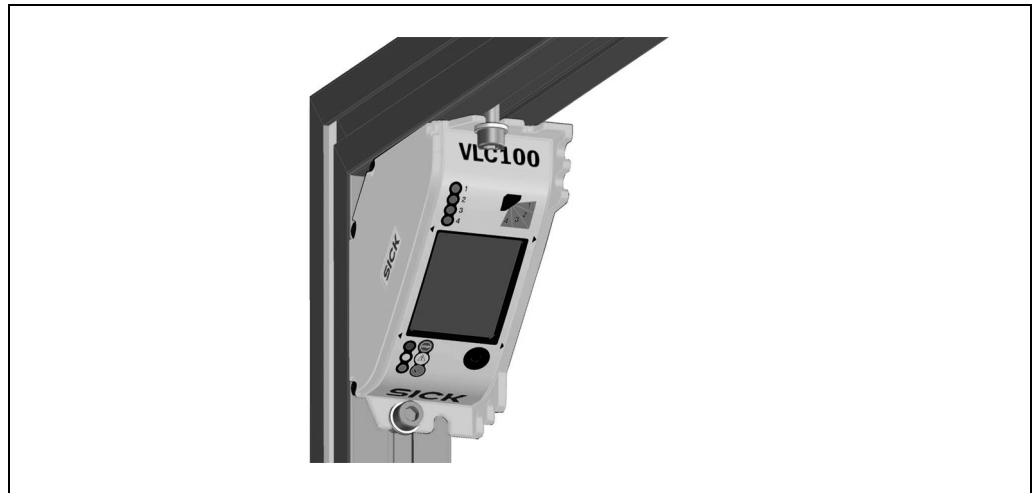
Fig. 9: Example: mounting with clamping lugs on different thickness profiles



- Align the camera such that the housing markings are aligned with the inside of the frame profile. (The monitoring field stretches between the housing markings and the ends of the reflective tape.)

4.3.2 Mounting in a frame

Fig. 10: Mounting in a frame



- Notes**
- Always mount the camera with at least two screws and use the fastening openings on two opposite sides of the housing.
 - Secure the two fixing screws against unintentional loosening.
 - Always use washers under the screws (cf. figure).
 - Use sliding nuts suitable for the profile system employed for mounting the camera.
 - Pay attention to the thickness of the flange on the camera when selecting a suitable screw length (see section 10.2 “Dimensional drawings” on page 36).



WARNING

Protect unmonitored areas using mechanical guards!

- Take organizational measures to protect the un-monitored areas (see section 4.2 “Avoiding unmonitored areas” on page 14).
-

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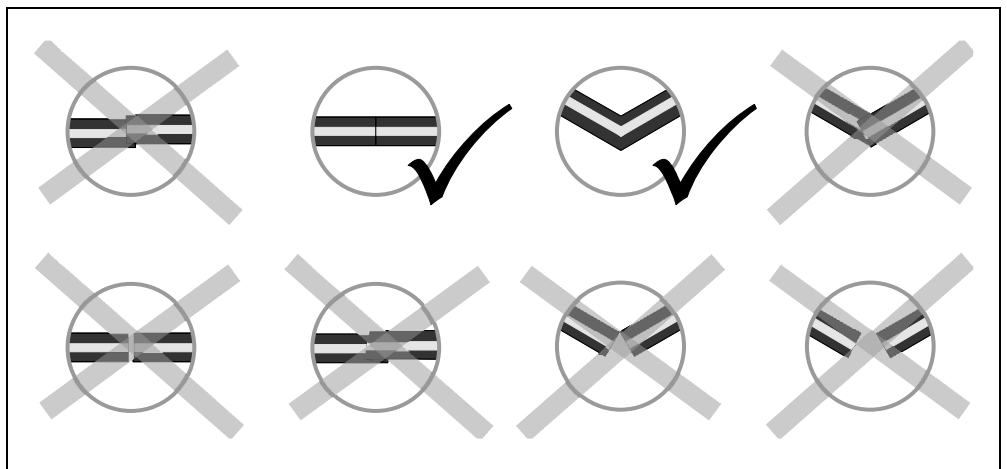
4.3.3 Mounting the reflective tape

Prior to mounting the reflective tape, pay attention to the following notes:

- Notes**
- Plan the attachment of the reflective tape exactly prior to bonding it in place. The adhesive on the reflective tape is very resilient. It is not possible to remove the tape again without destroying it. You will need a suitable solvent to remove the reflective tape (see chapter 11 “Ordering information” on page 38).
 - If you must bond the reflective tape in several sections, then ensure there are no gaps, no folds and no offset at the joints. The reflective tape must run seamlessly along the contour to be monitored.

Only the longest contiguous section of the reflective tape is taught-in by the VLC100. If there are gaps in the reflection, the camera system will ignore the shorter section of the reflective tape.

Fig. 11: Correct arrangement of the reflective tapes at joints



- If damage to the reflective tape is to be expected due to the application, e.g. because heavy or sharp-edged objects are to be pushed over the working area, you should use one of the following possible mounting methods:
 - Mount the camera in the bottom of the frame.
 - Mount the camera lower than the contact surface in front of the frame.

How to mount the reflective tape:

The reflective tape is attached by simply bonding it in place.

- Clean the surface where the tape is to be attached so that it is clean of residue.
- Remove the protective film on the rear of the reflective tape and apply the tape perpendicular to the camera's optical axis. The camera will tolerate a small divergence from the optical axis (cf. Fig. 12ff.).

Fig. 12: Permissible divergence of the reflective tape from the optical axis of the camera as a function of the distance at 6 mm resolution (illustration of divergence not to scale)

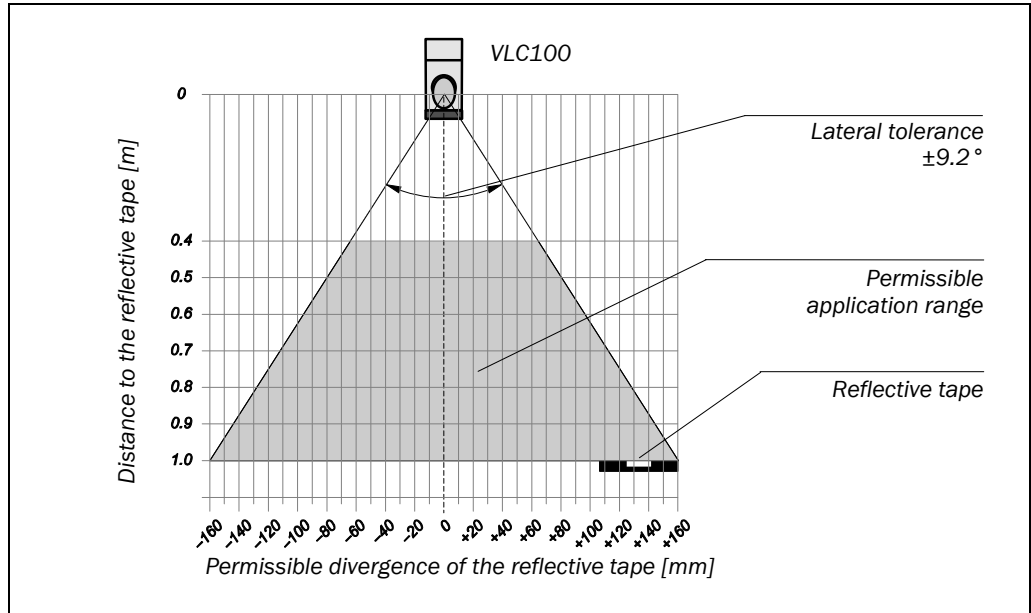
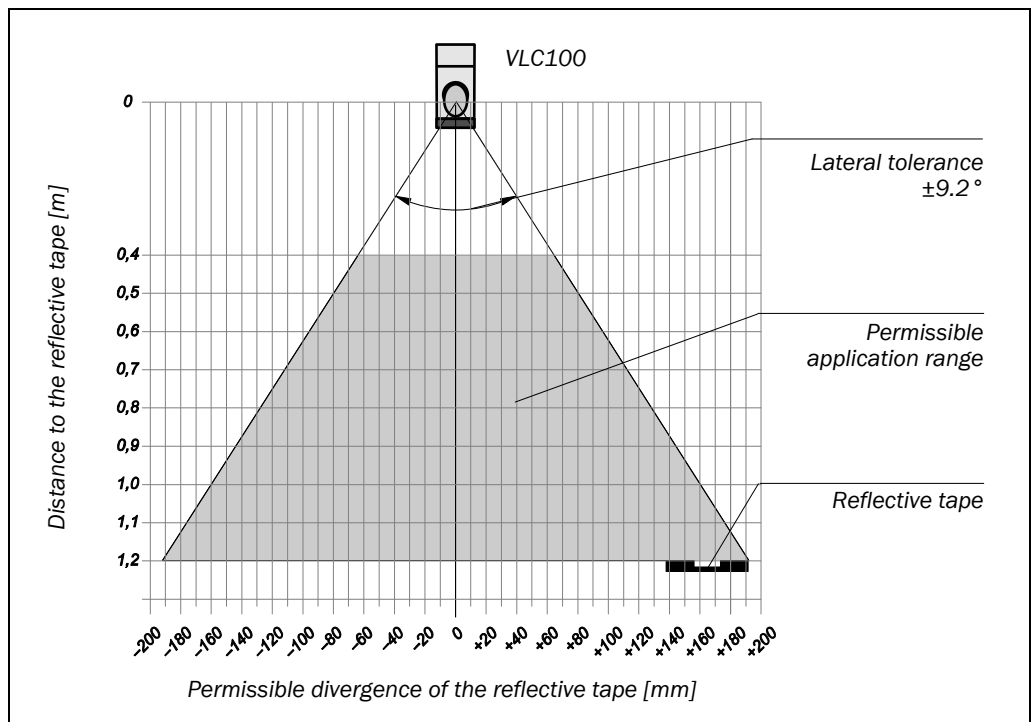


Fig. 13: Permissible divergence of the reflective tape from the optical axis of the camera as a function of the distance at 8 mm resolution (illustration of divergence not to scale)



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Fig. 14: Permissible divergence of the reflective tape from the optical axis of the camera as a function of the distance at 10 mm resolution (illustration of divergence not to scale)

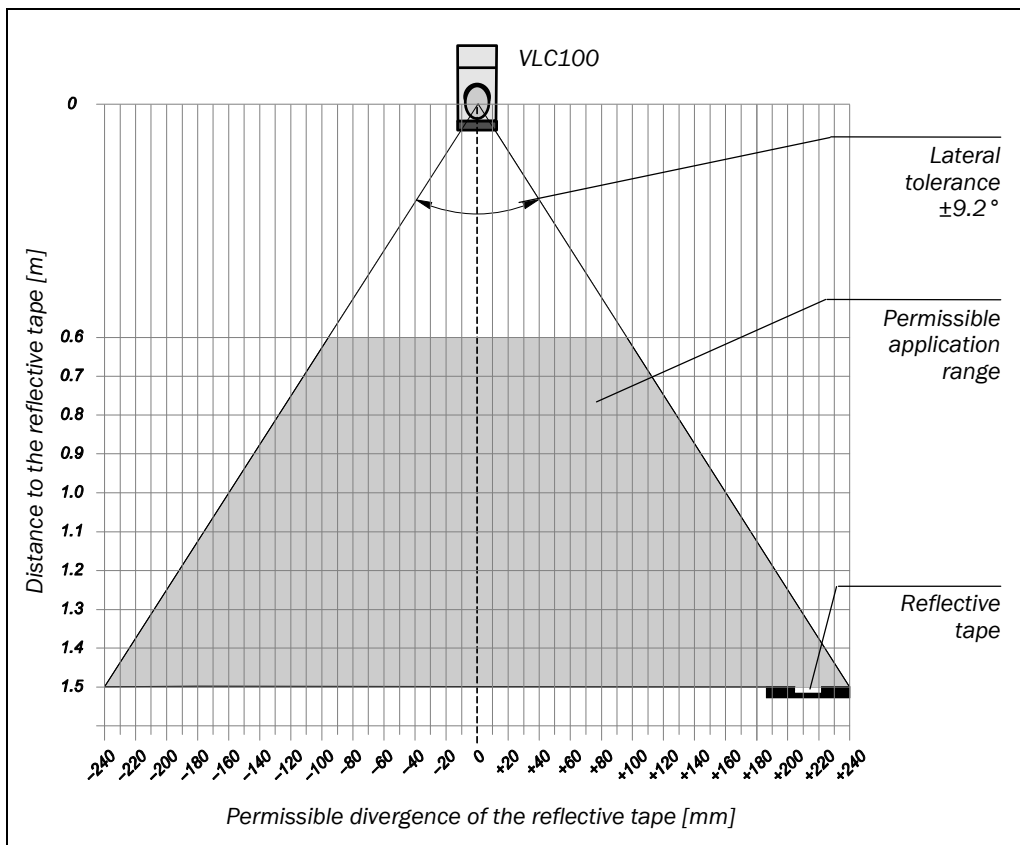
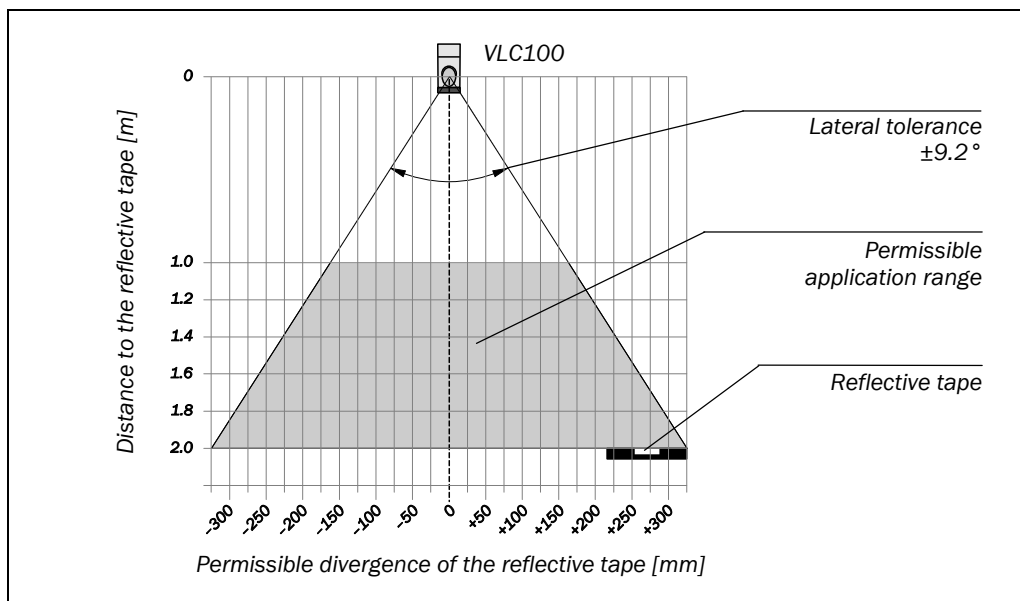


Fig. 15: Permissible divergence of the reflective tape from the optical axis of the camera as a function of the distance at 20 mm resolution (illustration of divergence not to scale)



- Press the reflective tape firmly and ensure the edges are firmly sealed. In this way you will prevent dirt and liquids getting under the reflective tape.

5 Electrical installation



WARNING

Switch the entire machine/system off line!

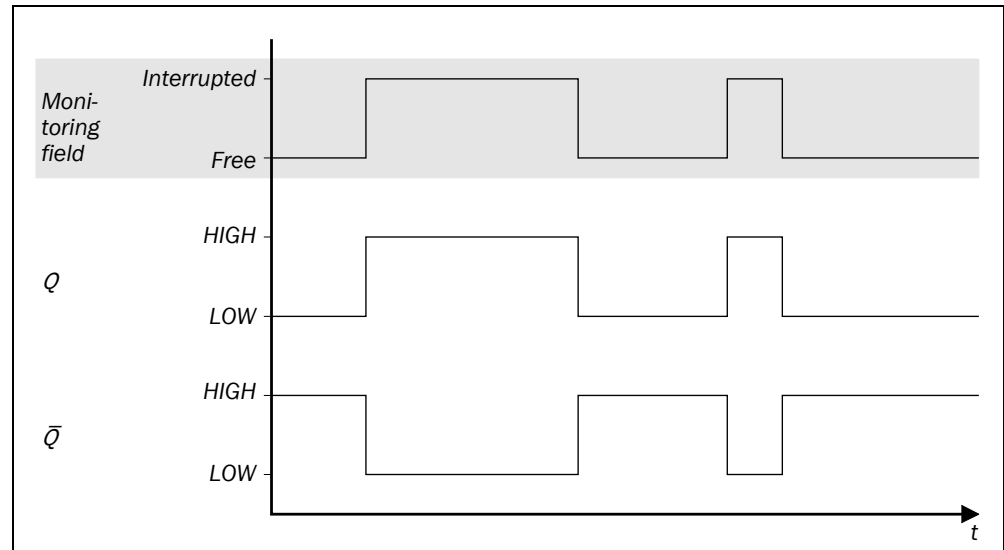
The machine/system could unintentionally start up while you are connecting the devices.

- Ensure that the entire machine/system is disconnected during the electrical installation.

Notes

- The switching outputs switch complementary.

Fig. 16: Complementary switching behavior of the switching outputs Q and \bar{Q}

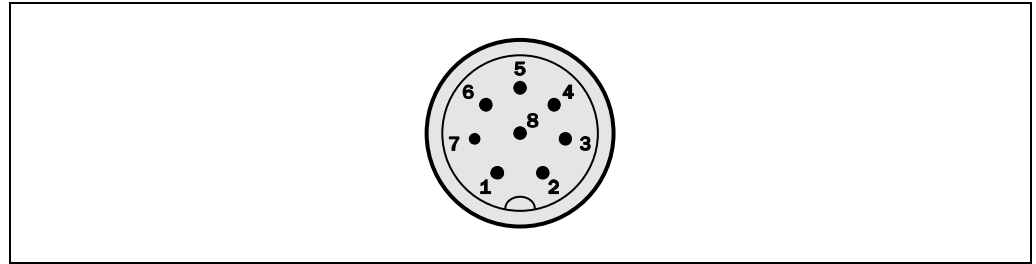


- During the power-up sequence (initialisation), both switching outputs are LOW (0 V, invalid status). As soon as the device has reached a valid status, the switching outputs switch complementary.
- The two switching outputs are protected against short-circuits to 24 V DC and 0 V.
- If not used, the input *Teach-in/synchronization* may not be connected to 0 V.
- The VLC100 camera system meets the interference suppression requirements (EMC) for industrial use (interference suppression class A). When used in residential areas it can cause radio interferences.
- To ensure full electromagnetic compatibility (EMC), functional earth (FE) must be connected.
- Dimension the electrical protection for the camera to suit the information in section 10.1 "Data sheet" on page 33.

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5.1 System connection M12 × 8

Fig. 17: System connection VLC100



The VLC100 has a hard-wired connector cable (length: approx. 30 cm) with a M12 × 8 cable plug.

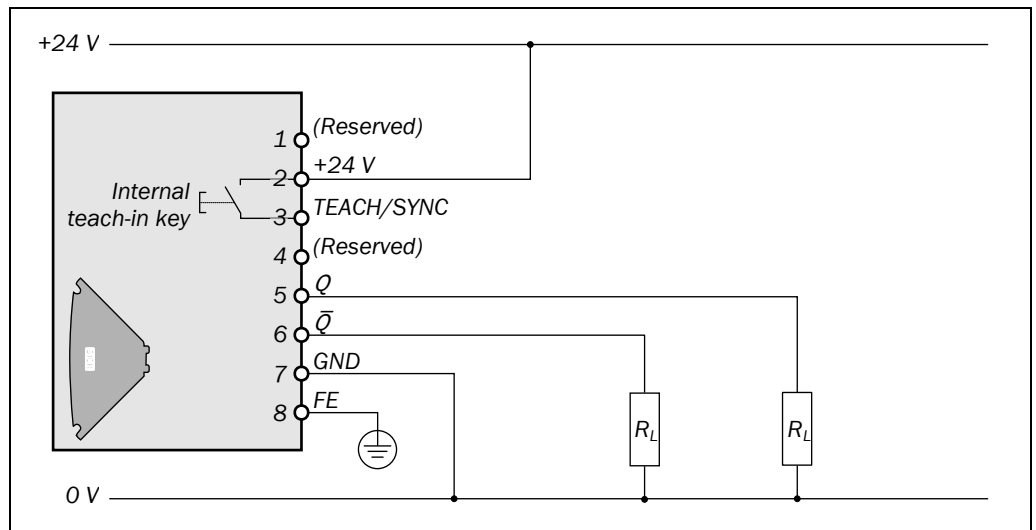
Tab. 7: Pin assignment system connection VLC100

Pin	Color	Signal	Function
1	White	(Reserved)	(Do not connect)
2	Brown	+24 V DC	24 V DC (voltage supply)
3	Green	TEACH/SYNC	Teach-in/synchronization (may not be connected to 0 V if not used)
4	Yellow	(Reserved)	(Do not connect)
5	Gray	Q	Q (switching output 1)
6	Pink	\bar{Q}	\bar{Q} (switching output 2)
7	Blue	GND	0 V DC (voltage supply)
8	-	FE	Functional earth

Note Connecting cables of different length are available as accessories from SICK (see chapter 11 “Ordering information” on page 38). If you use connecting cables you have assembled yourself, ensure the functional earth (pin 8) is connected.

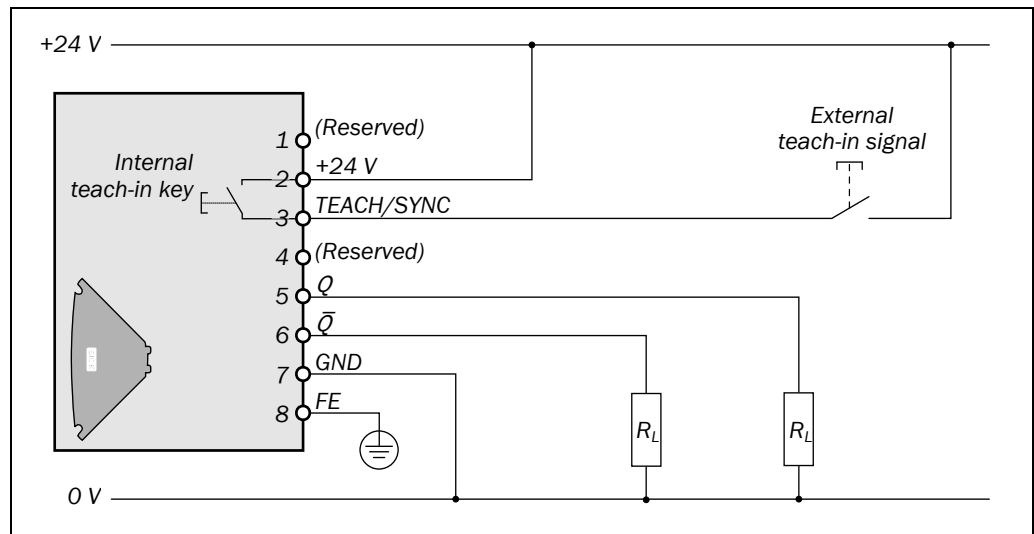
5.2 Connection of the VLC100 without external teach-in signal

Fig. 18: Connection of the VLC100 without external teach-in signal



5.3 Connection of the VLC100 with external teach-in signal

Fig. 19: Connection of the VLC100 with external teach-in signal



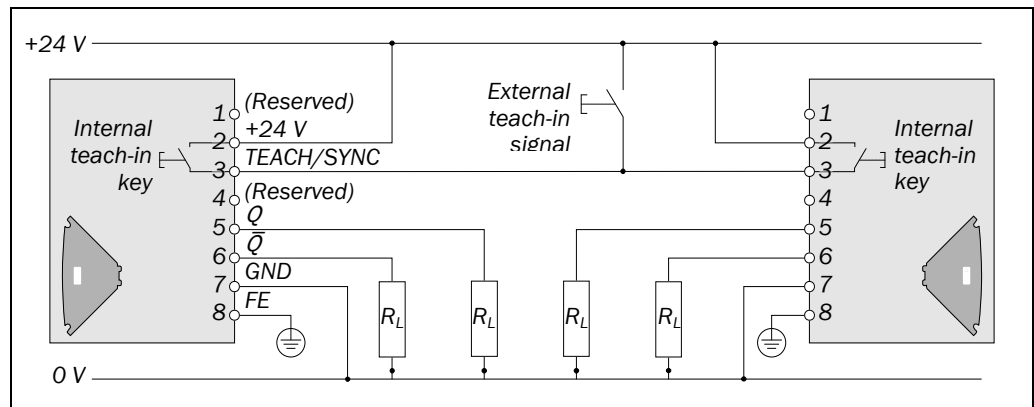
External teach-in signal

To permit remote teach-in and/or to protect the configuration, you can connect an external teach-in signal and lock the internal teach-in key.

- Notes**
- Once the external teach-in signal has been activated, the VLC100 locks the internal teach-in key and saves this configuration in the device. Teach-in can now only be performed by the external teach-in signal (see section 7.2 “Locking the internal teach-in key” on page 29).
 - If you use two VLC100 in an application, then both systems use the same external teach-in signal (see Fig. 20 on page 24).

5.4 Connection of two VLC100 with synchronization

Fig. 20: Connection of two VLC100 with synchronization



If two VLC100 are so arranged that they entirely or partially look at the same reflective tape, the two cameras may interfere with each other. To prevent this situation occurring, you must synchronize the two cameras.

How to synchronize two VLC100:

- Connect pin 3 on the two cameras together. The cameras will synchronize automatically each time after switch on and after every teach-in procedure.

Note If you activate the external teach-in signal or actuate one of the two internal teach-in keys, both devices will learn their respective monitoring field at the same time.

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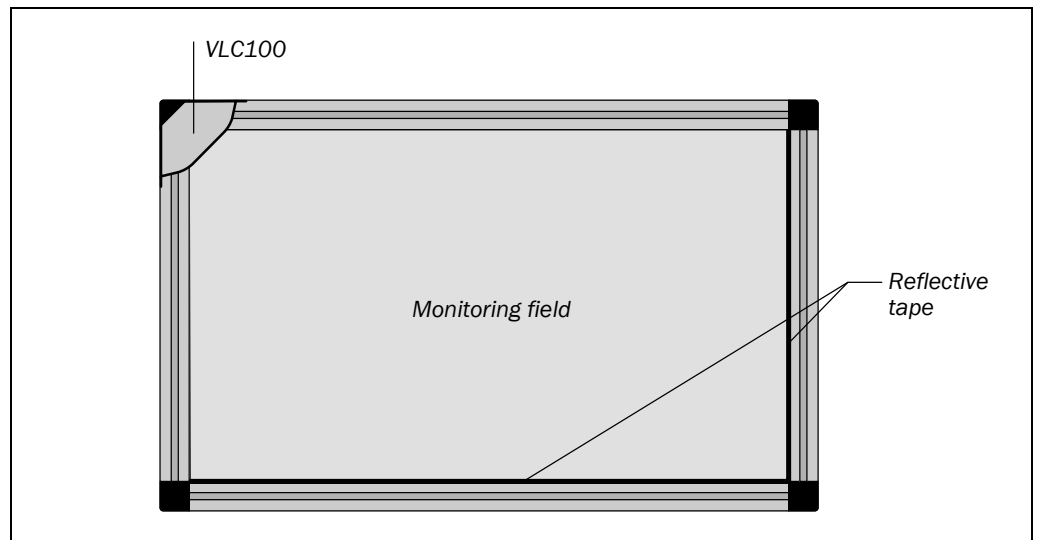
6 Application examples

Note The examples shown are only provided as an aid for your planning.

6.1 Application with one VLC100

If the necessary monitoring field dimensions can be realized using a single VLC100, then mount the camera on a corner of the frame or in a corner of the frame. Apply the reflective tape to the opposite sides.

Fig. 21: Application with small monitoring field (1 × VLC100, ratio of the lengths of the sides 1:2)

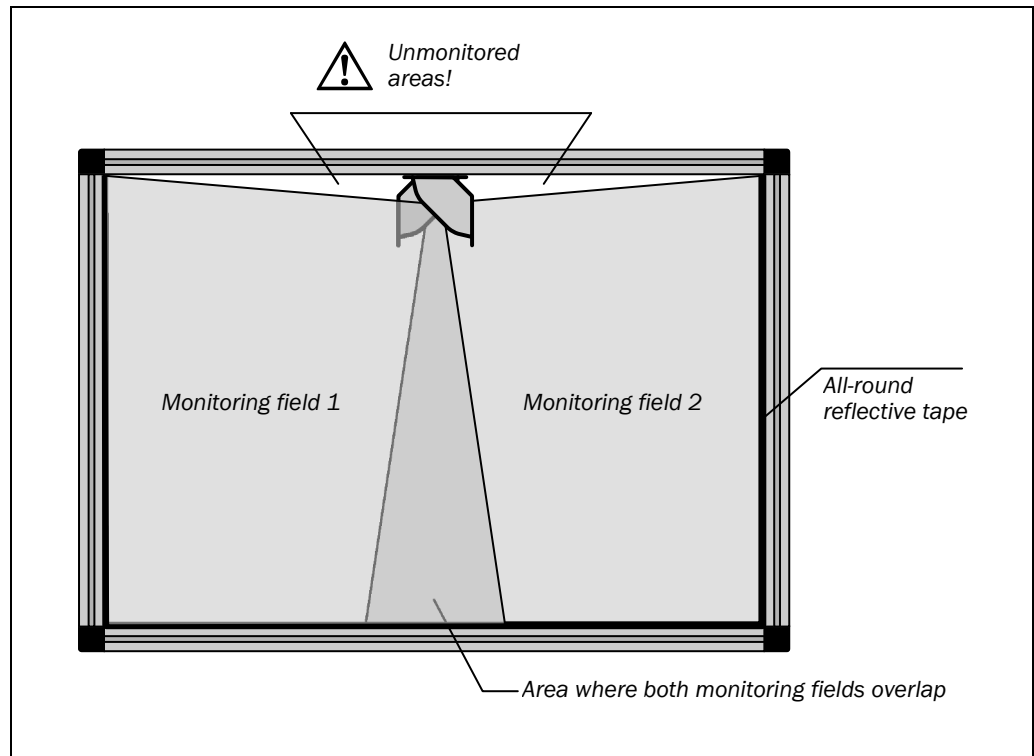


6.2 Application with two VLC100

If the application requires a larger monitoring field width than can be covered with one VLC100, you can mount two VLC100 in parallel in opposite directions (see Fig. 22). In this way you can realize two overlapping monitoring fields.

- Notes**
- Mount the devices overlapping as shown in the figure (i.e. **not** back to back). Otherwise unmonitored areas may be produced in the middle of the monitoring field.
 - Ensure the housing markings on the two cameras are aligned.
 - You must synchronize the two VLC100 so that they do not interfere with each other (see section 5.4 on page 24).

Fig. 22: Application with large monitoring field (2 × VLC100)



7 Configuration and commissioning



WARNING

Switch off the entire system!

While you configure the camera system, the machine could start unintentionally.

- Ensure that the whole system is in a safe condition during the configuration process.

7.1 Teach-in

Prior to initial commissioning, you must perform a new teach-in procedure. The following occurs during teach-in:

- The VLC100 detects the current connection configuration and configures the locking of the internal teach-in key to suit. In the default delivery status, these functions are deactivated.
- The VLC100 detects the monitoring field based on the reflective tape. In the default delivery status, the VLC100 has no monitoring field configured.

How to teach-in the current configuration and shape of the monitoring field:

- Ensure camera and reflective tape are correctly mounted and the electrical connections have been made.
- Switch on the VLC100. The ☉ LED is constantly illuminated.

Note

Ensure there are no objects in the monitoring field during teach-in!

Only the longest contiguous section of the reflective tape is taught-in by the VLC100. If there are gaps in the reflection, e.g. because the reflective tape has been damaged or because there is an object in the monitoring field, the camera system will ignore the shorter section of the reflective tape.



- Start the teach-in process as follows:

Tab. 8: Starting the teach-in process

Using the internal teach-in key	Using the external teach-in signal
<ul style="list-style-type: none"> ➤ Press the internal teach-in key for at least 2 seconds. (The diagnostics LED 4 ☉ flashes.) ➤ Important: Now remove your hand from the monitoring field so that the VLC100 can completely detect the monitoring field. ➤ If the VLC100 does not react, the internal teach-in key is probably locked. Start the teach-in process using the external teach-in signal or unlock the internal teach-in key (see section 7.2 “Locking the internal teach-in key” on page 29). 	<ul style="list-style-type: none"> ➤ Activate the external teach-in signal for at least 0.5 seconds. The diagnostics LED 4 ● illuminates. ➤ Deactivate the external teach-in signal. The diagnostics LED 4 ○ goes off.

The VLC100 now teaches-in the current configuration and shape of the monitoring field. The process takes approx. 15 seconds. During the teach-in the flashing diagnostics LEDs indicate the configuration detected:




Tab. 9: Meaning of the diagnostics LEDs during teach-in

Display	Meaning
1 	Switching outputs Q and \bar{Q} detected and OK
4 	Internal teach-in key unlocked

Note During the tech-in procedure, both switching outputs are LOW (0 V, invalid status). As soon as the device has reached a valid status, the switching outputs switch complementary.

➤ Using the LEDs, check whether the teach-in was successful:

Tab. 10: LED displays after teach-in

Status LEDs			Diagnostics LEDs				Meaning
			1	2	3	4	
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Teach-in successful. Monitoring field clear.
<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Teach-in successful. Monitoring field interrupted.
<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Teach-in failed (for measures see below).

➤ Check the taught-in monitoring field, e.g. by briefly reaching into the monitoring field.

If the teach-in fails:

- Check the following points:
 - Is the reflective tape fitted and clean?
 - Is the reflective tape perpendicular to the area of the monitoring field?
 - Are the reflective tape or its sub-segments of an adequate length?
 - Is it ensured that the system does not suffer interference due to reflective objects in the immediate vicinity (e.g. reflective strips on safety clothing, packing film etc.)?
 - When using the internal teach-in key: Is the internal teach-in key locked?
(See section 7.2 "Locking the internal teach-in key" on page 29.)
- Remove the cause.
- Perform teach-in again.

7.2 Locking the internal teach-in key

In the default delivery status the internal teach-in key is unlocked, i.e. it can be used. To permit remote teach-in and/or to protect the configuration, you can connect an external teach-in signal and lock the internal teach-in key.

How to lock the internal teach-in key:

- Connect an external teach-in signal (see section 5.3 on page 24).
- Switch on the VLC100.
- Perform a teach-in procedure **using the external teach-in signal**.

The VLC100 locks the internal teach-in key and saves this configuration in the device. Teach-in can now only be performed using the external teach-in signal.

- Check the correct function of the camera system, e.g. by briefly reaching into the monitoring field.

How to unlock the internal teach-in key:

- Switch on the VLC100.
- Activate the external teach-in signal for **at least 60 seconds**.

The VLC100 unlocks the internal teach-in key and saves this configuration in the device.

- If you no longer need the external teach-in signal, remove it from the electrical installation. If not used, the input *Teach-in/synchronization* may not be connected to 0 V. Otherwise the VLC100 will again lock the internal teach-in key the next time the external teach-in signal is activated.
- Check the correct function of the camera system, e.g. by briefly reaching into the monitoring field.

8 Care and maintenance

The VLC100 camera system is maintenance-free in operation. The front screen on the VLC100 as well as the reflective tape should be cleaned regularly and also cleaned immediately in case of soiling.

- Do not use aggressive cleaning agents.
- Do not use abrasive cleaning agents.

Note Static charges cause dust particles to be attracted to the front screen and the reflective tape. You can reduce this effect by using the antistatic plastic cleaner (SICK part number 5600006) and the SICK lens cloth (part number 4003353).

How to clean the front screen and the reflective tape:

- Use a clean and soft brush to remove dust from the front screen and the reflective tape.
- Now wipe the front screen and the reflective tape with a clean and damp cloth.
- Check the correct function of the camera system, e.g. by briefly reaching into the monitoring field.

9 Fault diagnosis

This chapter describes how to identify and rectify errors and malfunctions during the operation of the camera system.

9.1 In the event of faults or errors





WARNING

Cease operation if the cause of the malfunction has not been clearly identified!

- Stop the machine if you cannot clearly identify or allocate the error and if you cannot safely rectify the malfunction.

The system state “lock-out”

In case of certain faults or an erroneous configuration, the system can go into the “lock-out” system status:

- The status LED  **Error** (red) flashes with a short duty cycle  (short on/long off).
- In the “lock-out” status both switching outputs are LOW (0 V, invalid status).

To place the device back in operation:



- Rectify the cause of the fault following the information given in this chapter.
- Switch the power supply for the VLC100 off and on again (e.g. by unplugging the system connection and reinserting it).







































9.2 SICK support

- If you cannot rectify an error with the help of the information provided in this chapter, please contact your local SICK representative.

9.3 Warnings and error messages of the LEDs

This section explains the meaning of the indications on the LEDs in case of warnings and errors and how you can react to them.

The procedure for troubleshooting varies for warnings  and errors  only in the last step: If there is an error, you must restart the VLC100 after rectification.

Status LEDs			Diagnostics LEDs				Meaning		Rectification of the error
			1	2	3	4			
							Warning	Short circuit or overcurrent on one of the two switching outputs Q or \bar{Q}	➤ Check the wiring for short-circuits or cross-circuits.
							Error		
							Warning	Input <i>TEACH</i>	➤ Check the connection of the external teach-in signal.
							Error		
							Error	System error	➤ Disconnect the supply voltage to the VLC100 for at least 3 seconds. ➤ If the problem persists, replace the unit.

Tab. 11: Indications on completion of the teach-in

VLC100

10 Technical specifications

10.1 Data sheet

Tab. 12: Data sheet VLC100

	Minimum	Typical	Maximum
General system data			
Monitoring field dimensions	See section 4.1 "Checking the monitoring field dimensions" on page 13.		
Protection class	III (EN 50 178)		
Enclosure rating	IP 54 (EN 60 529)		
Resolution	6 mm, 8 mm, 10 mm or 20 mm		
Field of view	103° ± 3°		
Ambient operating temperature	0 °C		+50 °C
Storage temperature	-25 °C		+70 °C (≤24 h)
Air humidity (non-condensing)	15 %		95 %
Vibration resistance	5 g, 10-55 Hz (EN 60 068-2-6)		
Shock resistance	10 g, 16 ms (EN 60 068-2-27)		
Lighting			
Wavelength	850 nm		
Ocular safety	Photobiologically harmless (IEC 62 471-7)		
Housing			
Material	Aluminium die-cast		
Dimensions	See section 10.2 "Dimensional drawings" on page 36.		
Total weight	0.355 kg		
Reflective tape (length × width) for resolution:			
6 mm	1.00 m × 37 mm		
8 mm	1.20 m × 37 mm		
10 mm	1.50 m × 48 mm		
20 mm	2.00 m × 48 mm		
Power-up delay after connecting the supply voltage			6 s

Minimum	Typical	Maximum
---------	---------	---------

Electrical data

Supply voltage V_S at the device (SELV)	19.2 V	24 V	28.8 V
Permissible cable resistance on the supply cable			1 Ω
Residual ripple ³⁾			$\pm 5\%$
Operating current At 24 V without output load With maximum output load			165 mA 690 mA
Power consumption At 24 V without output load With maximum output load			4 W 19 W
Electrical connection	M12 \times 8 (see section 5.1 on page 23)		
Cable length for wire cross-section 0.25 mm ²			7.5 m
Synchronization	Electrical (see section 5.1 on page 23)		
<i>Teach-in/synchronization</i> input (TEACH/SYNC)			
Resistance HIGH		2 k Ω	
Capacitance		15 nF	
Voltage HIGH	11 V	24 V	30 V
Static current	6 mA		15 mA

³⁾ Within the limits of V_S .

VLC100

	Minimum	Typical	Maximum
Switching outputs Q and \bar{Q}	2 PNP semiconductors, short-circuit protected ⁴⁾ , cross-circuit monitored		
Switching voltage HIGH (active, U_{rms}) at 250 mA	$U_V - 2.7\text{ V}$		U_V
Switching voltage LOW (inactive)	0 V	0 V	3.5 V
Source switching current	6 mA		250 mA ⁵⁾
Leakage current ⁶⁾			250 μA
Load inductance			2.2 H
Load capacity at 50 Ω			2.2 μF
Permissible line resistance between device and load ⁷⁾			2.5 Ω
Response time			20 ms
Switch off time	16 ms		20 ms
Switching time after monitoring field has been cleared again			12 ms
Connected loads			
Permissible dropout time			300 ms
Permissible pick-up time			300 ms

⁴⁾ Applies to the voltage range between V_S and 0 V.

⁵⁾ Switching currents $\leq 500\text{ mA}$ are allowed briefly ($\leq 100\text{ ms}$).

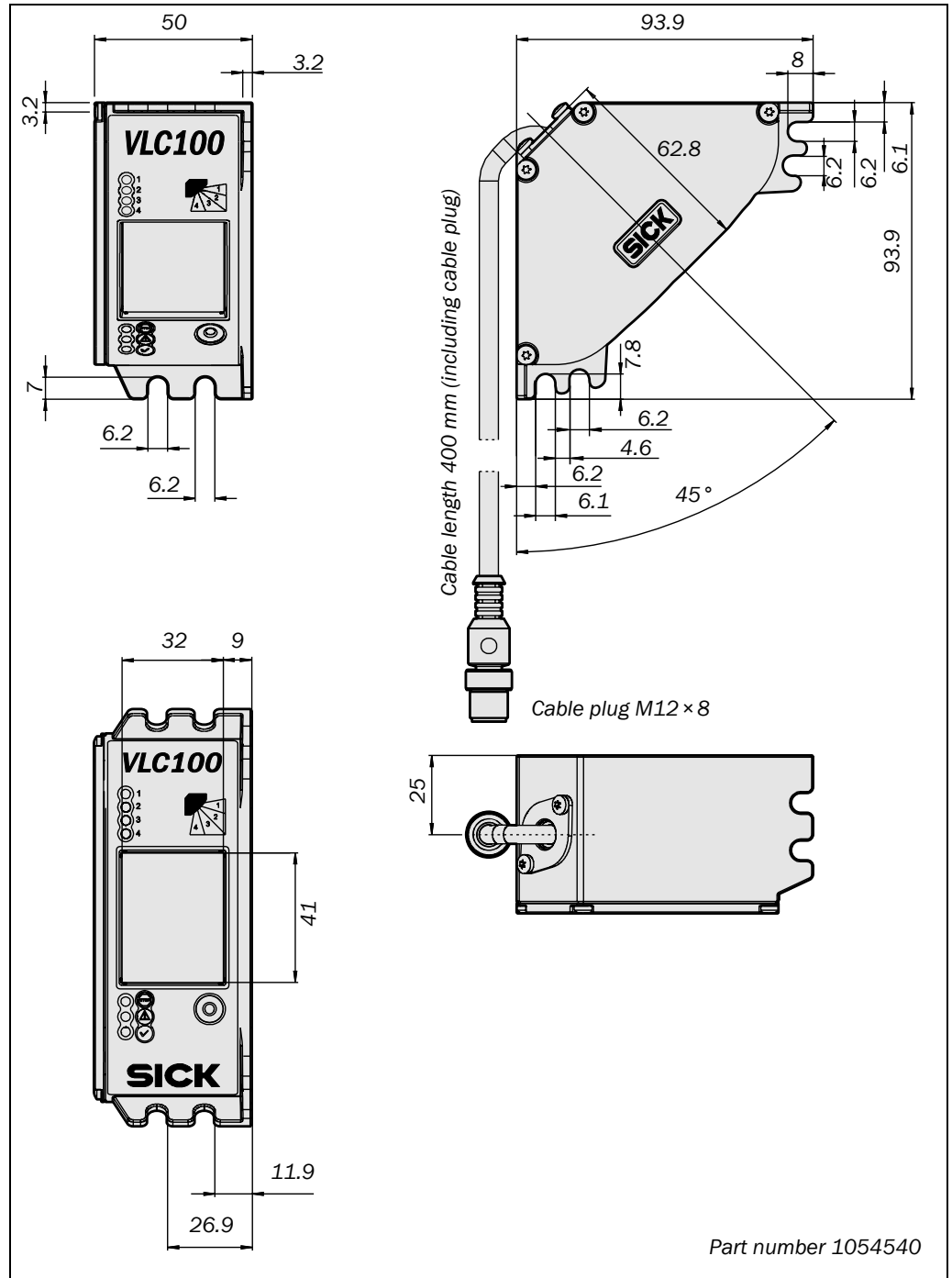
⁶⁾ In the case of a fault (0 V cable open circuit) in the most the leakage current is flowing. The downstream controller must detect this status as LOW.

⁷⁾ Make sure to limit the individual cable resistance to the downstream controller to this value to ensure that a cross-circuit between the outputs is safely detected. (Also note EN 60 204, Electrical Machine Equipment, Part 1: General Requirements.)

10.2 Dimensional drawings

10.2.1 Dimensional drawing VLC100

Fig. 23: Dimensional drawing VLC100 (mm)

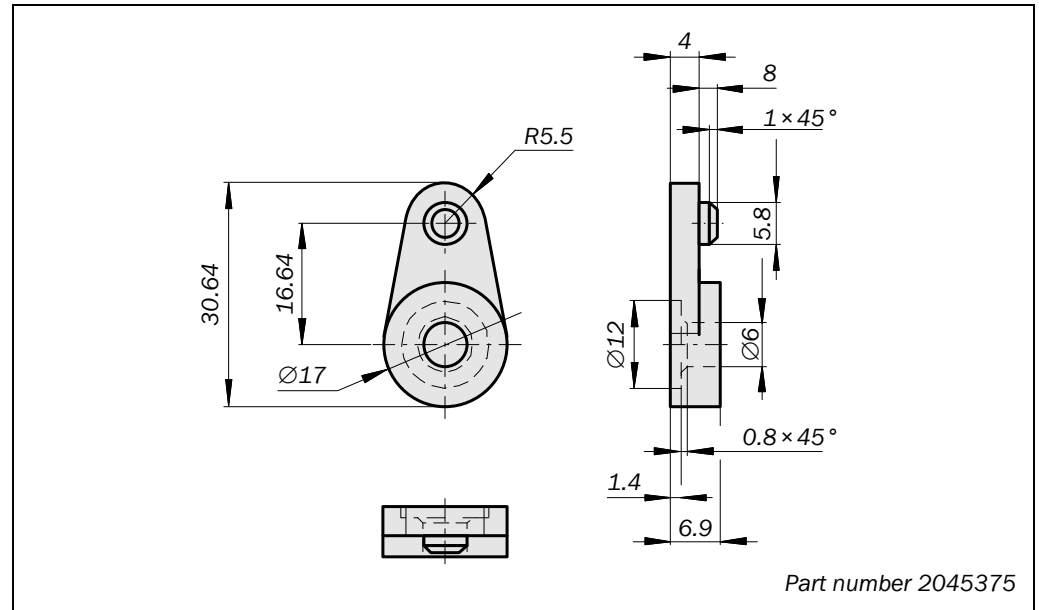


Part number 1054540

VLC100

10.2.2 Dimensional drawing mounting kit

Fig. 24: Dimensional drawing mounting kit (mm)



11 Ordering information

Tab. 13: Part numbers
camera system VLC100

Description	Part number
Camera system for area monitoring	
Consisting of camera VLC100, teach-in pin and Quick Start (instructions for quick commissioning), multi-lingual	1054540
Reflective tapes	
Robust version. Suitable for applications in which the reflective tape is subject to friction or weight.	
2 pieces at 1.0 m each	2046005
2 pieces at 1.5 m each	2051582
2 pieces at 2.0 m each	2061272
Mounting kit	
To mount the VLC100 on profile frames, 2 clamping lugs incl. screws	2045375
Power supply	
Power supply 24 V, 100/240 V AC, 50 W	7028789
Power supply 24 V, 100/240 V AC, 95 W	7028790
Connecting cables	
With cable socket M12 × 8, straight socket, with knurled nut/stripped	
2.0 m	6020633
5.0 m	6020993
7.5 m (halogen free)	6037517
Other accessories	
Teach-in pin	4052939
Anti-static plastic cleaner	5600006
Lens cloth	4003353
Solvent for adhesive, spray bottle, 200 ml, suitable for removing the reflective tape	5602135

Ordering example

A VLC100 is to be used in your application with a resolution of 20 mm.
Then you must order the following:

- | | |
|---|---------|
| • 1 VLC100 | 1054540 |
| • 1 set reflective tapes for 10 mm resolution, 2 pieces at 2.0 m each | 2061272 |
| • 1 connection cable 2.0 m | 6020633 |

12 Annex

12.1 EC Declaration of Conformity

You can obtain the complete EC declaration of conformity via the SICK homepage on the Internet at www.sick.com

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