CLV63x, CLV64x, CLV65x

Bar code scanner

SICK
Sensor Intelligence.

Described product

CLV63x

CLV64x

CLV65x

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

Contents

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1 About this document

1.1 Information on the operating instructions

These operating instructions provide important information on how to use devices from SICK AG.

Prerequisites for safe work are:

- Compliance with all safety notes and handling instructions supplied.
- Compliance with local work safety regulations and general safety regulations for device applications

The operating instructions are intended to be used by qualified personnel and electrical specialists.

(i) NOTE

Read these operating instructions carefully before starting any work on the device, in order to familiarize yourself with the device and its functions.

The instructions constitute an integral part of the product and are to be stored in the immediate vicinity of the device so they remain accessible to staff at all times. Should the device be passed on to a third party, these operating instructions should be handed over with it.

These operating instructions do not provide information on operating the machine in which the device is integrated. For information about this, refer to the operating instructions of the specific machine.

1.2 Scope

These operating instructions serve to incorporate the device into a customer system. Instructions are given by stages for all actions required.

These instructions apply to all available device variants of the device. More detailed information for the identification of the available device type see "Type code", page 13.

Available device variants are listed on the online product page.

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

Various device variants are used as examples for commissioning, based on the default parameter settings for the relevant device.

1.3 Explanation of symbols

Warnings and important information in this document are labeled with symbols. The warnings are introduced by signal words that indicate the extent of the danger. These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.

⚠ DANGER

… indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.

⚠ **WARNING**
... indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented.

⚠ **CAUTION**
... indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.

❗ **NOTICE**
... indicates a potentially harmful situation, which may lead to material damage if not prevented.

ⓘ **NOTE**
... highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

1.4   Further information

ⓘ **NOTE**
All the documentation available for the device can be found on the online product page at:

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

The following information is available for download there:

- Model-specific online data sheets for device variants, containing technical data, dimensional drawings, and reading field diagrams
- EU declaration of conformity for the product family
- Dimensional drawings and 3D CAD dimension models in various electronic formats
- Reading field diagrams
- These operating instructions are available in German and other languages.
- Other publications related to the devices described here
- Publications dealing with accessories

1.4.1   Supplementary documents

Information about configuration of the device can be found in the online help function of the SOPAS ET configuration software.

1.4.2   Documents on request

Overview of command strings for the device.

1.5   SICK service

If you require any technical information, our SICK Service will be happy to help. To find your agency, see the final page of this document.

ⓘ **NOTE**
Before calling, make a note of all type label data such as type code, serial number, etc., to ensure faster processing.

2 Safety information

2.1 Intended use

The device is an intelligent, opto-electronic SICK ID sensor and is used for automatic, fixed identification and decoding of bar codes on moving or stationary objects. The data content of the decoded bar codes is sent by the device to a higher-level control (PLC) for further coordinating processing.

> **NOTE**
> The bar codes being read must conform to at least quality level C in accordance with ISO/IEC 15416.

SICK AG assumes no liability for losses or damage arising from the use of the product, either directly or indirectly. This applies in particular to use of the product that does not conform to its intended purpose and is not described in this documentation.

2.2 Incorrect use

- The device does not constitute a safety-relevant device according to the EU Machinery Directive (2006/42/EC).
- The device must not be used in explosion-hazardous areas.
- The device must not be used in forklift applications in low temperature conditions.
- Any other use that is not described as intended use is prohibited.
- Any use of accessories not specifically approved by SICK AG is at your own risk.

> **WARNING**
> **Danger due to improper use!**
>
> Any improper use can result in dangerous situations.
>
> Therefore, observe the following information:
>
> - Device should be used only in accordance with its intended use.
> - All information in these operating instructions must be strictly observed.

2.3 Internet protocol (IP) technology

> **NOTE**
> SICK uses standard IP technology in its products. The emphasis is placed on availability of products and services.
>
> SICK always assumes the following prerequisites:
>
> - The customer ensures the integrity and confidentiality of the data and rights affected by its own use of the aforementioned products.
> - In all cases, the customer implements the appropriate security measures, such as network separation, firewalls, virus protection, and patch management.

2.4 Limitation of liability

Relevant standards and regulations, the latest technological developments, and our many years of knowledge and experience have all been taken into account when compiling the data and information contained in these operating instructions. The manufacturer accepts no liability for damage caused by:

- Non-adherence to the product documentation (e.g., operating instructions)
- Incorrect use

- Use of untrained staff
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts, consumables, and accessories

With special variants, where optional extras have been ordered, or owing to the latest technical changes, the actual scope of delivery may vary from the features and illustrations shown here.

2.5 Modifications and conversions

> **!** **NOTICE**
> Modifications and conversions to the device may result in unforeseeable dangers.

Interrupting or modifying the device or SICK software will invalidate any warranty claims against SICK AG. This applies in particular to opening the housing, even as part of mounting and electrical installation.

2.6 Requirements for skilled persons and operating personnel

> ⚠ **WARNING**
> **Risk of injury due to insufficient training.**
> Improper handling of the device may result in considerable personal injury and material damage.
>
> - All work must only ever be carried out by the stipulated persons.

This product documentation refers to the following qualification requirements for the various activities associated with the device:

- **Instructed personnel** have been briefed by the operator about the tasks assigned to them and about potential dangers arising from improper action.
- **Skilled personnel** have the specialist training, skills, and experience, as well as knowledge of the relevant regulations, to be able to perform tasks delegated to them and to detect and avoid any potential dangers independently.
- **Electricians** have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions to be able to carry out work on electrical systems and to detect and avoid any potential dangers independently. In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g. Master Electrician). Other relevant regulations applicable in other countries must be observed.

The following qualifications are required for various activities:

Table 1: Activities and technical requirements

Activities	Qualification
Mounting, maintenance	■ Basic practical technical training ■ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	■ Practical electrical training ■ Knowledge of current electrical safety regulations ■ Knowledge of the operation and control of the devices in their particular application

Activities	Qualification
Commissioning, configuration	▪ Basic knowledge of the Windows™ operating system in use ▪ Basic knowledge of the design and setup of the described connections and interfaces ▪ Basic knowledge of data transmission ▪ Basic knowledge of bar code technology
Operation of the device for the particular application	▪ Knowledge of the operation and control of the devices in their particular application ▪ Knowledge of the software and hardware environment for the particular application

2.7 Hazard warnings and operational safety

To reduce health risks and to avoid dangerous situations, observe the safety notes and warnings set out in the following chapters of these operating instructions.

2.7.1 Laser radiation

The device works with a red light laser diode in the wavelength range between 655 nm (CLV63x-64x) and 658 nm (CLV65x).

⚠ **CAUTION**
Optical radiation: Laser class 2

The human eye is not at risk when briefly exposed to the radiation for up to 0.25 seconds. Exposure to the laser beam for longer periods of time may cause damage to the retina. The laser radiation is harmless to human skin.

- Do not look into the laser beam intentionally.

- Never point the laser beam at people's eyes.

- If it is not possible to avoid looking directly into the laser beam, e.g., during commissioning and maintenance work, suitable eye protection must be worn.

- Avoid laser beam reflections caused by reflective surfaces. Be particularly careful during mounting and alignment work.

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

- Current national regulations regarding laser protection must be observed.

It is not possible to entirely rule out temporary disorienting optical effects, particularly in conditions of dim lighting. Disorienting optical effects may come in the form of dazzle, flash blindness, afterimages, photosensitive epilepsy, or impairment of color vision, for example.

Laser class
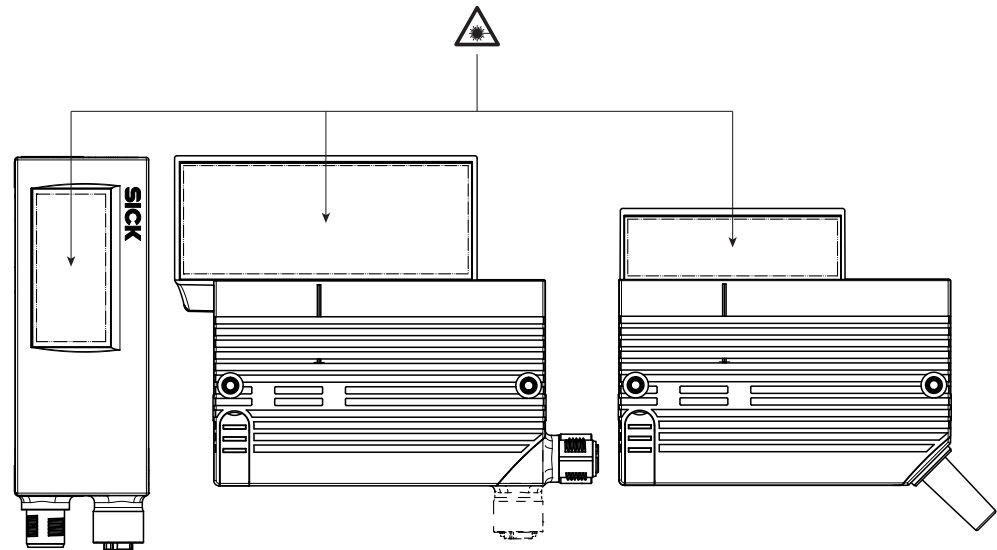
Figure 1: Laser output aperture of the different designs

The device complies with laser class 2. The entire reading window is a laser output aperture.

> **ⓘ NOTE**
> No maintenance is required to ensure compliance with Laser Class 2.

Warning symbol on the device

The colored laser warning label is fitted in combination with the type label on the rear of the device.

In addition to other information, the type label of the device in use also contains the laser output data. This consists of: Laser output power (maximum/average), wavelength or wavelength range, and pulse time duration. The data is located on the lower section of the type label, see "Type label", page 13.
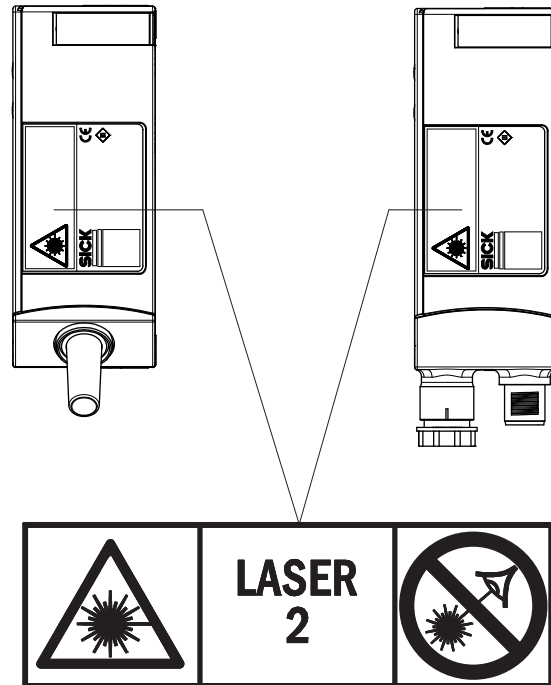
Figure 2: Example of a laser warning sign on the device

What the laser warning label means: Laser radiation – Never look into the light beam – Laser class 2

ℹ **NOTE**

Additional laser warning label

If the laser warning label applied to the device is concealed when the device is installed into a machine or paneling, the laser beam outlet opening must be suitably labeled. For this purpose, an additional warning label of the same type must be applied next to the outlet opening.

Controlling the laser diode

When operating properly, the device only switches the laser diode on if there is an object in the reading area, or if a reading is required (cyclic reading operation).

A laser timeout can switch off the laser diode automatically in this type of object trigger control if **the pulse has stopped for too long** (e.g. the conveyor system has stopped). In this case, the current internal reading interval of the device remains open.

Depending on the selected parameterization type, the laser timeout can be set as follows:

• Using the SOPAS ET configuration software, on the **Illumination Control** device page
• During GSD configuration with the "10_Object Trigger Ctrl" module (Profinet/Profibus)

In the default setting, laser timeout is deactivated.

The laser diode is permanently or repeatedly switched on in the following device statuses:

▪ In the "Percentage Evaluation" and "Auto Setup" operating modes (only used temporarily for configuration/diagnosis)
▪ In reading operation in the PSDI types "Auto pulse" (adjustable duty cycle) or "free."

If the timeout is activated, it will have no effect in this case.

2.8 Switching off the device

When switching off the device, at the most, the following data will be lost:

- Application-specific parameter sets that were only temporarily stored in the device
- Last reading result
- Daily operating hours counter

2.9 Protection of the environment

During construction of the device, attention was paid to achieving the smallest environmental impact possible. Apart from the housing, the device contains no materials using silicon.

2.10 Repairs

Repair work on the device may only be performed by qualified and authorized personnel from SICK AG. Interruptions or modifications to the device by the customer will invalidate any warranty claims against SICK AG.

3   Product description

3.1   Product ID

3.1.1   Type label

The type label gives information for identification of the device. An existing UL certification can be found on the type label.
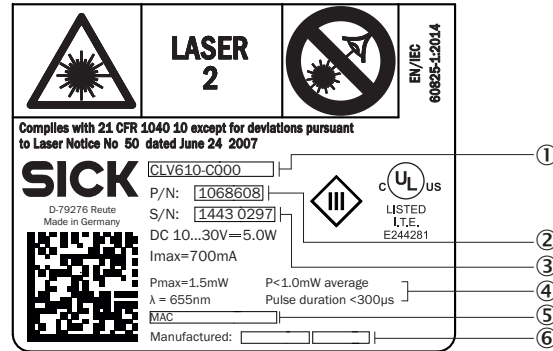
Figure 3: Type label design for the device, illustration may differ from actual type label

①   Type designation
②   Part number
③   Serial number
④   Laser output data
⑤   MAC address
⑥   Date of manufacture

3.1.2   Type code

The devices of the CLV63x, CLV64x, and CLV65x product families are arranged according to the following type code:

CLVxyz-abcde

CLV	x	y	z	-	a	b	c	d	e
1	2	3	4		5	6	7	8	9

Table 2: Type code

Position	Description	Characteristic
1	Code reader	V-principle
2 - 3	Product family	63: CLV63x 64: CLV64x 65: CLV65x

Position	Description	Characteristic
4	CLV63x: Working range CLV64x: Resolution CLV65x: Resolution	**CLV63x:** 0: Long range 1: Mid range 2: Short range **CLV64x:** 0: Standard density 2: High density **CLV65x:** 0: Standard density 1: Depth of field optimized for 0.5 mm
5	Scanning method, reading window orientation [1]	0: Line scanner, reading window on front 1: Raster scanner, reading window on front 2: Line scanner, reading window on side 3: Raster scanner, reading window on side 6: Line scanner with oscillating mirror, reading window on side
6	Electrical connections (design)	0: Cable 0.9 m with male connector, D-Sub-HD, 15-pin 1: Swivel connector, 12-pin (2 x M12 plug connector) 3: Cable 2 m with male connector, D-Sub-HD, 15-pin 8: Swivel connector, 17-pin (2 x M12 plug connector)
7	Interfaces	0: RS-232, RS422/485, CAN, digital IOs 2: Ethernet, RS-232, RS422/485, CAN, digital input 3: Ethernet, RS-232, RS422/485, CAN, digital IOs
8	Front screen material	0: Glass 1: Plastic
9	Application (environment)	Without label: Ambient temperature 0 °C ... +40 °C F0: With mounted external heating (Ambient temperature –35 °C ... + 35 °C) Without label: Protection class IP 65 S01: IP 69k in the special housing

[1] Refers to the longitudinal axis of the device.

ⓘ **NOTE**
Additional information on electrical connections and interfaces can be found in the Technical data chapter of this product documentation.

ⓘ **NOTE**
Not all combinations are possible according to the type code. The available device variants can be found online at:

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

3.2 Product characteristics

3.2.1 Device view

CLV63x, CLV64x, CLV65x
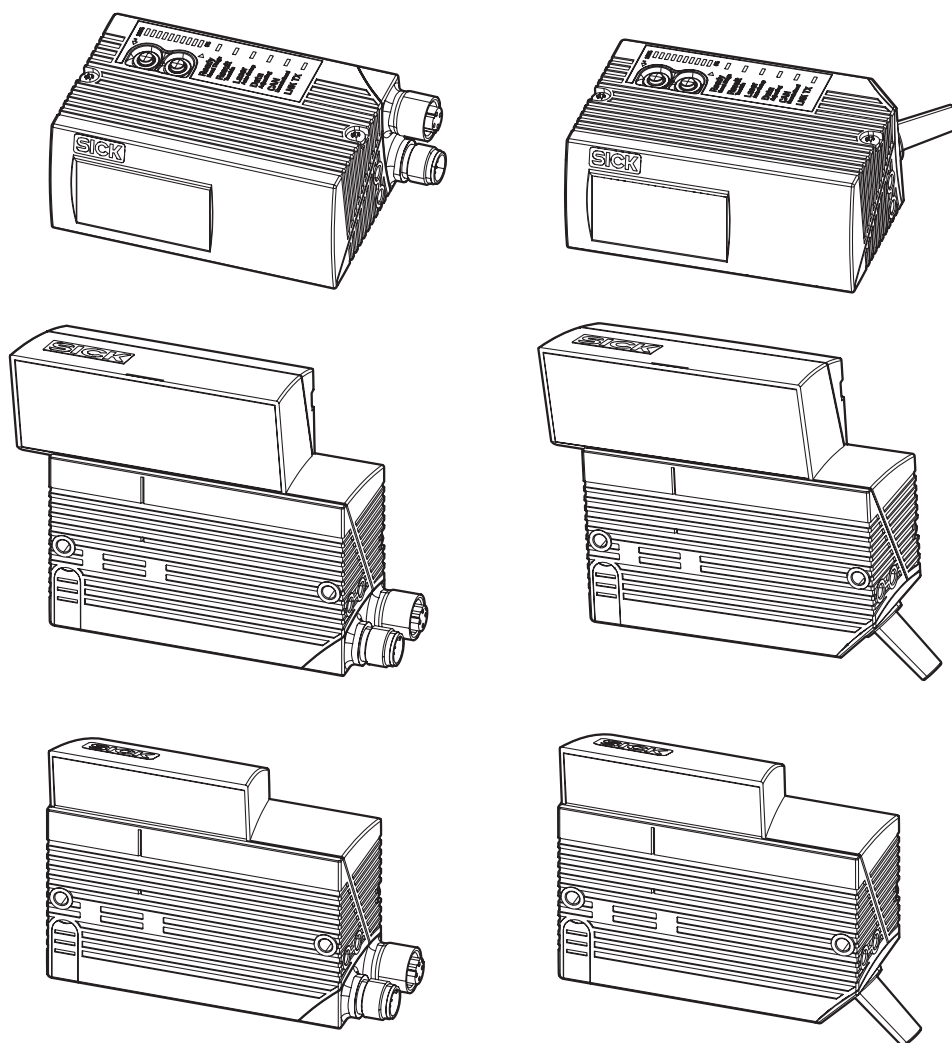
Figure 4: Device variants (from top to bottom) - reading window on front, oscillating mirror (reading window on side)
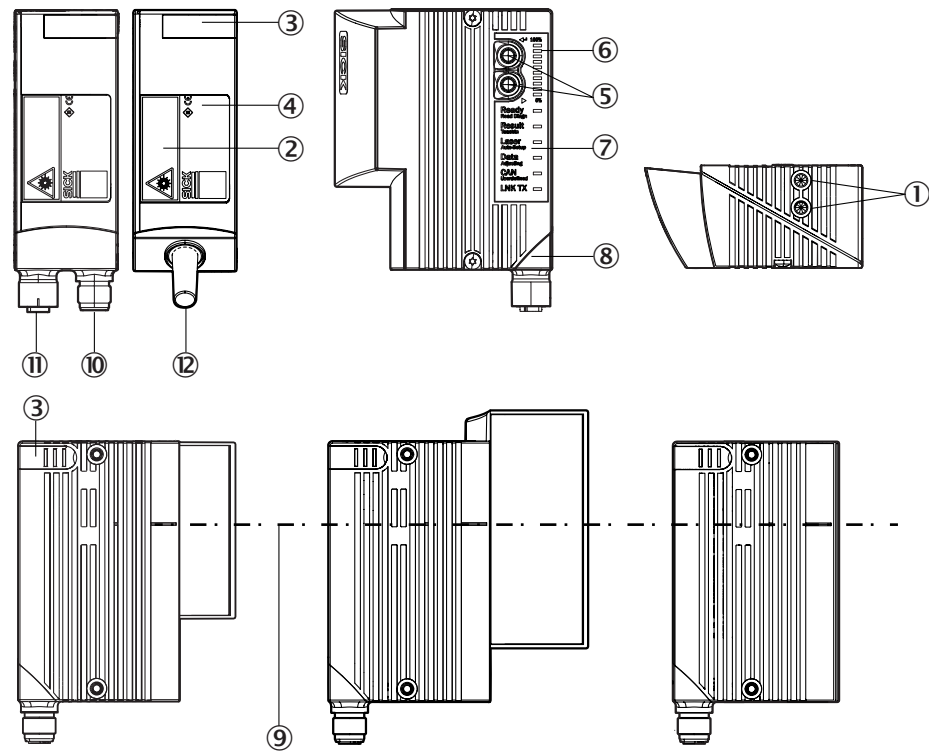
Figure 5: Device view of the CLV63x, CLV64x and CLV65x

①   Blind hole thread M5 (5 mm deep) for mounting (4x)

②   Laser warning label

③   Cover for micro SD card slot

④   Type label

⑤   Buttons for function selection/activation

⑥   Bar graph display

⑦   LEDs for indicating the status

⑧   Swivel connector

⑨   Central position of the deflected laser beam in the V-shaped aperture angle

⑩   Male connector, M12, 12-pin or 17-pin, A-coded

⑪   Female connector, M12, 4-pin, D-coded (Ethernet)

⑫   Cable with male connector, D-Sub-HD, 15-pin

3.2.2 Product features and functions (overview)

Table 3: Overview of product features and functions of the device

Product feature/func-tion	Characteristic
Safety and ease of use	- Rugged, compact metal housing, CE marking - Laser Class 2, laser switches off if the output power is exceeded - Automatic self-test on system start - Diagnostic tools for system setup and (remote) system monitoring - Configurable output of reading diagnostic data in two reading results formats - Operating data polling, in case of error, issue of error code if required - Test string function (heartbeat) can be activated to signal that the device is ready for operation - Password-protected configuration mode via SOPAS ET - Future-oriented by firmware update (FLASH PROM) via data inter-face - Future-oriented SOPAS ET configuration software - Low power consumption - Additional supply voltage range - Optional parameter cloning with external CMC600 parameter mem-ory module in the CDB/CDM connection module
Convenient operation/configuration	- Configuration via configuration software SOPAS ET (online/offline) or commands - Configuration depending on the model via GSD configuration (via CDF600-2xx or with Ethernet version device) - Status displays via LEDs - Auto setup of the optical reading properties - Profile programming with bar codes, generated and printed via SOPAS ET - Two pushbuttons on the device to call up preset functions without connecting a computer - Buzzer, which can be switched off, to confirm the device function
Read operation modes	- Start/stop operation (one bar code bearing object per read pulse) - Tracking operation (CLV65x-x8300A)
Read cycle	- Pulse sources for start: switching inputs, data interface (command), auto pulse, free, CAN - Pulse sources for stop: read pulse source, switching inputs, data interface (command), timer, condition
Bar code evaluation	- All current 1D bar code types - Max. number of bar codes: 50 per reading interval - Separation of identical codes of the same code type using the read angle
Data processing	- Influencing the output of the reading data by event-dependent eval-uation conditions - Influencing the output string by filtering and output sorting
Data communication	- Host interface: two data output formats can be configured, can be switched to various physical interfaces, parallel operation possible - Aux interface: fixed data output format, can be switched to various physical interfaces

3.2.3 Operating principle

The device consists of a laser scanner (laser diode and optics), an electronics unit with integrated decoder and various data interfaces (type-dependent) to industrial bus sys-tems. The use of various focusing settings, resolutions, scan processes, bus systems, mounting options and optics enables use in most industrial applications. Interfaces to

external timers, such as photoelectric sensors or incremental encoders, enable reading pulses independent of the control. The reading results are provided for further processing by the data interfaces.

In principle, the codes can be recorded on any side on still or moving objects in a conveyor system (single-side reading).

By combining several devices, it is possible to record several sides in one passage (multi-side reading).

To record the codes, the device generates a scan line (line scanner).

When designed as a raster scanner, the device generates eight scan lines which are offset parallel to each other.

Line scanner with oscillating mirror

The oscillating mirror also moves the scan line vertically to the scan direction from the resting position to both sides with a low oscillation frequency. This means that the device can also scan larger areas for bar codes.

ⓘ **NOTE**
When starting up the device, the oscillating mirror may cause increased volume development.

The length of the scan line which can be used for evaluation (reading field height) depends on the reading distance as a result of the V-shaped light emission.

The light pattern reflected from the bar code is recorded, processed, and decoded. External sensors deliver information about the read cycle and conveyor speed (increment) to control this process. The read results are output to the device data interfaces and forwarded to a host/PC.

Detailed wiring of the device and the connections to the host/PC and the external sensors are described in chapter Electrical installation.

ⓘ **NOTE**
The CDB620 connection module with additional circuit board (see "Connecting connection modules to devices with heating", page 48) or the CDM420 connection module with additional terminal (see "Connecting the supply voltage", page 51) is to be used for devices with heating.

Block diagrams
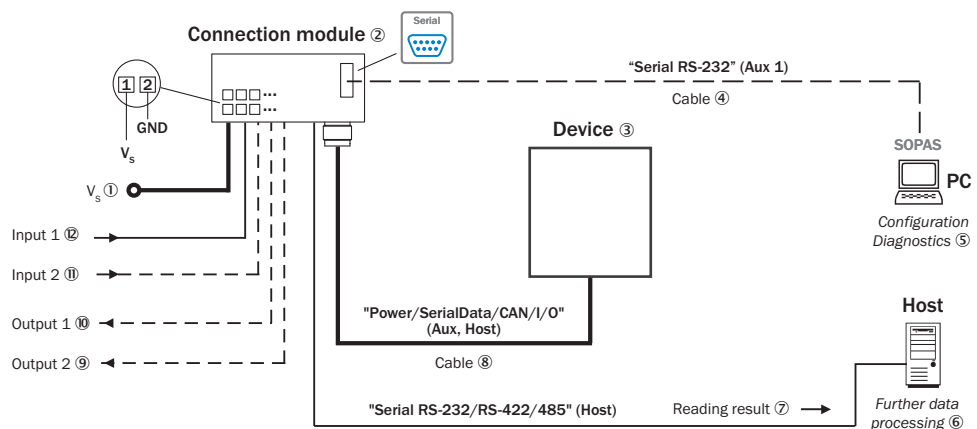
Figure 6: CLV63x to CLV65x facilities for connecting, serial variant

① Supply voltage V_S ($V_S = U_V$)

②   Connection module (optional, CDB620 here as example)

③   Device

④   Null modem cable (female connector, D-Sub, 9-pin/female connector, D-Sub, 9-pin), crossed TxD and RxD

⑤   Configuration or diagnostics

⑥   Data further processing

⑦   Read result

⑧   Serial variant: Device cable with male connector, D-Sub-HD, 15-pin

⑨   Digital switching output 2, e.g. for connecting an LED

⑩   Digital switching output 1, e.g. for connecting an LED

⑪   Digital switching input 2, e.g., for connecting an incremental encoder

⑫   Digital switching input 1, e.g., for connecting a read cycle sensor

Figure 7: CLV63x to CLV65x facilities for connecting, Ethernet variant, M12, 12-pin, A-coded

①   Supply voltage V_S ($V_S = U_V$)

②   Connection module (optional, CDB620 here as example)

③   Device

④   Null modem cable (female connector, D-Sub, 9-pin/female connector, D-Sub, 9-pin), crossed TxD and RxD

⑤   Alternative to Ethernet AUX port

⑥   Alternative to serial AUX

⑦   Configuration or diagnostics

⑧   Read result

⑨   Data further processing

⑩   Alternative to Ethernet host port

⑪   Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)

⑫   Adapter cable (female connector, M12, 12-pin, A-coded/male connector, D-Sub-HD, 15-pin)

⑬   Digital switching input 1, e.g., for connecting a read cycle sensor

Figure 8: CLV63x to CLV65x facilities for connecting (all without heating), Ethernet variant, M12, 17-pin, A-coded

①   Supply voltage V_S ($V_S = U_V$)

②   Connection module (optional, CDB650-204 required here)

③   Device

④   Null modem cable (female connector, D-Sub, 9-pin/female connector, D-Sub, 9-pin), crossed TxD and RxD

⑤   Alternative to Ethernet AUX port

⑥   Alternative to serial AUX

⑦   Configuration or diagnostics

⑧   Read result

⑨   Data further processing
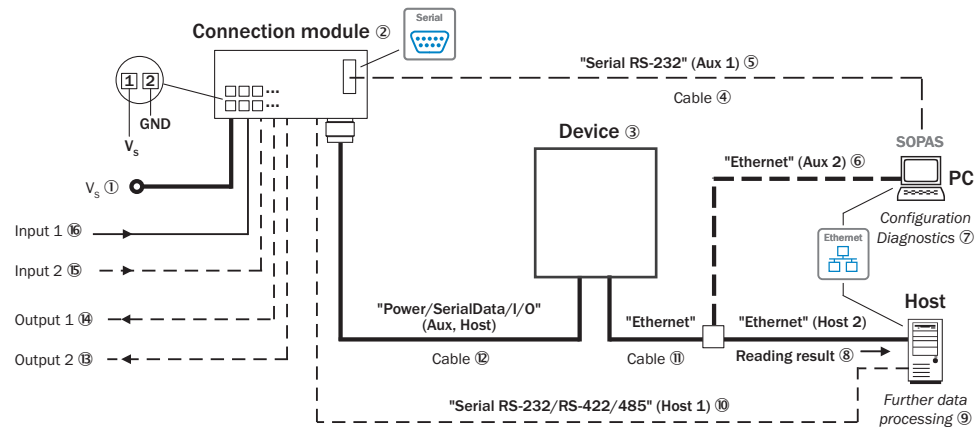
⑩   Alternative to Ethernet host port

⑪   Adapter cable (male connector, M12, 4-pin, D-coded/male connector, RJ-45, 8-pin)

⑫   Connection cable 1:1 (female connector, M12, 17-pin, A-coded/male connector, M12, 17-pin, A-coded)

⑬   Digital switching output 2, e.g. for connecting an LED

⑭   Digital switching output 1, e.g. for connecting an LED

⑮   Digital switching input 2, e.g., for connecting an incremental encoder

⑯   Digital switching input 1, e.g., for connecting a read cycle sensor

3.2.3.1 Object trigger control

The device needs a suitable external signal (trigger source) as notification of an object being in the reading field to start an object-related read process. As standard, the start signal is issued via an external read cycle sensor (e.g. photoelectric sensor). As soon as an object has passed the reading cycle sensor, a time window ("reading interval") is opened in the device for the reading process.

Alternatively, a command triggers the read process via a data interface or the SICK SENSOR network. In auto pulse mode, the device internally generates the reading gate itself with an adjustable clock ratio.

The read cycle can be terminated in various ways. In the event of external triggering, this is carried out via the read cycle source or a command, or internally via a timer or an evaluation condition that needs to be met.

> **ℹ NOTE**
> The SOPAS-ET configuration software can be used to configure the trigger source.

3.2.3.2   Auto focus function (for CLV65x only)

The auto focus function allows the device to conduct the distance detection for the object without help from external sensors and to set the focus position independently. In order to do this, the device measures the distance from the object in its field of vision, uses this to create a distance profile internally and positions the focus on the object.

The auto focus function works in the "Difference to background" mode. The device is taught the distance profile of the background of its vision area without an object. Then the device focuses on the object, which it detects by establishing the difference from the background. The application is carried out e.g. with free vision of the object with restriction from structures which permanently protrude into the read level. Only one object with bar code(s) is in the reading field for each read cycle.

The distance profile of the background that is created can be displayed in the SOPAS ET configuration software. The definition of the auto focus area is carried out by selecting the aperture angle, the auto focus area and for line scanners with oscillating mirror also by limiting the oscillation amplitude (the angle of deflection). It is possible to specify, among other things, the park position (preferred position) of the focus position, from which refocusing is carried out for each reading, for the device and a temporal and/or spatial delay time (timeout/hysteresis).

The focus position to be set via measurement can also have an additional offset applied if necessary. This means that the depth of field, which runs radially in the direction of the scan line and is caused by the V-principle of light beam deflection, can be optimized for the object.
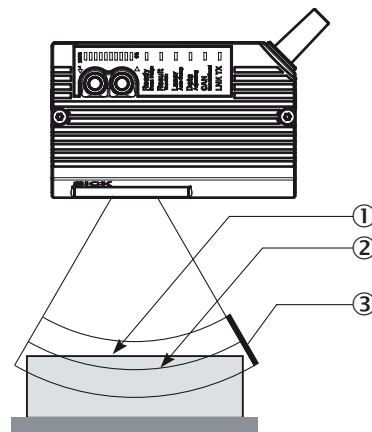

Figure 9: Distance measurement: optimization of the depth of field for the object

①   Measured distance

②   Optimized focus position: measured distance plus offset for maximum

③   Depth of field (DOF)

ℹ NOTE

The auto focus function can be configured with the SOPAS-ET configuration software: project tree, CLV6xx, parameters, read configuration, focus control, options tab, auto focus parameters

---

3.2.3.3   Switchable focus position

As an alternative to the auto focus function, the focus position can also be changed dynamically and therefore cover a big read area.

A maximum of eight read areas can be defined internally as distance configuration for this purpose and can be approached by the optics in any order in read mode.
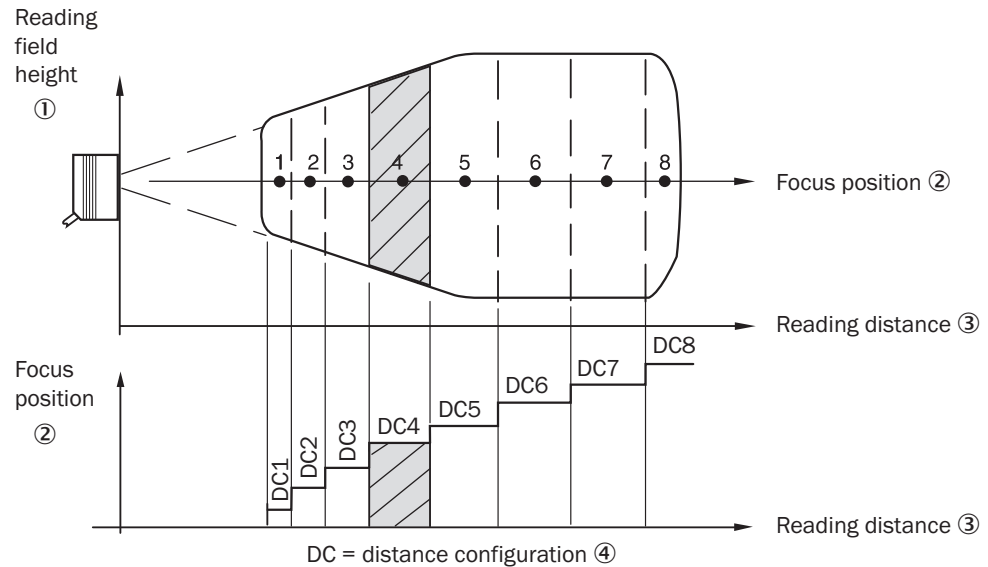
Figure 10: Focus switching - dividing the total read area into distance configurations

①   Reading field height

②   Focus position

③   Reading distance

④   Distance configuration

The switching of the focus is carried out by the changing object distance (e.g. during reading from the top: object height detection).

Trigger sources for switching are:

–   Signal at switching input e.g. "sensor 2" for the max. 2-stage switching
–   Command to the host interface or the integrated timer (e.g. for search run) for the max. 8-level switching
–   Oscillating mirror dead centers of the double-sided deflection for line scanner with oscillating mirror

The distance configurations are assigned to the switching order via a programmable assignment table.

> **ℹ NOTE**
> The SOPAS-ET configuration software can be used to configure the focus position:
>
> •   Project tree, CLV6xx, parameters, read configuration
> •   Project tree, CLV6xx, parameters, read configuration, oscillating mirror
> •   Project tree, CLV6xx, parameters, read configuration, focus control

3.2.3.4   Oscillating mirror control

In the case of a line scanner with oscillating mirror, the position of the scan line is influenced by the configuration of the oscillating mirror.

In addition to the "Park" (fixed, adjustable position of the scan line) or the continuous oscillation (irrespective of the read cycle), optimized function processes related to the read cycle are also possible in the controlled operation of oscillating mirror:

–   N times vibrations at an adjustable start position within the read cycle
–   One-Shot: single deflection (approach and return) per read cycle from an adjustable start position

In each oscillation mode, the deflection width can be set (amplitude) independently for each of the deflection directions. Within the selected cycle duration of the entire vibration process, the deflection speeds can be set in relation to each other for both deflection directions.
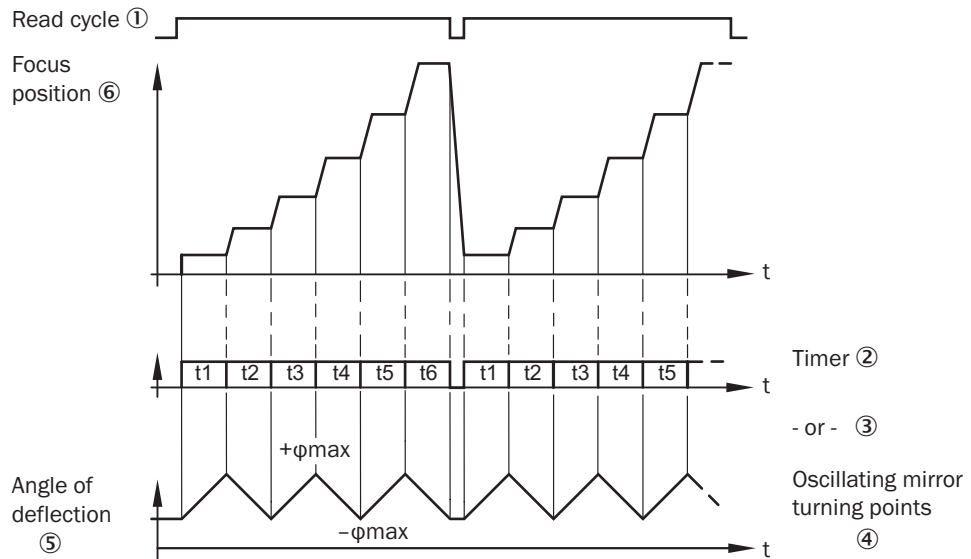

Figure 11: Oscillating mirror - example for focus position control during the search run, here with 6 focus positions

①   Read cycle
②   Timer
③   - or -
④   Oscillating mirror dead centers
⑤   Angle of deflection
⑥   Focus position

> **NOTE**
> The SOPAS-ET configuration software can be used to configure the vibration behavior and the position of the oscillating mirror.

3.2.3.5 Reading operation mode

In "start/stop" operation, there is only ever one object in the reading field during the reading process, i.e., all read codes can be clearly assigned to the object. As standard, starting and stopping of the reading process are controlled by one or two read cycle sensor(s) at the start and end of the reading field.

In this case, the distance between the read cycle sensors determines the size of the reading field. The reading process can alternatively be controlled with command strings via the data interface.

The output of the read results is either carried out at the end of the read cycle (the rear edge of the object has left the end of the reading field) or even during the read cycle if certain configurable conditions are met.
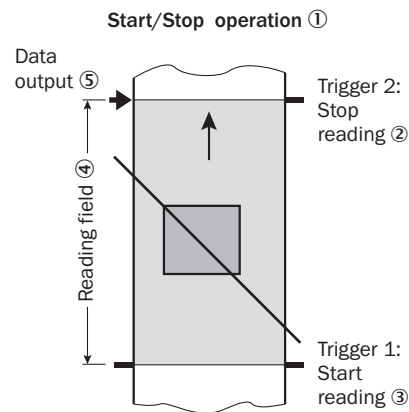
Figure 12: Start/stop operating mode of the device in stand-alone operation

① Start/stop operation
② Trigger 2: Stop reading
③ Trigger 1: Start reading
④ Reading field
⑤ Data output

NOTE
The SOPAS ET configuration software can be used to configure the reading operation mode.
Alternatively, configuration can be done via GSD file (Ethernet version/PROFINET).

3.2.3.6 Tracking operation (only CLV65x-x8300A)
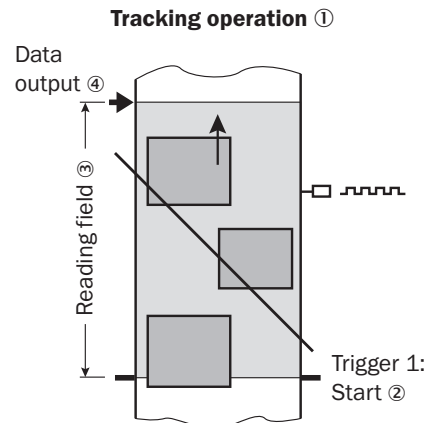
Figure 13: Tracking operating mode of the device in stand-alone operation

① Tracking operation
② Trigger 1: Start reading
③ Reading field
④ Data output

In the internal tracking operation, there are a maximum of 10 objects behind each other in the reading field at the same time during the reading process.

As standard, the start of the reading process is controlled by a read cycle sensor at the start of the reading field. The specification of the object release point defines the end. This also defines the size of the resulting reading field.

In order to be able to track the transport of the objects in the reading field, a regular cycle is required. This is generated by an external incremental encoder, which constantly provides at least one pulse per 1 mm movement in the conveyor direction. This provides a clear temporal representation in the device of the route between the read cycle sensor and object release point.

Jittering when the conveyor technology is starting up or in the event of slowing down when there is a high load with lots of objects to convey is therefore also recorded. An internal pulse generator in the device alternatively allows for operation at a conveyor speed that is always constant.

A gap of at least 50 mm is necessary for clear separation of successive objects.

The issuing of the read result for an object is carried out after the rear edge of the object passes the object release point. The reading process can alternatively be started with a command string via the data interface.

4   Transport and storage

4.1   Transport

For your own safety, please read and observe the following notes:

> **!** **NOTICE**
> **Damage to the product due to improper transport.**
> - The device must be packaged for transport with protection against shock and damp.
> - Recommendation: Use the original packaging as it provides the best protection.
> - Transport should be performed by trained specialist staff only.
> - The utmost care and attention is required at all times during unloading and transportation on company premises.
> - Note the symbols on the packaging.
> - Do not remove packaging until immediately before you start mounting.

4.2   Transport inspection

Immediately upon receipt in Goods-in, check the delivery for completeness and for any damage that may have occurred in transit. In the case of transit damage that is visible externally, proceed as follows:

- Do not accept the delivery or only do so conditionally.
- Note the scope of damage on the transport documents or on the transport company's delivery note.
- File a complaint.

> **i** **NOTE**
> Complaints regarding defects should be filed as soon as these are detected. Damage claims are only valid before the applicable complaint deadlines.

4.3   Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Electrical connections are provided with protective caps and plugs (as they are on delivery).
- Do not store outdoors.
- Store in a dry area that is protected from dust.
- So that any residual damp can evaporate, do not package in airtight containers.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: see "Technical data", page 70.
- Relative humidity: see "Technical data", page 70.
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

5 Mounting

5.1 Overview of mounting procedure

- Selecting and preparing the mounting location.
- Mounting the device.
- Align device towards object with bar code.
- Connect device to data cable and supply cable.
- Adjust the device.

> ⚠️ **WARNING**
> **Risk of injury due to damage to the device**
>
> For reasons of safety, a device which is visibly damaged must not be operated or must be immediately taken out of operation. Damage includes, for example:
>
> - Housing: Cracked or broken
> - Reading window lens: Cracked or broken
> - Device with connector: Over-rotation of the connector, cracks, or being torn from the housing
> - Device with fixed cable: Damage to the cable outlet or cable itself

5.2 Scope of delivery

The delivery of the device includes the following components:

Table 4: CLV63x–CLV65x: scope of delivery

No. of units	Component	Notes
1	Device in the version ordered	Without bracket. **IP65 standard housing:** **Ethernet variant:** • M12 female connector sealed with tightly screwed on protective plugs • Without connecting cables. **IP69K protective housing:** Both M12 connections sealed with tightly screwed on protective plug or cap. Without connecting cables.
1	Multilingual safety notes in a printed document	Informs about the requirements for safe use of the product.

The delivery of the device in the IP69K protective housing includes the following additional components:

Table 5: CLV63x–CLV65x IP69K: additional scope of delivery

No. of units	Component	Notes
1	Protective double bushing for the two electrical connections in the terminal compartment	Seals the connections and the two cable outlets to the outside. Use of both bushings or only one bushing with dummy plug for the free bushing. Protective double bushing equipped with: • Recessed flat seal on the side to the protective housing • One internal groove in each case at the end of the bushings (cable outlet) to accommodate an O-ring for sealing • 2 captive mounting screws for securing on the protective housing
1	O-ring Inside diameter x cord thickness: 11.0 mm x 4.0 mm	Seals the plug connector for the "Ethernet" connection towards the protective double bushing. One O-ring serves as a spare part.
1	O-ring Inside diameter x cord thickness: 13.5 mm x 3.0 mm	Seals the plug connector for the "Power/Serial Data/CAN/I/O" connection towards the protective double bushing. One O-ring serves as a spare part.
1	Dummy plug	Seals the free entry on the protective double bushing when the "Ethernet" connection is not in use. Matching O-ring: 11.0 mm x 4.0 mm.

Associated components not contained in the delivery:

Table 6: CLV63x–CLV65x: scope of delivery, other components

Component	Notes
SOPAS ET configuration software and device description file (*.sdd file for SOPAS ET) for the CLV63x, CLV64x or CLV65x.	Available online at: • www.sick.com/SOPAS_ET
Combined CLV63x–CLV65x operating instructions as PDF in English, German and French. Other languages also available online where applicable.	Available online at: • www.sick.com/CLV63x • www.sick.com/CLV64x • www.sick.com/CLV63x
Function blocks for selected controls.	
Dimensional drawings and reading field diagrams.	

5.3 Preparation for mounting

5.3.1 Mounting requirements

Space requirements

- Typical space requirement for device, see type-specific dimensional drawing and reading field diagram.
- The device requires a direct, unimpeded line of sight to the codes being read.
- The path between the read barcode and the device's reading window for the light reflected from the bar code must be dimensioned sufficiently, i.e. there must be a corridor with at least the same height as the reading window along the entire light path.

Environmental influences

- Comply with technical data, such as the permitted ambient conditions for operation of the device (e.g., temperature range, EMC interference emissions, ground potential), see "Technical data", page 70.
- To prevent the formation of condensation, avoid exposing the device to rapid changes in temperature.
- Protect the device from direct sunlight. The prevents additional external heating and potential optical dazzle of the device.

Mounting

- The device must only be mounted using the pairs of blind tapped holes provided for this purpose.
- Mount the device in a shock and vibration insulated manner.

Equipment required

- Mounting device (bracket) with sufficient load-bearing capacity and suitable dimensions for the device.
- 2 x M5 screws – the maximum screw-in depth in the device is 5 mm from the housing surface

> **NOTE**
> The screws are for mounting the device on mounting equipment (bracket) supplied by the user. Screw length is dependent on the mounting base (wall thickness of the bracket). When using an optional SICK bracket, the screws for mounting the device are included in the scope of delivery for the bracket.

- Tool and tape measure

5.3.2 Mounting device

The device is mounted on the bracket using at least two M5 blind hole threads that are in pairs on both of the narrow sides of the device, see "Dimensional drawings", page 99.

The device can be installed using optional SICK brackets or customer-specific brackets.

SICK offers prefabricated brackets which are optimally suited for the mounting of the device in a wide range of applications. See:

Example: The design of the bracket with adapter plate supports many different installation variants, for example, as well as the alignment of the device in two axes.
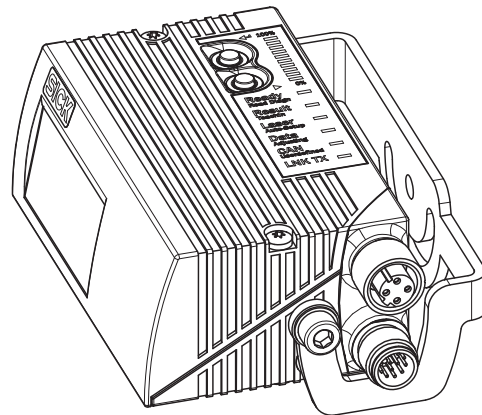

Figure 14: Example mounting of a device with bow-shaped mounting bracket (SICK accessories, illustration of the device can differ)

Devices with heating

> **NOTE**
>
> In devices with heating, use special mounting brackets for thermal decoupling. Suitable mounting brackets are available as accessories (part numbers: 2050705, 2058082). Three plastic insulation panes are to be used across from the bracket for heat insulation. These panes are included with the mounting brackets for thermal decoupling.
>
> Corresponding mounting brackets can be found in the product catalog, for example, under:
>
> • www.sick.com/CLV63x
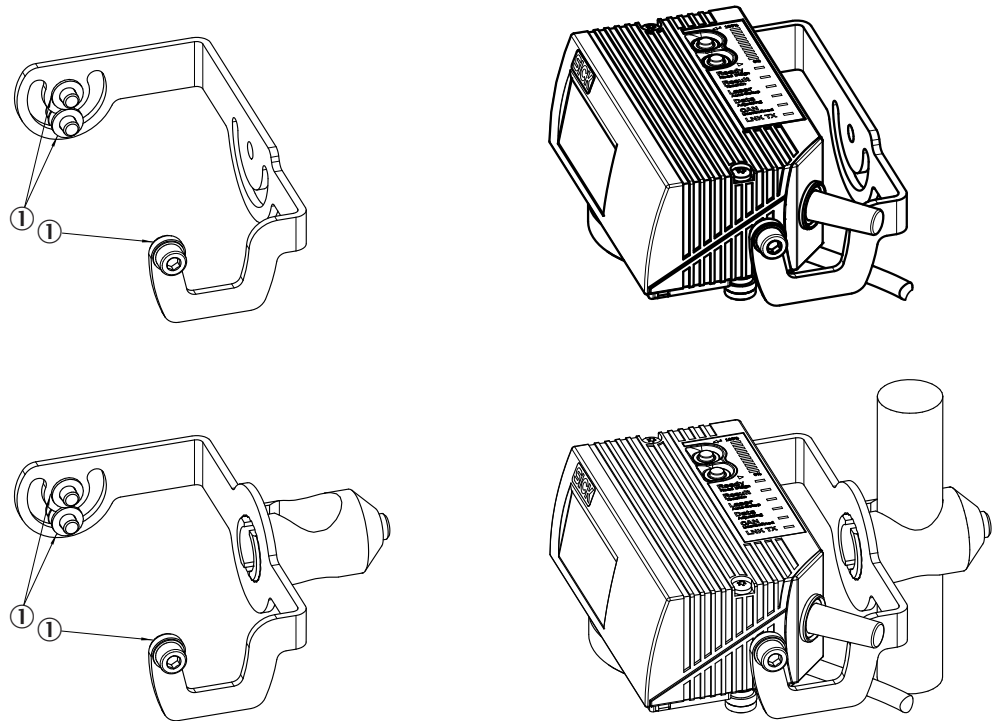> • www.sick.com/CLV64x
> • www.sick.com/CLV65x

Figure 15: Example mountings of a device with external heating using bow-shaped mounting brackets (SICK accessories). Illustration of the device may differ.

①   Plastic insulation panes

User-supplied brackets

The brackets should meet the following requirements:

- Stable mounting device
    - Alignment of the device in the x and y axes can be adjusted.
    - The mounting device must be able to bear the weight of the device and connecting cables without shock.
- Two or three M5 screws for mounting the device
- Three plastic insulation panes are to be used across from the bracket for heat insulation in devices with heating.
    - The screw length depends on the wall thickness of the mounting device.
    - The maximum screw in depth in the device is 5 mm from the housing surface.

5.4   Mounting location

When selecting the mounting location, the following factors are significant:

- Basic allocation of the scan line to the bar code
- Reading distance to the bar code and aperture angle α (see figure 16, page 31).
- Angle alignment of the device
- Avoidance of surface reflections
- Count direction of the reading angle (position of the bar code along the scan line)

5.4.1   Basic allocation of the scan line to the bar code

The basic allocation of the scan line to the bar code on the object depends on the version of the device (line scanner on the front or to the side, grid scanner or line scanner with oscillating mirror).
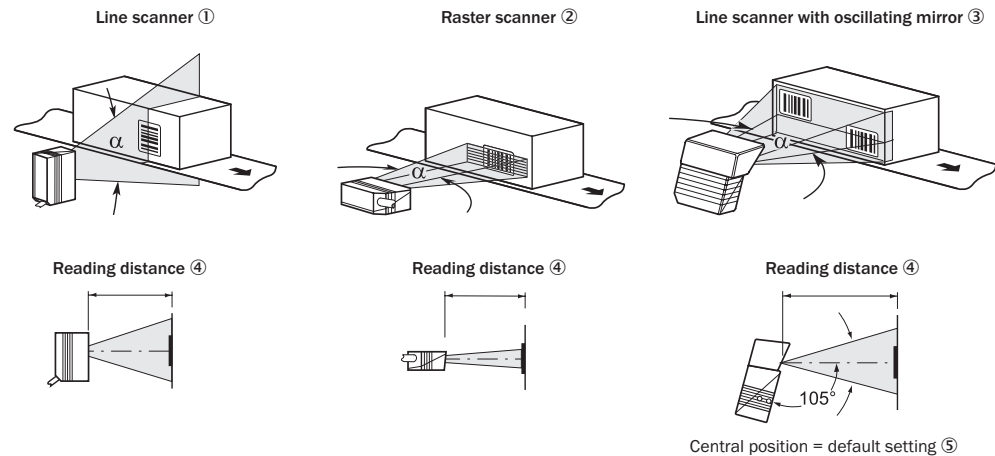

Figure 16: Allocation of scanning line(s) to bar code and conveyor direction

①   Line scanner
②   Grid scanner
③   Line scanner with oscillating mirror
④   Reading distance
⑤   Middle position = default

5.4.2   Reading distance to the bar code and aperture angle α

The maximum distance from the reading window of the device to the bar code may not exceed the design values for the device. Because of the V-shaped deflection of the beams, the usable length of the scan line for evaluation (reading field height) depends on the reading distance.

In the specification diagrams, the height of the reading field dependent on the reading distance is shown for differing resolutions (module widths), "Technical data", page 70.

5.4.3   Angle alignment of the device

The optimum alignment of the device is achieved when the scan line crosses the stripes of the bar code as close to a right angle as possible (tilt and inclination). Possible reading angles that can arise between scan line and bar code at all three levels in the area must be taken into account.

In order to prevent surface reflections, the angle of rotation must be approx. 15° out of plumb to the bar code, see "Avoidance of surface reflections", page 32.
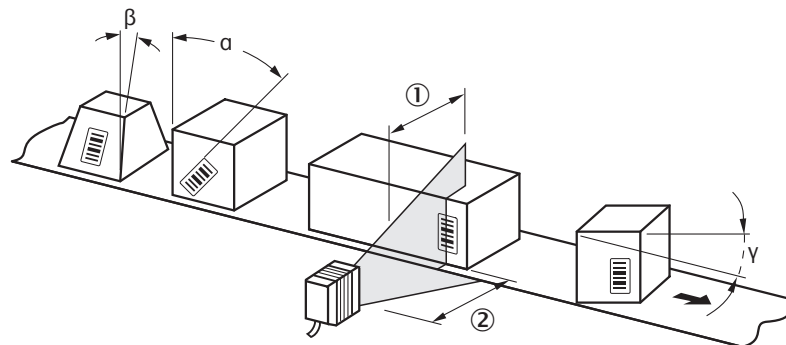
Figure 17: Line scanner: Read angle occurring between scanning line and bar code

① Depth of field

② Reading distance

> **NOTE**
>
> The specified maximum values can only be reached in optimum conditions. The actual maximum depends on module width, code type, print contrast, ambient light, distance and scanning frequency.

Table 7: Permitted read angle between scanning line and bar code

Angle	Limit Value	
Tilt α	CLV63x, CLV64x: max. 30°	CLV65x: max. 45°
Pitch β	Max. 45°	
Skew γ	Max. 45°	

5.4.4 Avoidance of surface reflections

If the light of the scan line(s) hits the surface of the bar code precisely vertically, this may cause interference when the light reflected back is received. To prevent this effect, the device must be mounted so that the light emitted is tilted relative to the vertical.

> **NOTE**
>
> Optimum results are achieved when the scan line tilts approx. 15° from the vertical.
>
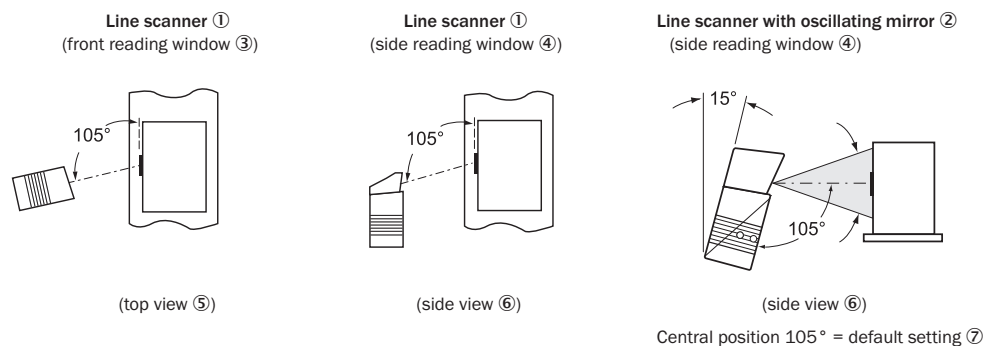> In devices with an oscillating mirror, these values relate to the central position of the scan field.

Figure 18: Avoiding surface reflections: Angle between light emitted and bar code (tilting away from vertical)

① Line scanner

② Line scanner with oscillating mirror

③ Reading window on front

④   Reading window on side

⑤   Supervision

⑥   Side view

⑦   Middle position 105° = default

5.4.5   Count direction of the reading angle and the code angle

The device can scan and decode several bar codes at each reading.

At the same time, the location-specific reading diagnostics data are determined for each of them.

- The reading angle, starting from the reading window, at which the device detects the bar code center on the red scanning line of the deflected scanning beam can be outputted as an RA (reading angle) value.
- In addition, in the device with oscillating mirror, the angle of deflection of the scan line under which the device detects the bar code on the red scan line can be released as the CA (code angle) value.

By determining the RA/CW value, identical bar codes (code type, code length, and data content) can be separated, and the bar code data can be assigned based on its position on the object.

Line or raster scanner ①   Line or raster scanner ①   Line scanner with oscillating mirror ②
(front reading window ③)   (side reading window ④)   (side reading window ④)
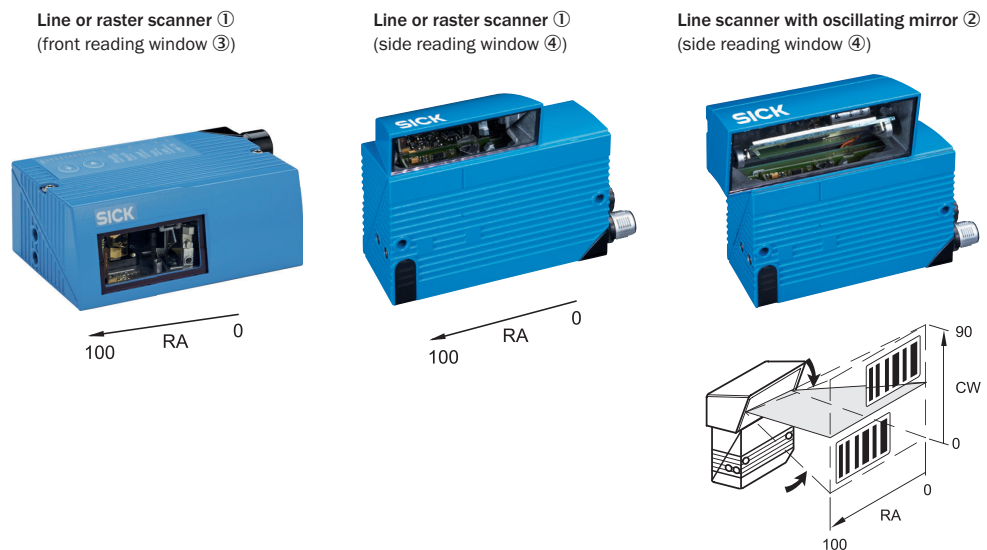
Figure 19: Counting direction of the reading angle RA in the scanning line and of the angle of deflection CW of the scanning line

①   Line or grid scanner

②   Line scanner with oscillating mirror

③   Reading window on front

④   Reading window on side

Resolution of the reading diagnostic data:

- Reading angle α (aperture angle) in scanning direction: 1° = 2 RA (50° = 100 RA)
- Angle of deflection of scanning line across scanning direction: 1° = 2 CW (20° = 40 CW)

5.5 Mounting the device

> **!** **NOTICE**
>
> **In devices with heating:**
>
> The device must not be exposed to strong air flows (e.g. from air circulation) since the required heat can otherwise not be output. If necessary, take appropriate measures to shield the device from air flows.
>
> If the device is used outside, we recommend installing it into an additional protective housing. This prevents contamination of the reading window by rain, snow or dust. The housing also protects from wind.

> **!** **NOTICE**
>
> **In devices with heating:**
>
> At an ambient temperature under 0 °C, the connecting cables, the (type-dependent) swivel connector on the device and the configuration switch on the optional connection module must not be moved.

> **!** **NOTICE**
>
> **Risk of damaging the device!**
>
> Observe the maximum screw-in depth of the blind hole thread. Longer screws than specified damage the device.
>
> ▶ Use screws of suitable length.

1. Prepare the base for mounting the bracket of the device, see "Preparation for mounting", page 28.
2. Place the object with the bar code in the view of the device in the position where the reading is to take place (conveyor static).
3. Align device with the bar code by eye. When doing so, be aware of the following:
   - For a device with the reading window at the front, ensure that the rear side with the laser warning label points in the direction of the observer and is aligned as near as possible to being parallel to the bar code surface.
   - For a device with the reading window at the side, ensure that the side panel with the LEDs points in the direction of the observer and is aligned almost parallel to the bar code surface.
   - In a device with oscillating mirror, the wide side panel (rear of the oscillating mirror) is almost parallel to the bar code surface.
   - During reading, note the reading angle that occurs see "Angle alignment of the device", page 31.
   - If the position of the bar code within the scanning line is relevant for the evaluation, bear in mind the count direction of the code position see "Count direction of the reading angle and the code angle", page 33.
4. Mount the device bracket onto the base.
5. Screw screws through the bracket into the blind hole threads of the device and slightly tighten.
6. Configure the device, see "Adjust the device", page 57.

5.6 Mounting with shock mounts (optional)

In application areas with severe vibrations or shocks caused by vibrations, jolts or abrupt changes in directions (e.g. when mounted to a manned forklift truck), mounting with shock mounts is to be carried out. Suitable shock mounts are available as accessories.

Corresponding mounting brackets with integrated vibration/shock damping can be found in the product catalog, for example, under:

▶ www.sick.com/CLV63x
▶ www.sick.com/CLV64x
▶ www.sick.com/CLV65x

! **NOTICE**

Equipment damage due to unsuitable device variants!

Mounting with shock mounts is not suitable for the device variant with oscillating mirror.

• Mounting bracket with integrated vibration/shock absorption only for device variants with front reading window.

Figure 20: Device with mounting bracket (top bracket)
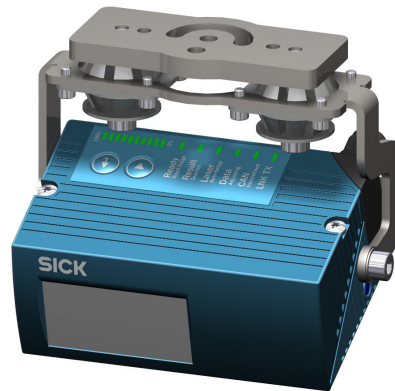

Figure 21: Device with mounting bracket (bottom bracket)

Permissible installation variants

The following installation variants can be selected:

1. Mounting line scanner (horizontal reading line), mounting bracket with integrated vibration/shock absorption for suspended horizontal mounting above the device.
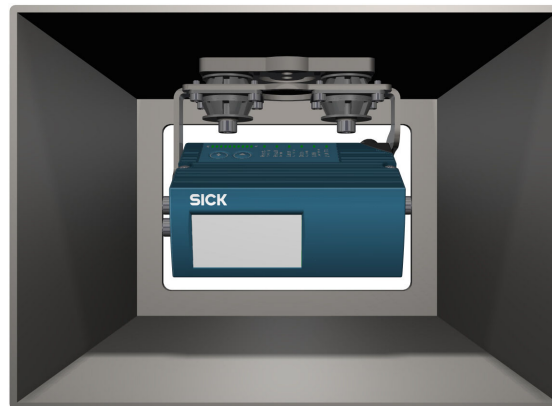

Figure 22: Mounting with top mounting bracket

2. Mounting line scanner (horizontal reading line), mounting bracket with integrated vibration/shock absorption for standing horizontal mounting under the device.
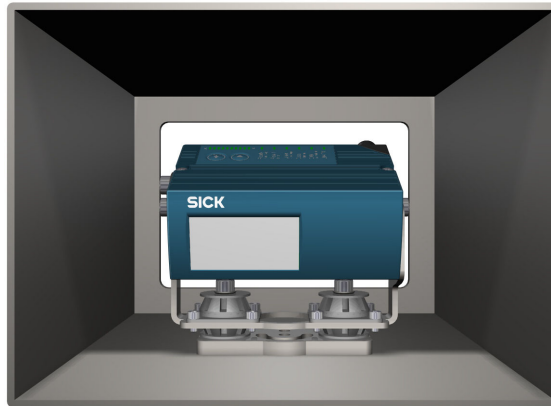

Figure 23: Mounting with bottom mounting bracket

Mounting the device

> ⚠ **NOTICE**
> **Damage to device through improper mounting!**
> In order to avoid damage during the mounting and subsequent operation of the device, you must following the following points:
>
> ▶ Mount the shock mount horizontally above or below the device.
> ▶ Only use the screws provided.
> ▶ Take into account the minimum 25 mm duty stroke in all axis directions of the device (see figure 24, page 36). This applies in particular to the installation.
> ▶ Dimension the length of the leads according to the duty stroke to ensure strain relief.
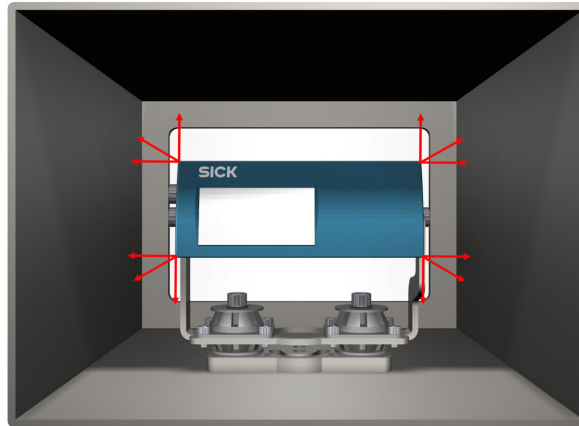
Figure 24: Mounting with mounting bracket – Taking into account the duty stroke

When mounting a bracket with shock mount, ensure that the holding plate/mounting bracket is screwed directly to the device and the attenuation is attached as closely as possible to the device. The shock mount must always be mounted horizontally above or below the device to achieve optimal vibration attenuation.

Mount the device to the bracket with shock mounts with the help of a minimum of two M5 blind tapped holes. The blind tapped holes are located in pairs on both of the narrow sides of the device, see "Dimensional drawings", page 99.

Mounting the device is the same as mounting using mounting brackets, see "Mounting device", page 29.

! **NOTICE**

To prevent damage occurring during subsequent operation of the device, please observe the following:

- The ground traveled upon is in good condition (e.g. free from major unevenness and potholes).
- If the shock mount is mounted by the customer, we recommend wetting the assembly screws with thread-locking fluid to prevent them from loosening. LOCITITE 268 is recommended.
- Appropriate driving behavior when lowering the forks in forklift applications (e.g. not driving with forks lowered, gentle lifting of the load).
- We recommend using a soft-drop system.

! **NOTICE**

Device damage due to lack of maintenance!

Mounting brackets with integrated vibration/shock absorption are subject to wear and tear under heavier loads and therefore must be periodically checked and serviced. The exchange intervals depend on the vibrations and shock effects (application specific).

5.7 Mounting external components

5.7.1 Mounting the connection module

If the device activation is carried out via a connection module, then this must be mounted near to the device.

ⓘ **NOTE**

If the PC with the SOPAS ET configuration software accesses the Aux interface (RS-232; 57.6 kBd) of the device via the connection module, the connection module should not be mounted more than 3 m of cable length away from the device.

1. Mount the connection module in the vicinity of the device.
2. Mount the connection module in such a way that the open module can be accessed at all times.

ⓘ **NOTE**

Detailed information on mounting and electrical installation can be found in the relevant operating instructions for the connection module.

5.7.2 Mount external read cycle sensor

If the device is triggered via an external read cycle sensor (photoelectric retro-reflective sensor), then the sensor must be mounted in the vicinity of the device.

ⓘ **NOTE**

A wide range of photoelectric sensors as well as accessories (brackets, connecting cables) can be found at www.sick.com.
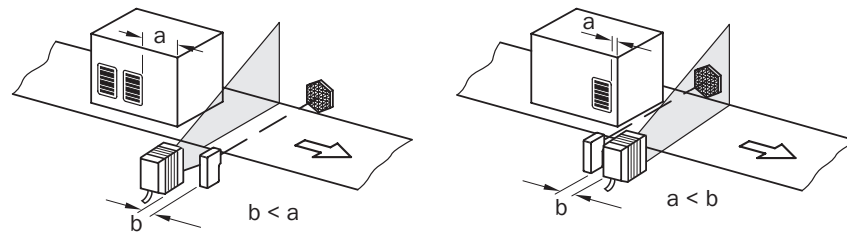
Figure 25: Bar code at the end or start of the piece goods

The mounting location of the device is dependent on the distance a from the bar code to the front object edge. Depending on the application, the device must be mounted so that bar codes on objects of different sizes can be read in full during the time window for evaluation (reading interval).

5.7.3 Mounting incremental encoder

An incremental encoder is required for the tracking function (CLV65x-x8300A).

The incremental pulses must originate from the area of the conveying line on which the device is reading.

1. Mount the suitable incremental encoder in the vicinity of the device.
   Ideally, the incremental encoder is mounted in front of the device and against the running direction of the conveying line.
2. Create direct and secure contact with the drive technology and ensure that friction wheel turns without slipping.

6 Electrical installation

6.1 Safety

6.1.1 Notes on the electrical installation

- **The electrical installation must only be performed by electrically qualified personnel.**
- **Standard safety requirements must be met when working on electrical systems.**
- Only switch on the supply voltage for the device when the connection tasks have been completed and the wiring has been thoroughly checked.
- When using extension cables with open ends, ensure that bare wire ends do not come into contact with each other (risk of short-circuit when supply voltage is switched on!). Wires must be appropriately insulated from each other.
- Wire cross-sections in the supply cable from the customer's power system must be selected in accordance with the applicable standards. When this is being done in Germany, observe the following standards: DIN VDE 0100 (Part 430) and DIN VDE 0298 (Part 4) and/or DIN VDE 0891 (Part 1).
- Circuits connected to the device must be designed as SELV circuits (SELV = Safety Extra Low Voltage).
- Protect the device with a separate fuse (type-specific max. 2 A (unheated) or 3 A (heated)) at the start of the supply circuit.

(i) NOTE
Layout of data cables

- Use screened data cables with twisted-pair wires.
- Implement the screening design correctly and completely.
- To avoid interference, e.g. from switching power supplies, motors, clocked drives, and contactors, always use cables and layouts that are suitable for EMC.
- Do not lay cables over long distances in parallel with power supply cables and motor cables in cable channels.

The specified IP enclosure rating for the device is only achieved under the following conditions:

- The cables plugged into the connections are screwed tight.
- Any electrical M12 connections that are not being used must be fitted with tightly-fastened protective caps or plugs (as in the delivery condition), depending on the type.
- Any other possible coverings must be closed and lie flush on the device.

In the event of non-compliance, the IP enclosure rating will not apply for the device.

Additional information on devices with heating

When using heated devices, you must also keep in mind the following points:

- Use cables suitable for the environmental conditions. In case of doubt, consult SICK Service.
- Restricted supply voltage range: 24 V DC ± 10%
- Connection work only within the temperature range 0 °C ... +40 °C
- Only operate in idle state (no mounting or connection work).

6.1.2   Note on the swivel connector

(i) NOTE

The swivel connector is type-dependent. It is not available in all device models.

(!) NOTICE

Damage to the connector unit from over-tightening!

The connector unit on the device has two opposite end positions.

- Do not rotate the connector unit from either of the two end positions by more than 180°.
- Always rotate the connector unit in the direction of the display LEDs.

Figure 26: Swivel connector unit, rotation direction from end position to end position

6.2   Prerequisites for safe operation of the device

⚠ WARNING

Risk of injury and damage caused by electrical current!

As a result of equipotential bonding currents between the device and other grounded devices in the system, faulty grounding of the device can give rise to the following dangers and faults:

- Metal housings are vulnerable to dangerous currents.
- Devices will behave incorrectly or be destroyed.
- Cable shielding will be damaged by overheating and cause cable fires.

Remedial measures

- Only skilled electricians should be permitted to carry out work on the electrical system.
- If the cable insulation is damaged, disconnect the voltage supply immediately and have the damage repaired.
- Ensure that the ground potential is the same at all grounding points.
- Where local conditions do not meet the requirements for a safe earthing method, take appropriate measures (e.g., ensuring low-impedance and current-carrying equipotential bonding).

The device is connected to the peripheral devices (voltage supply, any local trigger sensor(s), system controller) via shielded cables. The cable shield – for the data cable, for example – rests against the metal housing of the device. The device can be grounded through the cable shield or through a blind tapped hole in the housing, for example.

If the peripheral devices have metal housings and the cable shields are also in contact with their housings, it is assumed that all devices involved in the installation have the **same ground potential.**

This is achieved by complying with the following conditions:

- Mounting the devices on conductive metal surfaces
- Correctly grounding the devices and metal surfaces in the system
- If necessary: low-impedance and current-carrying equipotential bonding between areas with different ground potentials
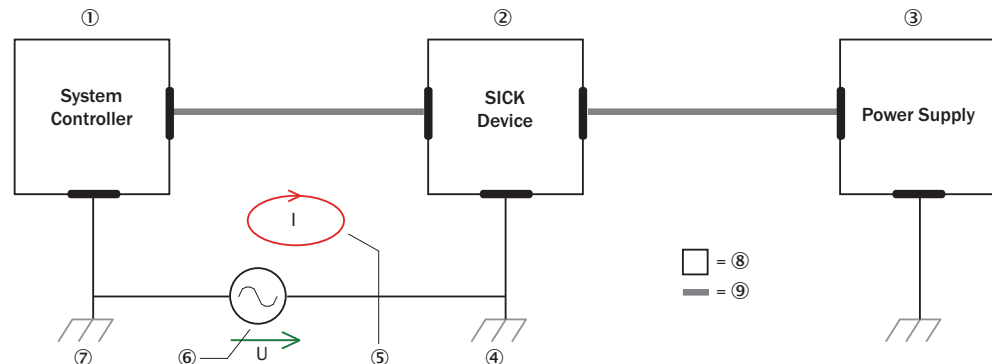

Figure 27: Example: Occurrence of equipotential bonding currents in the system configuration

① System controller
② Device
③ Voltage supply
④ Grounding point 2
⑤ Closed current loop with equalizing currents via cable shield
⑥ Ground potential difference
⑦ Grounding point 1
⑧ Metal housing
⑨ Shielded electrical cable

If these conditions are not fulfilled, equipotential bonding currents can flow along the cable shielding between the devices due to differing ground potentials and cause the hazards specified. This is, for example, possible in cases where there are devices within a widely distributed system covering several buildings.

Remedial measures

The most common solution to prevent equipotential bonding currents on cable shields is to ensure low-impedance and current-carrying equipotential bonding. If this equipotential bonding is not possible, the following solution approaches serve as a suggestion.

⚠ NOTICE

We expressly advise against opening up the cable shields. This would mean that the EMC limit values can no longer be complied with and that the safe operation of the device data interfaces can no longer be guaranteed.

Measures for widely distributed system installations

On widely distributed system installations with correspondingly large potential differences, the setting up of local islands and connecting them using commercially available **electro-optical signal isolators** is recommended. This measure achieves a high degree of resistance to electromagnetic interference.

Figure 28: Example: Prevention of equipotential bonding currents in the system configuration by the use of electro-optical signal isolators
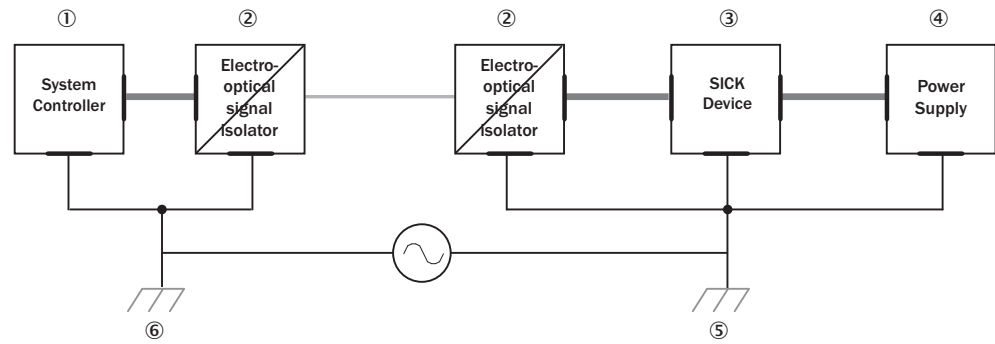
①	System controller
②	Electro-optical signal isolator
③	Device
④	Voltage supply
⑤	Grounding point 2
⑥	Grounding point 1
⑦	Metal housing
⑧	Shielded electrical cable
⑨	Optical fiber

The use of electro-optical signal isolators between the islands isolates the ground loop. Within the islands, a stable equipotential bonding prevents equalizing currents on the cable shields.

Measures for small system installations

For smaller installations with only slight potential differences, insulated mounting of the device and peripheral devices may be an adequate solution.

Figure 29: Example: Prevention of equipotential bonding currents in the system configuration by the insulated mounting of the device

①	System controller
②	Device
③	Voltage supply

④   Grounding point 3

⑤   Insulated mounting

⑥   Grounding point 2

⑦   Ground potential difference
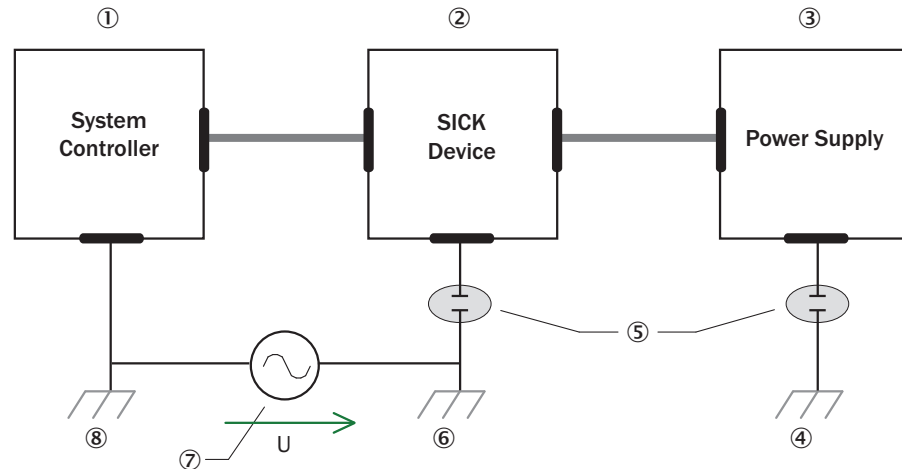
⑧   Grounding point 1

⑨   Metal housing

⑩   Shielded electrical cable

Even in the event of large differences in the ground potential, ground loops are effectively prevented. As a result, equalizing currents can no longer flow via the cable shields and metal housing.

> **! NOTICE**
> The voltage supply for the device and the connected peripheral devices must also guarantee the required level of insulation.
>
> Under certain circumstances, a tangible potential can develop between the insulated metal housings and the local ground potential.

6.3 Wiring notes

> **! NOTICE**
> **Faults due to incorrect wiring.**
>
> Incorrect wiring may result in operational faults.
>
> - For data transmission, use only screened cables with twisted-pair wires.
> - Follow the wiring notes precisely.

> **i NOTE**
> Preassembled cables can be found online at:
>
> - www.sick.com/CLV63x
> - www.sick.com/CLV64x
> - www.sick.com/CLV65x

All electrical connections of the device are configured as M12 round connectors or as a cable with D-Sub-HD male connector, depending on the type. The IP65/IP69K enclosure rating is only achieved with screwed plug connectors or protective caps.

All electrical connections of the device are configured as M12 round connectors or as a cable with D-Sub-HD male connector, depending on the type. The IP65 enclosure rating is only achieved with screwed plug connectors or protective caps.

6.4 Pin allocation of the connections

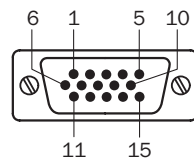**Device connections with cable and male connector (standard version)**

Figure 30: Male connector, D-Sub-HD, 15-pin

Table 8: Standard version: Pin assignment on 15-pin D-Sub-HD male cable connector

Pin	Signal	Function
1	DC 18 ... 30 V	Supply voltage
2	RxD (AUX)	AUX interface (receiver)
3	TxD (AUX)	AUX interface (sender)
4	Sensor 2	Digital switching input (function adjustable, e.g. external reading cycle)
5	GND	Ground
6	RD+ (RS-422/485)	Host interface (receiver)
7	RD– (RS-422/485); RxD (RS-232)	Host interface (receiver)
8	TD+ (RS-422/485)	Host interface (sender)
9	TD– (RS-422/485); TxD (RS-232)	Host interface (sender)
10	CAN H	CAN bus (IN/OUT)
11	CAN L	CAN bus (IN/OUT)
12	Result 1	Digital switching output, function can be set
13	Result 2	Digital switching output, function can be set
14	Sensor 1	Digital switching input for external reading cycle
15	SensGND	Common ground for switching inputs
-	–	Screen

Device connections with connector (Ethernet version)

Figure 31: Female connector, M12, 4-pin, D-coding

Table 9: Ethernet version: Pin assignment on the 4-pin M12 female connector

Pin	Signal	Function
1	TD+	Sender+
2	RD+	Receiver+
3	TD–	Sender–
4	RD–	Receiver–
-	-	Screen

Figure 32: Male connector, M12, 12-pin, A-coding

Table 10: Ethernet version: Pin assignment on 12-pin M12 male connector

Pin	Signal	Function
1	GND	Ground
2	DC 18 ... 30 V	Supply voltage

Pin	Signal	Function
3	CAN L	CAN bus (IN/OUT)
4	CAN H	CAN bus (IN/OUT)
5	TD+ (RS-422/485)	Host interface (sender)
6	TD– (RS-422/485); TxD (RS-232)	Host interface (sender)
7	TxD (AUX)	AUX interface (sender)
8	RxD (AUX)	AUX interface (receiver)
9	SensGND	Sensor 1 switching input ground
10	Sensor 1	Digital switching input (external reading cycle)
11	RD+ (RS-422/485)	Host interface (receiver)
12	RD– (RS-422/485); RxD (RS-232)	Host interface (receiver)
-	–	Screen

The "Sensor 2", "Result 1", and "Result 2" connections are only available on the device with cable and male connector (standard version) as well as for the Ethernet version (M12, 12-pin, A-coded) via the CDB620 connection module with the CMC600 parameter memory module.
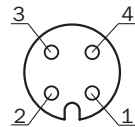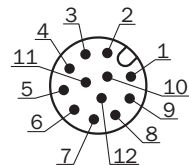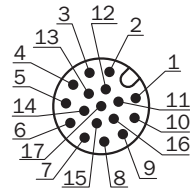
Figure 33: Male connector, M12, 17-pin, A-coding

Table 11: Ethernet version: Pin assignment on 17-pin M12 male connector

Pin	Signal	Function
1	GND	Ground
2	DC 18 … 30 V	Supply voltage
3	CAN L	CAN bus (IN/OUT)
4	CAN H	CAN bus (IN/OUT)
5	TD+ (RS-422/485)	Host interface (sender)
6	TD– (RS-422/485); TxD (RS-232)	Host interface (sender)
7	TxD (AUX)	AUX interface (sender)
8	RxD (AUX)	AUX interface (receiver)
9	SensGND	Sensor 1 switching input ground
10	Sensor 1	Digital switching input (external reading cycle)
11	RD+ (RS-422/485)	Host interface (receiver)
12	RD– (RS-422/485); RxD (RS-232)	Host interface (receiver)
13	Result 1	Digital switching output, function can be set
14	Result 2	Digital switching output, function can be set
15	Sensor 2	Digital switching input (external reading cycle)
16	–	–

Pin	Signal	Function
17	–	–

6.5 Connection diagrams

Standard version, cable, 15-pin male connector

Figure 34: Standard version: Electrical connections on the bar code scanner with connecting cable, 15-pin male connector, D-Sub-HD

❶   Here CDM420-0001 or CDM420-0006

①   Device

②   Interfaces

③   USB not required for CLV62x

④   Connection module

⑤   Configuration or diagnostics

⑥   Further data processing

⑦   External switching outputs

⑧   Supply voltage V_S

⑨   External switching inputs

⑩   CMC600 parameter memory module is required to be able to use the additional external switching inputs and outputs of the device (highlighted in gray)

⑪   Other functions

⑫   Application-dependent alternative stop reading cycle (e.g., photoelectric sensor) or travel increment (incremental encoder)

⑬   Start/Stop reading sensor (e.g., photoelectric sensor)

Ethernet version, 12-pin male connector

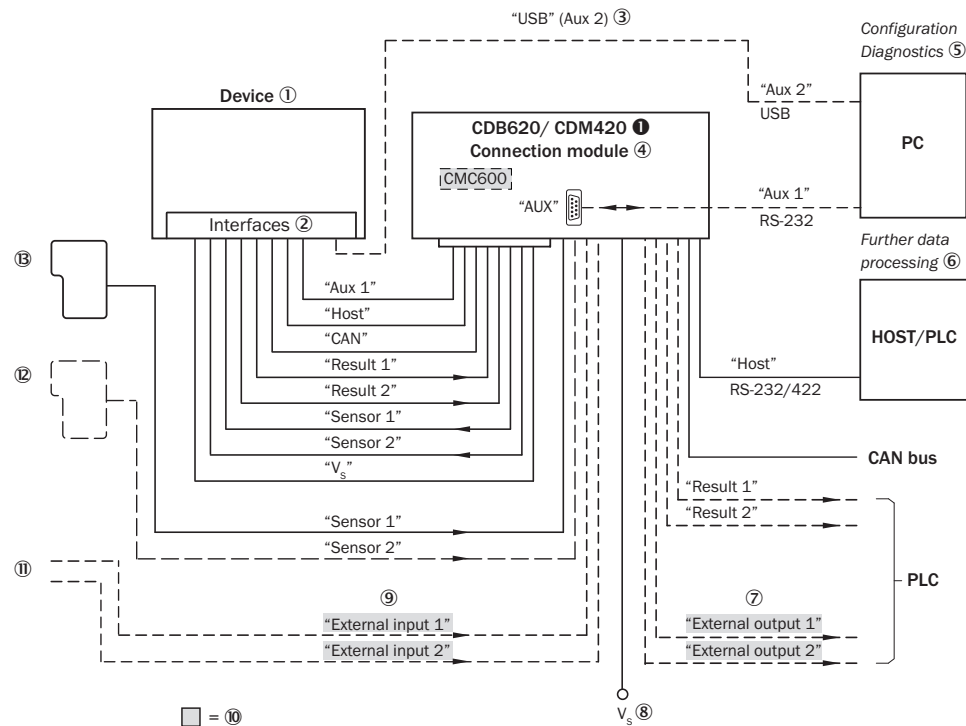*Figure 35: Ethernet version: Electrical connections on the bar code scanner with connector, 12-pin male connector, M12*

❶   Here CDM420-0001 or CDM420-0006

①   Device

②   Interfaces

③   USB not required for CLV62x

④   Connection module

⑤   Configuration or diagnostics

⑥   Further data processing

⑦   External switching outputs

⑧   Supply voltage V_S

⑨   External switching inputs

⑩   CMC600 parameter memory module is required to be able to use the additional external switching inputs and outputs of the device (highlighted in gray)

⑪   Other functions

⑫   Application-dependent alternative stop reading cycle (e.g., photoelectric sensor) or travel increment (incremental encoder)

⑬   Start/Stop reading sensor (e.g., photoelectric sensor)
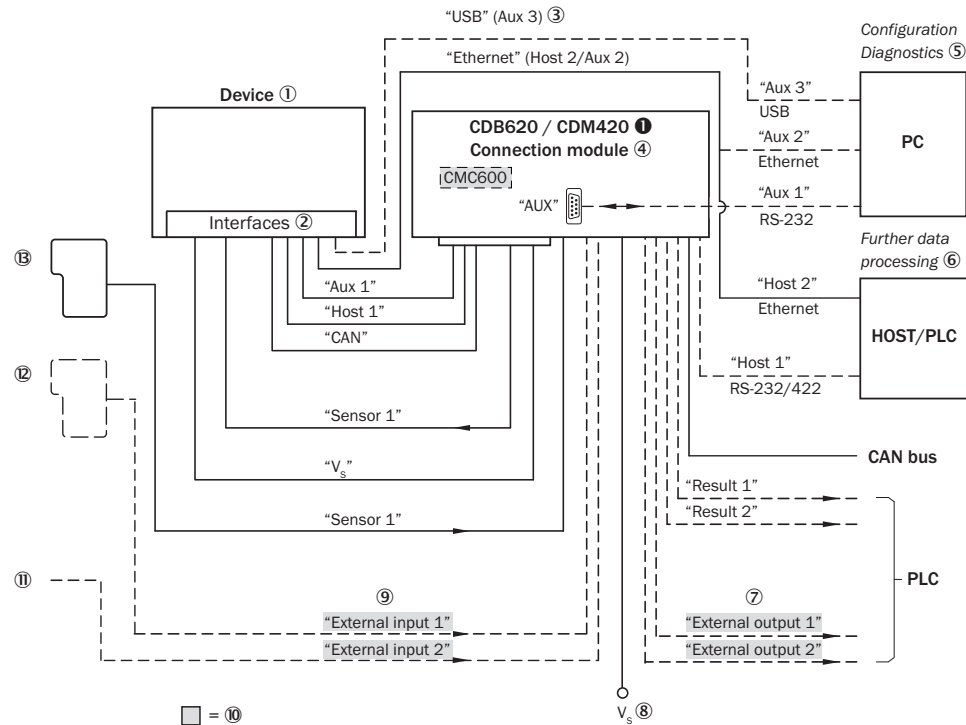
Ethernet version, 17-pin male connector
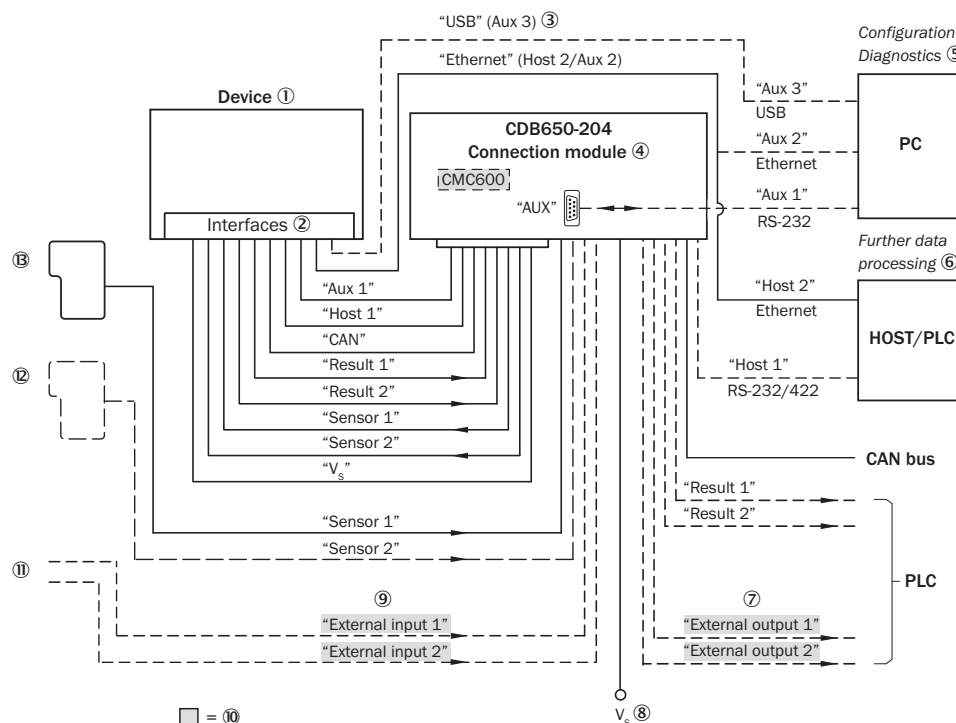
Figure 36: Ethernet version: Electrical connections on the bar code scanner with connector, 17-pin male connector, M12

①   Device

②   Interfaces

③   USB not required for CLV62x

④   Connection module

⑤   Configuration or diagnostics

⑥   Further data processing

⑦   External switching outputs

⑧   Supply voltage V_S

⑨   External switching inputs

⑩   CMC600 parameter memory module is required to be able to use the additional external switching inputs and outputs of the device (highlighted in gray)

⑪   Other functions

⑫   Application-dependent alternative stop reading cycle (e.g., photoelectric sensor) or travel increment (incremental encoder)

⑬   Start/Stop reading sensor (e.g., photoelectric sensor)

6.5.2 Connecting connection modules to devices with heating

General notes

- Electrical connections may only be made when there is no power in the system.
- Do not do any connection work at temperatures under 0 °C!
- The wire cross section of the incoming supply cables to the connection module must be 0.75 mm².
- The required supply voltage at the connection module is DC 24 V ±10%.
- Due to voltage drops, long cables require a larger wire cross section in line with valid standards.

> **NOTE**
> The device loses its UL certification if the connecting cables are extended over 2 m.

Using connection module CDM420-0001

The incoming/continuing supply cables in the CDM420-0001 are connected on terminal block U_{IN} of the additional connection circuit board.
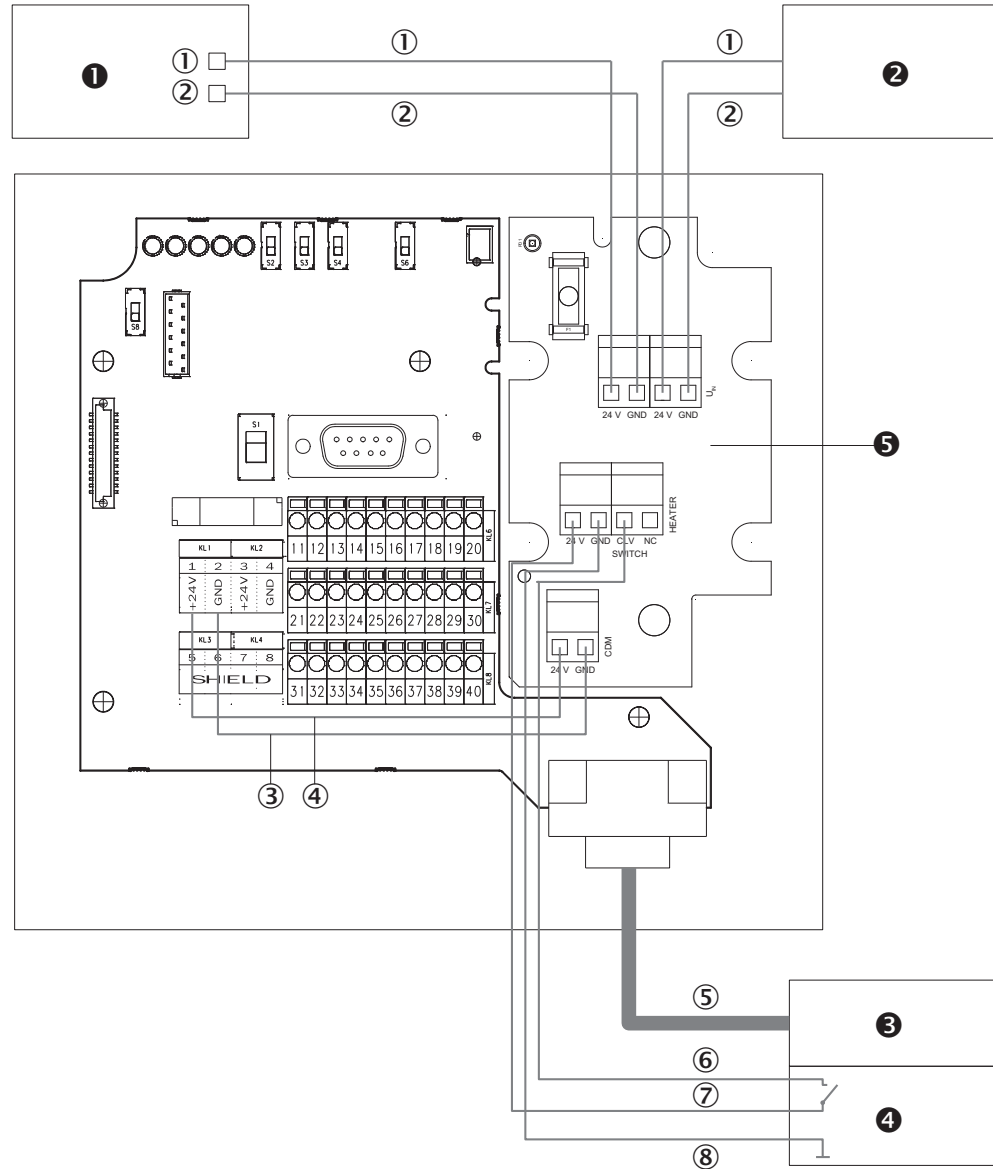
Figure 37: Supply voltage wiring for device and heating in CDM420-0001 connection module

①	Supply voltage
②	GND
③	GND (black)
④	Supply voltage (red)
⑤	15-pin cable
⑥	CLV switch (brown)
⑦	Supply voltage (red)
⑧	GND (black)
❶	Control cabinet

❷   Additional connection modules

❸   CLV

❹   Heating

❺   Additional circuit board (part number 2055071)

When connecting a device with heating to the CDM420-0001 connection module, the supply voltage supply lines for the heating are protected by the fuse on the additional connection circuit board.

The maximum permissible wire cross section on the screw terminals in the CDM420-0001 is 2.5 mm².

If the device is not operated with UL-compliance, the maximum permissible current to the screw terminals is 20 A in accordance with the specification of the terminals.

This enable parallel switching of several CDM420-0001 modules with connection devices with heating.

Using connection module CDB620-001

When connecting a device with heating to a CDB620-001 connection module, the supply lines of the supply voltage to the CDB620-001 are to be protected at the customer site by a 3 A fuse in the control cabinet.

A separate fuse is to be used for every connection module and device. The additional terminal (DC 24 V) and terminal 2 (GND) are provided for connecting the incoming supply voltage in the CDB620-001. The operating voltage reaches terminal 3 (U_{IN}) via the heating switch.
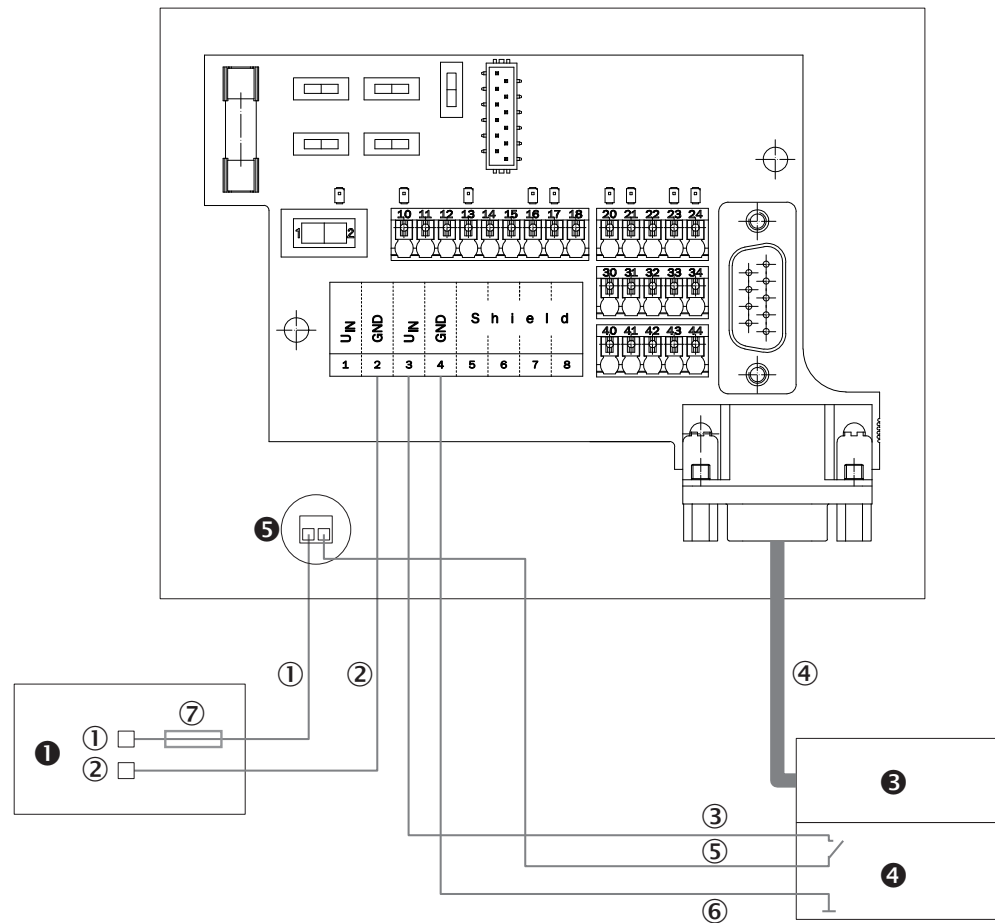
Figure 38: Supply voltage wiring for device and heating in CDB620-001 connection module

①   Supply voltage
②   GND
③   CLV switch (brown)
④   15-pin cable
⑤   Supply voltage (red)
⑥   GND (black)
⑦   F (fuse)
❶   Control cabinet
❸   CLV
❹   Heating
❺   Additional terminal (part number 6041383)

6.6   Wiring interfaces

6.6.1   Connecting the supply voltage

Connecting supply voltage to devices without heating

The device must be connected to a power supply unit with the following properties:

- Supply voltage DC 24 V ± 20% (stabilized safety extra low voltage SELV as per currently valid standards)
- Electricity source with at least 30 W power
- Additional 0.5 W output power when using the optional CMC600 parameter memory module in the corresponding connection modules

Connecting supply voltage to devices with heating

> **!** **NOTICE**
> Devices with heating must only be connected via a CDM420-0001 or CDB620-001 connection module.

A connection module must be used to connect the sensor to a power supply unit with the following properties:

- Supply voltage DC 24 V ± 10% (stabilized safety extra low voltage SELV as per currently valid standards)
- Electricity source with at least 40 W power
- Additional 0.5 W output power when using the optional CMC600 parameter memory module in the corresponding connection modules

Protecting the supply cables

To ensure protection against short-circuits and overload in the customer's supply cables, the conductor cross sections used must be appropriately selected and protected.

The following standards must be observed in Germany:

- DIN VDE 0100 (part 430)
- DIN VDE 0298 (part 4) and/or DIN VDE 0891 (part 1)

The infeed of the supply voltage is carried out using a SICK connection module or the customer's voltage supply.

6.6.2 Wiring the data interfaces

Wiring Ethernet interface

1. Connect the device to the Ethernet connection of the PC via the adapter cable.
2. Set up communication via SOPAS ET configuration software.

> **i** **NOTE**
> The Ethernet interface of the device has an Auto-MDIX function. This automatically adjusts the transmission speed as well as any necessary crossover connections.

Wiring the serial data interfaces

The maximum data transmission rate for the serial interface depends on the cable length and on the type of interface. The following recommendations apply:

Table 12: Data transmission rates

Interface type	Data transmission rate	Distance to the target computer (host)
RS-232	Up to 19.2 kBd 38.4 kBd ... 57.6 kBd 115.2 kBd ... 500 kBd	Max. 10 m Max. 3 m Max. 2 m
RS-422/485 [1]	Up to 38.4 kBd 38.4 kBd ... 57.6 kBd	Max. 1200 m Max. 500 m

[1] For RS-422/485-suitable cable and corresponding cable termination as per specification
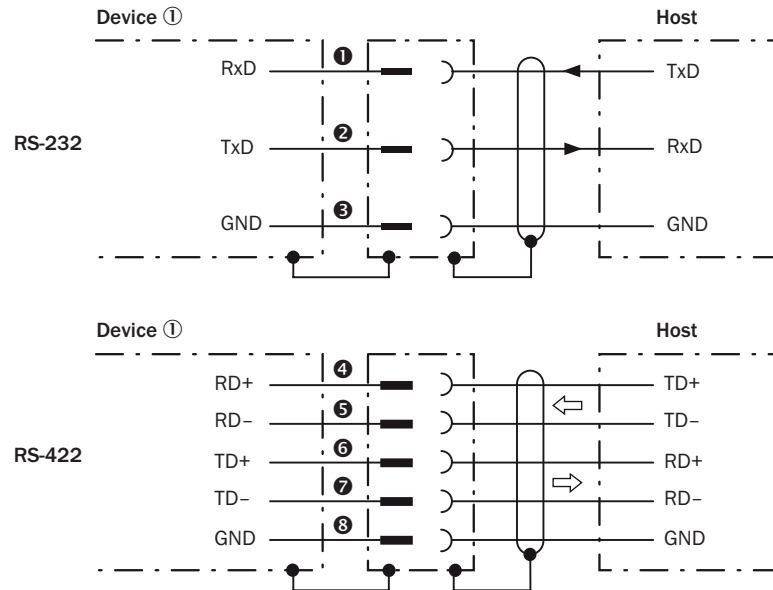
Figure 39: Internal circuitry for RS-232 and RS-485 data interfaces

①   Device

❶...❸ Pin assignment: See RS-232 pin assignment for the respective device

❹...❽ Pin assignment: See RS-422 pin assignment for the respective device

Termination of the RS-422 data interface

Termination of the data interface can be implemented in the connection module via switches.

Additional information on this can be found in the operating instructions for the relevant module.

6.6.3 Wiring the CAN interface

If the wiring of the CAN interface is carried out via a connection module, then the relevant operating instructions of the module used must be followed.

6.6.4 Wiring digital switching inputs

Physical switching inputs on the device

The physical switching inputs can be used for starting and/or ending the reading pulse or for feeding an incremental signal.

Depending on the device, there are different number of switching inputs available on the connections, see "Pin allocation of the connections", page 43.

Table 13: Characteristic data for the switching inputs

Switching behavior	Power at the input starts the internal reading interval of the device (default: active high, debounce time: max. 10 ms)
Properties	Opto-decoupled Reverse polarity protected
Electrical values	The electrical values are identical for all switching inputs. Low: $\lvert V_{in} \rvert \leq 2$ V; $\lvert I_{in} \rvert \leq 0.3$ mA High: 6 V $\leq \lvert V_{in} \rvert \leq 32$ V; 0.7 mA $\leq \lvert I_{in} \rvert \leq 5$ mA

ℹ NOTE

The SOPAS ET configuration software can be used to configure the debounce time.

- Min.: 0 ms
- Max.: 10,000 ms
- Default: 10 ms

In areas with strong electromagnetic radiation, debounce times of < 10 ms can cause undesired status changes to the switching input of the device (e.g. unintended initiation of the reading process).

In order to avoid undesired status changes, the following measures are recommended:

- Keep the length of cables from the signal source to the device as short as possible
- Reduced coupling to adjacent cables
- Shielding of influenced cables
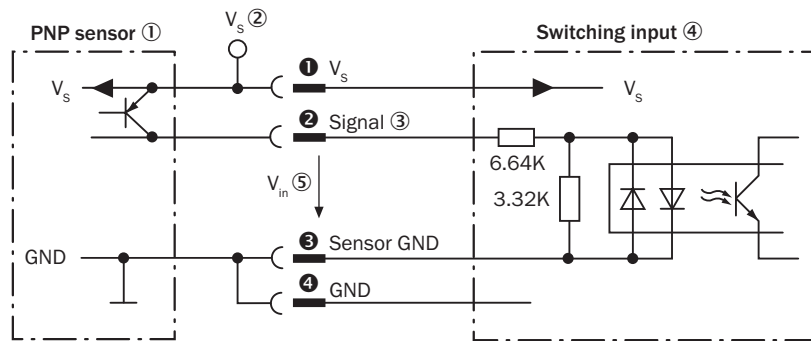
Figure 40: Wiring of a switching input with external PNP sensor

① PNP sensor

② Supply voltage $V_S = U_V$

③ Input signal

④ Switching input ("Sensor 1" or "Sensor 2")

⑤ Input voltage V_{in}

❶...❹ For pin assignment, see respective device

Extension: additional logical switching inputs in the device in the case of physical "external" switching inputs on the optional connection module

Thanks to the optional CMC600 parameter memory module, the two external switching inputs "External input 1" and "External input 2" on the relevant terminals in the connection module are additionally available.

ℹ NOTE

These two external switching inputs are not suitable for time-critical applications.

If the wiring of the inputs is carried out via a connection module, the respective operating instructions for the module are to be observed.

7 Commissioning

7.1 Overview of the commissioning steps

- Commissioning of the device with factory default
- Installing the SOPAS ET configuration software
- Connection of the device to PC/notebook with the SOPAS ET configuration software
- Adjustment and configuration of the device to optimize functionality
- Test of the device for correct functionality in read operation

7.2 SOPAS ET configuration software

The SOPAS-ET configuration software can be used to adapt the device to the reading situation on site. The configuration data is stored and archived as a parameter set (project file) on the PC.

7.2.1 Functions of the SOPAS-ET configuration software for the device (overview)

The general functions of the software and its operation are described in the online help in the SOPAS ET configuration software:

- Choice of the menu language (German, English)
- Setting up communication with the device
- Password-protected configuration for different operating levels
- Recording of the data in continuous operation (recording and analyzing data of certain memory areas of the device with the data recorder)
- Diagnostics for the system

7.2.2 Installing SOPAS ET

> **NOTE**
> The configuration software SOPAS ET, the current system prerequisites for the PC, and the instructions for downloading can be found online at:
>
> ▶ **www.sick.com/SOPAS_ET**

1. Start the PC and download the current version from **www.sick.com/SOPAS_ET**.
2. If installation does not start automatically, launch setup.exe from the download directory.
3. Follow the operating instructions to complete the installation.

7.2.3 Connecting SOPAS ET to the device

Administrator rights may be required on the PC to install the software.

1. Start the "SOPAS ET" program after completing the installation. Path: C:\Program Files (x86)\SICK\SOPAS ET\SopasET.exe or using the Windows search.
2. Install the device driver (SDD) in the device catalog using the wizard (gear symbol). The *.jar file can be obtained from the online repository if an Internet connection is present.
3. In the device search list, establish a connection between SOPAS ET and the device using the search settings. To do this, select the CLV6xx family of devices and select the default IP address 192.168.0.1 when connecting for the first time.
✓ The device is detected and can now be integrated into a project for configuration purposes.

7.3   Initial commissioning

The user adjusts the device to the reading situation on location using the SOPAS-ET configuration software. During this, the device is usually connected directly to the PC/laptop (online method).

The starting point for adjustment during the initial commissioning is a copy of the device's factory default settings in the working memory with predefined parameter values. Each of the parameter values can be changed within their value range to optimize the device. An application-specific, new parameter set is created with the SOPAS ET configuration software as a result, provisionally only in the device's working memory.

After testing the desired functionality in read mode, the parameter set created can be permanently saved on the device. The factory default settings cannot be overwritten and remain available at all times in case the device needs to be reset ( ).

The device can only save **one** application-specifically created parameter set.

If the effects of various parameter variations need to be tested on the read mode, then they must be saved in a further parameter set under another file name on the PC/laptop. Then download these parameter sets one after another for testing on the device without permanently saving them. Each download overwrites the previously transferred parameter set in the working memory. Only the last parameter set to be set is then finally saved on the device with the "Permanent" option.

ℹ️ **NOTE**

As part of a structured data security concept, it is recommended to save, and therefore archive, the current parameter set using a project file (Sopas file with configuration data) under a meaningful name on the PC.

External, optional parameter memory components outside of the device's internal parameter memory allow for direct parameter cloning. In case of defects, it is possible to exchange the device quickly without losing configuration data. The storage media are available for this, depending on the device, are microSD memory cards for the device or the parameter cloning module CMC600 for the connection module CDB and/or CDM.

Memory organization for parameter set

The following diagram shows the memory management principle for the involved internal and external components:
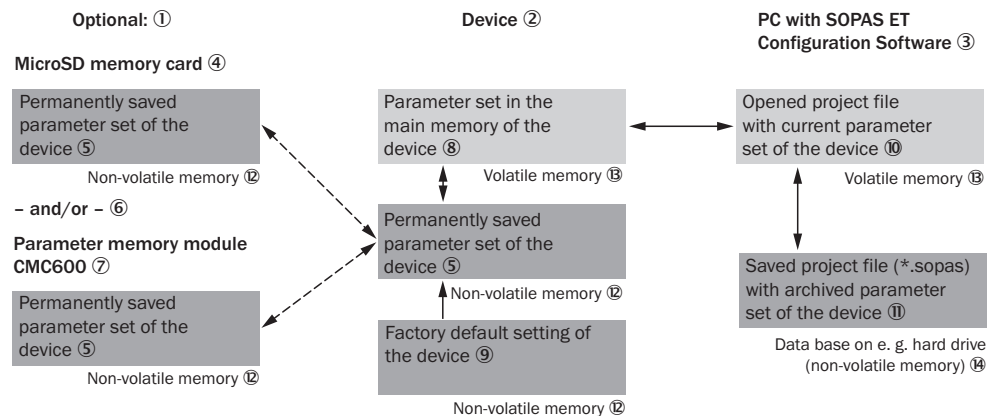
Figure 41: Configuration with SOPAS ET and saving the parameter set

①   Optional
②   Device

③ PC with SOPAS ET configuration software
④ MicroSD memory card
⑤ Permanently saved device parameter set
⑥ and/or
⑦ CMC600 parameter cloning module
⑧ Parameter set in the working memory of the device
⑨ Factory-set defaults for the device
⑩ Opened project file with current device parameter set
⑪ Saved project file with archived device parameter set
⑫ Nonvolatile memory
⑬ Volatile memory
⑭ Database on the hard drive, for example (nonvolatile memory)

Saving behavior:

The device is optionally equipped with a microSD memory card or connected to a CDB or CDM connection module with an optional CMC600 parameter cloning module:

- Each time the currently valid parameter set is saved in the device with the option "Permanent", the parameter set is also permanently saved externally on the memory card or in the CMC600.

NOTE
To avoid compatibility problems, we recommend only using micro SD memory cards approved by SICK. You can find these as accessories online at:

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

Supporting the exchange of a defective device without manually required reconfiguration

NOTE
Exchanging the device without losing the configuration data only makes sense if a defective device is replaced with an exchange unit **of the same type**.

In order to quickly exchange a defective device with an exchange unit, an optional CMC600 must be present beforehand in the connected connection module of the defective device or a memory card must be present beforehand in the device. If a memory card and a CMC600 are present, the exchange unit adopts the parameter set from the CMC600.

Device with memory card
1 Remove the memory card from the defective device in a de-energized state.
2 Only use the memory card when the exchange unit's power is off.
3 Switch on the supply voltage for the replacement unit.
The device starts and loads the parameter set from the memory card to its working memory and permanent internal parameter memory.

7.4 Adjust the device

For complete adjustment of the device, the electrical installation must be complete and the device must have been commissioned.

1. Loosen the bracket screws so that the device can be aligned.
2. Align the device so that the angle between the scanning line and the bar code stripes is almost 90°.

3. To prevent interference reflections, arrange the device as close to being plane-parallel to the object surface as possible.
4. Manually place objects with bar codes one after the other into the reading range of the device, see "Technical data", page 70.
5. Check the reading result with the SOPAS ET configuration software.
6. When doing so, place objects at different positions (angles) in the reading field and ensure that the limit values for the permitted reading angles are not exceeded, see "Angle alignment of the device", page 31.
7. Align the device so that the good read rate is between 70% and 100%.
8. Tighten the screws on the device.

7.5 Fine adjustment and further configuration

> **i** NOTE
> The other settings and the fine adjustment depend on the relevant application situation.

User level, parameter download to the device

The user is automatically logged into the device in the "Authorized customer" level and can change parameters which are immediately transmitted to the device (default setting).

Commissioning via Quickstart

The "Quickstart" tab offers an overview of the most important parameters and enables quick evaluation of code content. Functions such as evaluation window, percentage evaluation, code configuration, and adjusting tool are available via the Quickstart.

Application wizard

The application wizard ("Wand" icon) supports device configuration both as a standalone device and as a master or as a slave for a master/slave combination based on the CAN bus.

Evaluation window

The evaluation window shows the code content, the object index, the code type, the code security, and the device number of the reading device.

Percentage evaluation

Percentage evaluation permanently assesses the quality of the reading. Bar codes are not assessed. Here, the bar codes must not be subjected to any conveying movement. The device performs 100 scans in each case and evaluates the reading quality. The device continuously emits read results every 2 s via the AUX interface, together with the read diagnostic data. A timer starts when percentage evaluation is called. If a manual abort is not carried out, the device automatically returns to read mode after 5 min.

Adjusting Tool

The "Adjusting Tool" operating mode supports optimal placing of the center of the scan line on the object. To do this, the device hides half of the scan line.
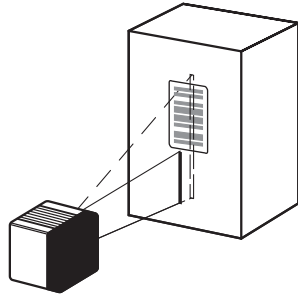
Figure 42: Appearance of the scan line in "Adjusting Mode"

This function is only available under "Analysis" in the "Service" user level.

Code configuration

In the factory default setting, the device decodes the following code types:

- Code 39
- 2/5 interleaved
- Code 128 family

You can activate further code types and set other decoder properties (Device Tree > Parameters > Code Configuration).

Scanning frequency

You can set the scanning frequency in the range from 400 Hz to 1200 Hz (Device Tree > Parameters > Reading Configuration).

Ethernet interface

Use the "Ethernet" page to make adaptations to the IP address and the subnet mask (Device tree > Parameters > Network/Interfaces/IOs > Ethernet).

Object trigger control

If the device is to be operated with an additional read pulse sensor, for example, a photoelectric sensor on the "Sensor 1" switching input, select the setting "Sensor 1" (Device tree > Parameters > Object trigger control).

Test and, if necessary, modify the specified settings when operating the system under real conditions.

8 Operation

8.1 Operating and status indicators

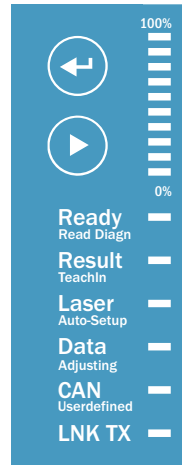### 8.1.1 Optical indications on the operating elements

Figure 43: LED status indicator, bar graph and function keys

Indication	LED	Color	Status
Ready	Lights up	Green	Lights up constantly after switching on and completion of successful self-test: Device ready to read Goes out when downloading or uploading configuration data
	Lights up	Red	Hardware error
	Lights up Flashing	Green Red	PROFINET active/No PROFINET network active
Result	Lights up	Green	Successful reading
Laser	Lights up	Green	Laser switched on
Data	Lights up	Green	Data output via host interface
CAN	Flashing	Yellow	Data transfer via CAN interface
LNK TX	Lights up	Green	Physical Ethernet connection

Operating button and status displays on the second display level

The two buttons are used for manually calling up device functions without using a PC. The second level of the LEDs signal the selectable functions.

1. Press the return key for about 3 s. The device interrupts the current read mode, switches off all LEDs and the bar graph and switches into button operating mode. Starting now, the device ignores all external reading cycles. The device does not output any read results via the host interface.
   The beeper confirms this process with an ascending melody. The "Read diagn" function, the first function, is preselected (LED flashes slowly).
2. Press the arrow button repeatedly until the LED of the desired function flashes. The device runs through all possible functions step-by-step without executing them and then starts again from the beginning.
   The beeper confirms every step with a tone.
3. Press the return key to confirm the selected function.
   The LED flashes faster, the beeper confirms start with a double beep.

The device executes the function and automatically returns to the read mode after 2 min.

The "TeachIn" function (for match code) as well as "Auto-setup" automatically stops the device when it has successfully read the presented bar code. The "Ready" LED then flashes green three times, the beeper confirms this with an ascending melody.

4. To abort the function manually, press the Return key again and hold for 3 seconds. The beeper confirms the change with an ascending melody. The "Ready" LED lights up again.

✓   The device is again ready for reading and is waiting for a reading cycle.

i **NOTE**
With the Auto-setup function, makes sure the bar code is at the maximum distance to be read from the device.

Table 14: Meaning of the LEDs when buttons are actuated

Func-tion	LED	Description	
Read diagn	Flash-ing slowly	"Read diagnosis/Percentage evalua-tion" selected	In the "Percentage evaluation" oper-ating mode, the bar graph continu-ously shows the last calculated read rate in % referring to the last 100 reads.
	Flash-ing rapidly	"Read diagnosis/Percentage evalua-tion" started	
TeachIn	Flash-ing slowly	"TeachIn match code" selected	Reads a match code which is used as a reference object for additional readings.
	Flash-ing rapidly	"TeachIn match code" started	
Auto-setup	Flash-ing slowly	"Auto-setup" selected	Sets the most important parameters of the device using a default bar code.
	Flash-ing rapidly	"Auto-setup" started	Note: Present the reference bar code at the maximum reading distance. "Laser" LED differs from the function in read mode!
Adjust-ing	Flash-ing slowly	"Adjusting" (adjustment aid) selected	Halves the scan line for aligning the device to the center of the reference bar code.
	Flash-ing rapidly	"Adjusting" (adjustment aid) started	
User-defined	-	Function not available	

Bar graph 0 … 100%

In the "Percentage analysis" operating mode, the bar graph continuously shows the last calculated read rate in % referring to the last 100 reads. The bar graph is deactivated in standard read mode.

8.2 Operating options

The device can be configured according to application in the following manner:

- Locally at the device with the SOPAS ET configuration software. Protection of the parameter set as a configuration file on the PC in SOPAS ET. Access to the device via AUX interface (RS-232, or Ethernet depending on type).
- As an alternative to the SOPAS ET configuration software, command strings are available, upon which the operator interface of the configuration software is also based. These are also for the triggering of device functions (e.g. reading). Documents on the command strings can be obtained from SICK on request.
- Centrally by the PROFINET controller via PROFINET using the GSD configuration. Protection of the parameter set as a configuration file in the PROFINET controller. Each time the PROFINET is restarted, the device is reconfigured.
- Profile programming by reading a set of printed configuration bar codes. Can be generated with the SOPAS ET configuration software.

The SOPAS ET configuration software is used for device diagnostics in case of a fault.

In normal operation, the device operates fully automatically.

9 Maintenance

9.1 Maintenance

During operation, the device works maintenance-free.

> **NOTE**
> No maintenance is required to ensure compliance with laser class 2.

Depending on the assignment location, the following preventive maintenance tasks may be required at regular intervals for the device:

Table 15: Maintenance schedule

Maintenance work	Interval	Implementation
Clean housing and front screen	Cleaning interval depends on ambient conditions and climate	Specialist
Check the screw connections and plug connectors	Every 6 months	Specialist
Exchanging mounting brackets with integrated vibration/shock damping	Depends on vibrations and shock effects (application-specific)	Specialist

9.2 Cleaning

9.2.1 Cleaning the device

At regular intervals (e.g. weekly), check the reading window and the housing of the device for contamination. This is especially relevant in harsh operating environments (dust, abrasion, damp, fingerprints, etc.). The reading window lens must be kept clean and dry during operation.

> **NOTICE**
> **Equipment damage due to improper cleaning.**
> Improper cleaning may result in equipment damage.
> - Only use recommended cleaning agents.
> - Never use sharp objects for cleaning.

Cleaning the reading window

> **NOTICE**
> **Damage to the Reading Window!**
> Reduced reading performance due to scratches or streaks on the reading window.
> - Clean the reading window only when wet.
> - Use a mild cleaning agent that does not contain powder additives. Do not use aggressive cleaning agents, such as acetone, etc.
> - Avoid any movements that could cause scratches or abrasions on the reading window.
> - Only use cleaning agents suitable for the screen material.

The type of screen material used in the reading window can be found on the type label, see "Type code", page 13.

> **NOTE**
> Static charge causes dust particles to adhere to the reading window. This effect can be avoided by using an anti-static glass cleaner in combination with the SICK lens cloth (can be obtained from **www.sick.com**).

Cleaning procedure:

> ⚠️ **CAUTION**
> **Optical radiation: Laser class 2**
>
> The human eye is not at risk when briefly exposed to the radiation for up to 0.25 seconds. Exposure to the laser beam for longer periods of time may cause damage to the retina. The laser radiation is harmless to human skin.
>
> - Do not look into the laser beam intentionally.
> - Never point the laser beam at people's eyes.
> - If it is not possible to avoid looking directly into the laser beam, e.g., during commissioning and maintenance work, suitable eye protection must be worn.
> - Avoid laser beam reflections caused by reflective surfaces. Be particularly careful during mounting and alignment work.
> - Do not open the housing. Opening the housing may increase the level of risk.
> - Current national regulations regarding laser protection must be observed.

▶ Switch off the device for the duration of the cleaning operation. If this is not possible, use suitable laser protection goggles. These must absorb radiation of the device's wavelength effectively.

▶ Glass lens: Remove dust from the reading window using a soft, clean brush. If necessary, also clean the reading window with a clean, damp, lint-free cloth, and a mild anti-static glass cleaning agent.

▶ Plastic lens: Clean the reading window only with a clean, damp, lint-free cloth, and a mild anti-static glass cleaning agent.

> **NOTE**
> If the reading window is scratched or damaged (cracked or broken), the lens must be replaced. Contact SICK Service to arrange this.

Cleaning the housing

In order to ensure that heat is adequately dissipated, the housing surface must be kept clean.

▶ Clear the build up of dust on the housing with a soft brush.

9.2.2 Cleaning surfaces that have an optical effect

Depending on how the reading station is equipped, additional local sensors may have other surfaces with an optical effect installed (e.g. single-beam photoelectric safety switches for an external reading pulse). Contamination on these sensors can result in faulty switching behavior.

▶ To avoid faulty switching behavior, remove contamination from the optical effect surfaces of external sensors.
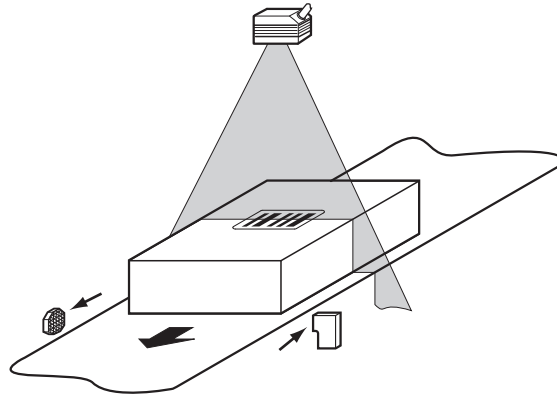

Figure 44: Cleaning the external optical sensors (read pulse encoder)

10 Troubleshooting

10.1 Overview of possible errors and faults

Table 16: Errors and faults

Situation	Error/fault
Mounting	▪ Device poorly aligned to the object with the bar code (e.g. dazzle). ▪ Read-cycle sensor incorrectly positioned (e.g., internal reading gate is opened too early or closed too late). ▪ Incremental encoder incorrectly positioned.
Electrical installation	▪ Data interfaces of the device incorrectly wired. ▪ Voltage supply not sufficiently dimensioned or cables with too small a cross-section used.
Configuration	▪ Functions not adapted to local conditions, e.g. parameters for the data interface not set correctly. ▪ Device limits not observed, e.g. reading distance, aperture angle. ▪ Read cycle trigger source not selected correctly.
Operation	▪ Read cycle control incorrect and/or not suitable for the object. ▪ Device faults (hardware/software).

10.2 Detailed fault analysis

10.2.1 LEDs on the device

The statuses that can be read from the device LEDs on the device housing (see "Operating and status indicators", page 60) include:

- Operational readiness (Ready)
- Reading result status (Good Read or No Read)
- Hardware fault
- Firmware download status
- Connection status of the device

The LED display can indicate possible errors or faults. Further information on this can be found in the "System Information" section.

10.2.2 System information

The device outputs faults in different ways. Fault output is staggered and thus allows for an increasingly detailed level of analysis.

- Communication errors can occur when transmitting data to the device. The device then returns a fault code.
- For faults that occur during reading, the device writes fault codes in the status log (see "Status log", page 66).

10.3 Status log

ℹ **NOTE**
The status log is retained even after switching the device off and on again.

The device distinguishes between four types of fault:

- Information
- Warning
- Error
- Critical fault

The device saves only the last five entries for each fault type.

10.3.1 Displaying the status log

To display the status log, the SOPAS ET configuration software must be connected with the device online.

1. Connect the SOPAS ET configuration software to the device.
2. Open CLV6xx in the project tree: Service > System Status > System Information tab.

10.4 SICK Support

If a fault cannot be rectified, the device may be defective.

The device must not be repaired by the user. Interrupting or modifying the device will invalidate any warranty claims against SICK AG.

Rapid replacement of a device by the user is however possible, see "Disassembly and disposal", page 68.

▶ Where a fault cannot be rectified, make contact with the SICK Service department. To find your agency, see the final page of this document.

NOTE
Before calling, make a note of all type label data such as type designation, serial number of the device and the connectivity used to ensure faster assistance.

---

11 Decommissioning

11.1 Disassembly and disposal

Dismantling the device

1. Switch off the supply voltage to the device.
2. Detach all connecting cables from the device.
3. If the device is being replaced, mark its position and alignment on the bracket or surroundings.
4. Remove the device from the bracket.
5. If available, remove the microSD memory card (optional) with the saved parameter set from the defective device. In order to do this, carefully open the black rubber covering and lightly press the memory card in order to release it.

Putting the replacement device into operation

1. Insert the memory card into the opening of the new, switched-off device on the correct side (contacts point upwards and to the back) and push until the lock engages.
2. Close the rubber cover.
3. Mount and align the replacement device of the same type (see "Mounting", page 27). When doing so, note the previously applied markings on the bracket or surroundings.
4. Reinstall the connecting cables to the device (see "Electrical installation", page 39).
5. Switch on the supply voltage for the device.
   The device starts with the default setting.
6. If an optional microSD memory card is inserted into the device or an optional CMC600 parameter memory module is inserted into the CDB620/CDM420 connection module, the exchanged device automatically adopts the saved parameter set from the memory card or from the CMC600 into its permanent memory. If a memory card and a CMC600 are present at the same time, the device adopts the parameter set from the CMC600.
   OR
   Without micro SD memory card/CMC600 parameter memory module: Establish a connection to the device via the SOPAS ET configuration software. Download the configuration previously stored on the PC to the device and permanently store it in the device.

> **(i) NOTE**
> If the parameter set of the device is stored on the PC, it can be played back to the device via a SOPAS ET connection.

Disposing of the device

Any device which can no longer be used must be disposed of in an environmentally friendly manner in accordance with the applicable country-specific waste disposal regulations. As they are categorized as electronic waste, the device must never be disposed of with household waste.

11.2 Returning devices

▶ Do not dispatch devices to the SICK Service department without consultation.

NOTE
To enable efficient processing and allow us to determine the cause quickly, please include the following when making a return:

- Details of the contact person
- Description of the application
- Description of the fault that occurred

12   Technical data

> **NOTE**
>
> The relevant online data sheet for your product, including technical data, dimensional drawing, and connection diagrams can be downloaded, saved, and printed from the Internet:
>
> - www.sick.com/CLV63x
> - www.sick.com/CLV64x
> - www.sick.com/CLV65x

These operating instructions provides additional technical data if required.

12.1   Optics

		CLV63x	CLV64x	CLV65x
Working range/ resolution		**CLV630 Long Range:** 0.35 mm ... 1.0 mm **CLV631 Mid Range:** 0.25 mm ... 0.5 mm **CLV632 Short Range:** 0.2 mm ... 0.5 mm	**CLV640 Standard Density:** 0.2 mm ... 1.0 mm **CLV642 High Density:** 0.15 mm ... 0.25 mm	**CLV650 Standard Density:** 0.25 mm ... 1.0 mm **CLV651 Low Density:** 0.5 mm
Scanning method		Line scanner, grid scanner [1], or line scanner with oscillating mirror [2].		
Reading window orientation		On the front or to the side (light emission at 105° relative to the longitudinal axis of the device), [2].		
Aperture angle		≤50°		
Focus		Fixed focus	Dynamic focus adjustment	Auto-focus/ dynamic focus adjustment
Scanning frequency		400 Hz ... 1,200 Hz		600 Hz ... 1,000 Hz
Light source		Laser diode, visible red light (λ = 655 nm)		Laser diode, visible red light (λ = 658 nm)
Light spot		Circular/oval (depending on type) [2].		-
Reading distance		Information on the reading distance, see "Reading field diagrams", page 74.		
Grid height, number of lines, from a distance	On the front	15 mm, 8, 200 mm		-
	On the side	15 mm, 8, 185 mm		-
Oscillating mirror functions		Fixed (adjustable position), oscillating (variable or fixed amplitude), one-shot		
	Oscillation frequency	0.5 Hz ... 6.25 Hz		
	Angle of deflection	−20° ... 20°		
MTBF		40,000 h		

		CLV63x	CLV64x	CLV65x
Laser class		Class 2 according to EN/IEC 60825-1: 2014 Identical laser class for issue EN/IEC 60825-1:2007 Complies with 21 CFR 1040.10 except for tolerances according to Laser Notice no. 50, dated June 24, 2007.		
Laser power (maximum/average)		3.2 mW/< 1.0 mW		CLV650: 7.0 mW/ < 1.0 mW CLV651: 4.5 mW/ < 1.0 mW
Laser pulse duration		< 300 µs		< 80 µs
Bar code print contrast (PCS)		≥ 60%		
Ambient light immunity		2,000 lx, (on bar code)		

[1] Grid height approx. 15 mm at a reading distance of 200 mm.
[2] Identifier see "Type code", page 13.

12.2   Performance

	CLV63x	CLV64x	CLV65x
Bar code types	Code 39, Code 128, Code 93, Codabar, GS1-128 / EAN 128, UPC/GTIN/EAN, 2/5 Interleaved, Pharmacode, GS1 DataBar, Telepen, MSI/Plessey		
Print ratio	2:1 ... 3:1		
No. of codes per scan	1 ... 20 (standard decoder) 1 ... 6 (SMART decoder)		
No. of codes per reading interval [1]	1 ... 50 (auto-discriminating)		
No. of characters per code (reading interval)	Max. 50 characters (max. 5000 characters across all bar codes per reading gate, 500 characters for multiplexer function (CAN))		
Number of multiple readings	1 ... 99		

[1] Reading interval: The time window generated internally by the reading cycle for code detection and evaluation

12.3   Interfaces

		CLV63x	CLV64x	CLV65x
Serial (RS-232, RS-422/-485)	Function:	Host, AUX (RS-232 only)		
	Data transmission rate:	2.4 kBd ... 115.2 kBd, AUX: 57.6 kBd (RS-232)		
Ethernet Ethernet version only	Function:	Host, AUX		
	Data transmission rate:	10/100 Mbit/s, half/full duplex		
	Protocol:	TCP/IP, EtherNet/IP		

		CLV63x	CLV64x	CLV65x
CAN	Function:	SICK CAN sensor network (master/slave, multiplexer/server), (tracking CLV65x-x8300A)		
	Data transmission rate:	20 kbit/s … 1 Mbit/s		
	Protocol:	CSN (SICK CAN sensor network), CANopen (CLV65x only)		
PROFINET	Function:	PROFINET single port PROFINET Dual Port optional over external fieldbus module CDF600-2		
	Data transmission rate:	10/100 Mbit/s		
EtherCAT®		Optional via external fieldbus module CDF600		
PROFIBUS		Optional via external fieldbus module CDF600-2		
DeviceNet		Optional over external connection module CDM420 and CMF fieldbus module		
Digital switching inputs		Opto-decoupled, V_{in} = max. 32 V, reverse polarity protected, can be wired via PNP output, adjustable debounce time 0 … 10,000 ms		
	Cable:	2 ("Sensor 1", "Sensor 2"), optionally with 2 additional inputs via CMC600 parameter memory module in the connection module [1]		
	12-pin Ethernet:	1 ("Sensor 1", "Sensor 2"), optionally with 2 additional inputs via CMC600 parameter memory module in the connection module [1]		
	17-pin Ethernet:	2 ("Sensor 1", "Sensor 2"), optionally with 2 additional inputs via CMC600 parameter memory module in the CDB650 connection module		
Digital switching outputs		PNP, I_{out} = max. 100 mA, short-circuit protected, pulse duration adjustable (static, 10 … 1,000 ms)		
	Management:	2 ("Result 1", "Result 2"), optionally with 2 additional outputs via CMC600 parameter memory module in the connection module [1]		
	12-pin Ethernet:	No output, optionally with 2 outputs via CMC600 parameter memory module in the connection module [1]		
	17-pin Ethernet:	2 ("Result 1", "Result 2"), optionally with 2 additional outputs via CMC600 parameter memory module in the connection module [1]		
Reading pulse	Start:	Switching input (type-dependent), fieldbus input (type-dependent), command, auto-pulse, CAN (type-dependent), free-running		
	Stop:	Reading pulse source, switching input (type-dependent), command, timer, event (e.g. Good Read)		
Optical indicators		6 LEDs (Ready, Result, Laser, Data, CAN, LNK TX) Bar graph display of percentage read rate (10 LEDs)		
Acoustic indicator		Beeper, can be switched off, can be allocated function for event status indication		
Operating elements		2 pushbuttons		
Parameter memory		Micro SD card (optional) or connection module [1] with CMC600		

		CLV63x	CLV64x	CLV65x
Configuration		SOPAS ET configuration software, profile programming with bar codes, command language, GSD configuration (only Ethernet version)		

[1]   Connection module CDB620, CDB650 or CDM420

12.4   Mechanics/electronics

		CLV63x	CLV64x	CLV65x
Electrical connection	Management:	1 x 15-pin D-Sub-HD male connector (0.9 mm) 1 x cable, open-ended, 3-wire (2 m) (with heating) [3]		
	12-pin Ethernet:	2 x M12 round connectors (1 x 12-pin male connector, A-coding, 1 x 4-pin female connector, D-coding) on swivel connector 1 x cable, open-ended, 3-wire (2 m) (with heating) [3]		
	17-pin Ethernet:	2 x M12 round connectors (1 x 12-pin male connector, A-coding, 1 x 4-pin female connector, D-coding) with swivel connector [3]		
	Ethernet 17-pin IP69K	2 x M12 round connectors (1 x 17-pin male connector, A-coding, 1 x 4-pin female connector, D-coding) [3]		-
Supply voltage V_S		18 V DC … 30 V DC ≤ 24 V DC, ± 10% (with heating) [3] LPS or NEC Class 2, reverse polarity protected		
Power consumption [1] (devices without heating)		Line or grid scanner: Typically 5 W at DC 24 V ± 10%	Line or grid scanner: Typically 5.5 W at DC 24 V ± 10%	Line scanner: Typically 8.5 W at DC 18 … 30 V Line scanner with oscillating mirror: typically 9.5 W
Power consumption (devices with heating)		Max. 40 W (max. 2.4 A)		
Housing		Aluminum die cast, stainless steel (unpainted) (IP69K)		
Housing color		Light blue (RAL 5012)		
Reading window material		Glass or polycarbonate pane [3].		
Weight [2]	On the front	Standard variant (cable): 320 g Standard variant (cable) with heating [3]: 520 g Ethernet variant: 250 g Ethernet variant with heating [3]: 450 g Ethernet IP69K variant [3]: 890 g		
	On the side	Standard variant (cable): 340 g Standard variant (cable) with heating [3]: 540 g Ethernet variant: 270 g		
	Oscillating mirror	Standard variant (cable): 420 g Standard variant (cable) with heating [3]: 620 g Ethernet variant: 350 g Ethernet variant with heating [3]: 550 g Ethernet IP69K variant [3]: 1230 g		

		CLV63x	CLV64x	CLV65x
Dimensions (L x W x H)	**On the front**	61 mm x 96 mm x 38 mm [4] 61 mm x 96 mm x 50 mm [4] (with heating) [3] 85 mm x 154 mm x 84 mm (IP69K)[3]		
	On the front with polarizing filter	-		61 mm x 96 mm x 38 mm [4]
	On the side	80 mm x 96 mm x 38 mm [4] 80 mm x 96 mm x 50 mm [4] (with heating) [3]		-
	Oscillating mirror	95 mm x 107 mm x 41 mm [4] 95 mm x 107 mm x 50 mm [4] (with heating) [3] 121 mm x 164 mm x 84 mm [4] (IP69K) [3]		
Electrical protection class		III (EN 60950-1: 2011-01) Designed for operation in SELV systems (Safety Extra Low Voltage).		
Enclosure rating		IP 65, according to EN 60529 (1991-10); A1 (2002-02) Variants with stainless-steel housing: IP69K, as per ISO 20653: 2013-02		

[1] For outputs without load.
[2] Glass reading window.
[3] Identifier see "Type code", page 13.
[4] Swivel connector protrudes by 15 mm.

12.5 Ambient data

	CLV63x	CLV64x	CLV65x
Electromagnetic compatibility (EMC)	Radiated emission: Acc. to EN 61000-6-3 (2007-01), electromagnetic immunity: Acc. to EN 61000-6-2 (2005-08)		
Vibration resistance	EN 60068-2-6: 2008-02		
Shock resistance	EN 60068-2-27: 2009-05		
Ambient operating temperature	Device without heating: 0 °C ... +40 °C Device with heating: –35 °C ... +35 °C		
Storage temperature	–20 °C ... +70 °C		
Permissible relative humidity	0% ... 90%, non-condensing		
Ambient light immunity	2,000 lx, on bar code		
Bar code print contrast (PCS)	≥ 60%		

12.6 Reading field diagrams

12.6.1 Reading field conditions

Test code	Code 128
Print contrast	> 90%
Tilt	±10°
Ambient light	< 2,000 lx
Good read rate	> 75%

> **i** **NOTE**
> Min. and max. reading distances are measured radially from the device.

12.6.2 Overview of CLV63x reading field diagrams
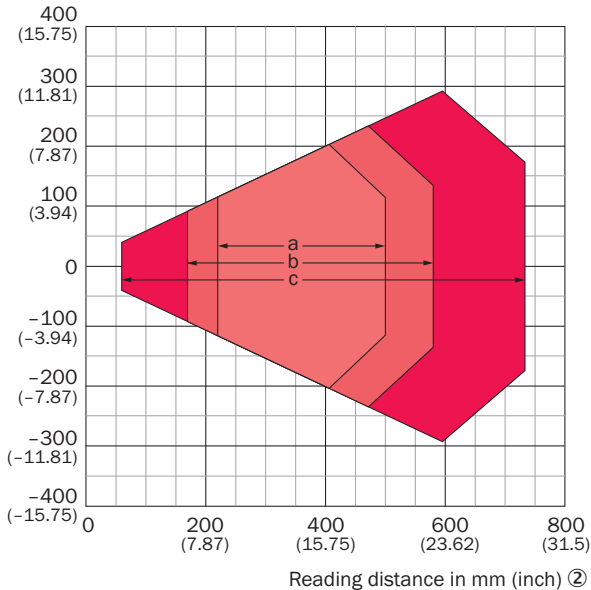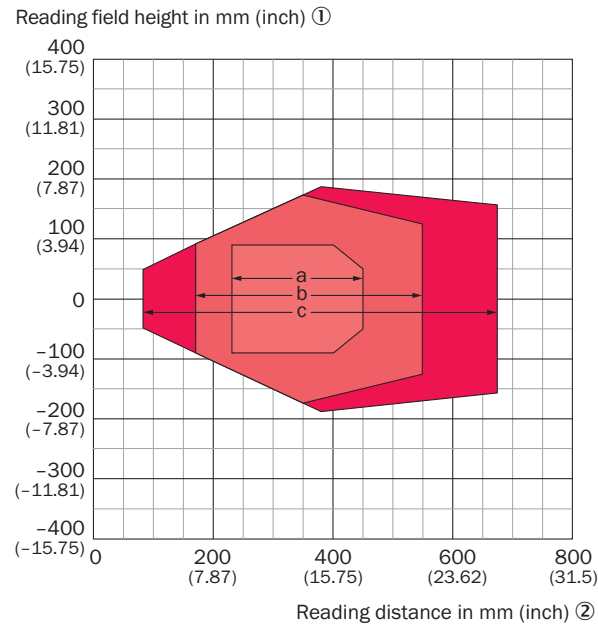
12.6.2.1 Long range

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution ④

- ▮ a: 0.35 mm (13.8 mil)
- ▮ b: 0.50 mm (19.7 mil)
- ▮ c: 1.0 mm (39.4 mil)

Figure 45: Reading field diagram CLV630, long range, reading window on front

① Reading field height in mm (inch)
② Reading distance in mm (inch)
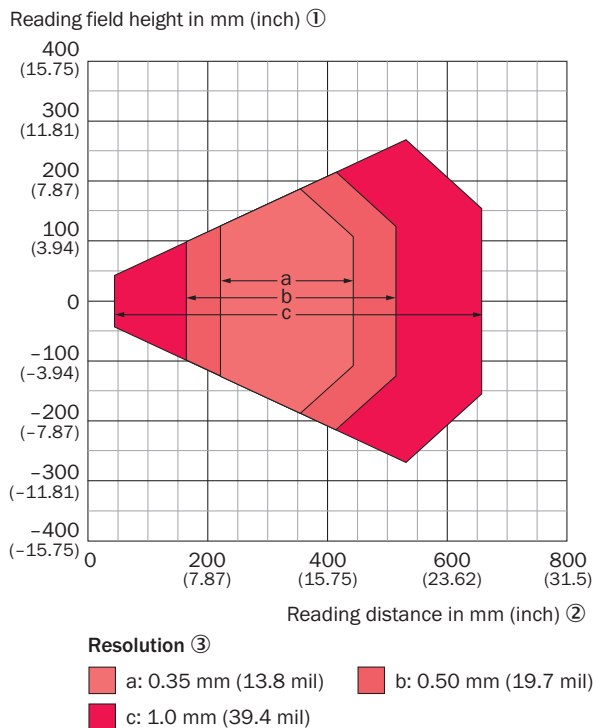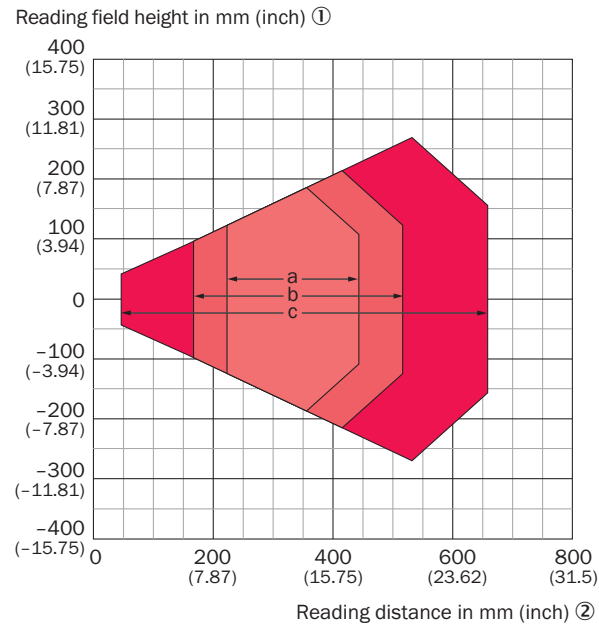③ The depth of field is reduced by approx. 10% for devices with plastic lenses.
④ Solution

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution ④

a: 0.35 mm (13.8 mil)   b: 0.50 mm (19.7 mil)

c: 1.0 mm (39.4 mil)

Figure 46: Reading field diagram CLV630, long range, reading window on front, oval light spot

①   Reading field height in mm (inch)

②   Reading distance in mm (inch)

③   The depth of field is reduced by approx. 10% for devices with plastic lenses.
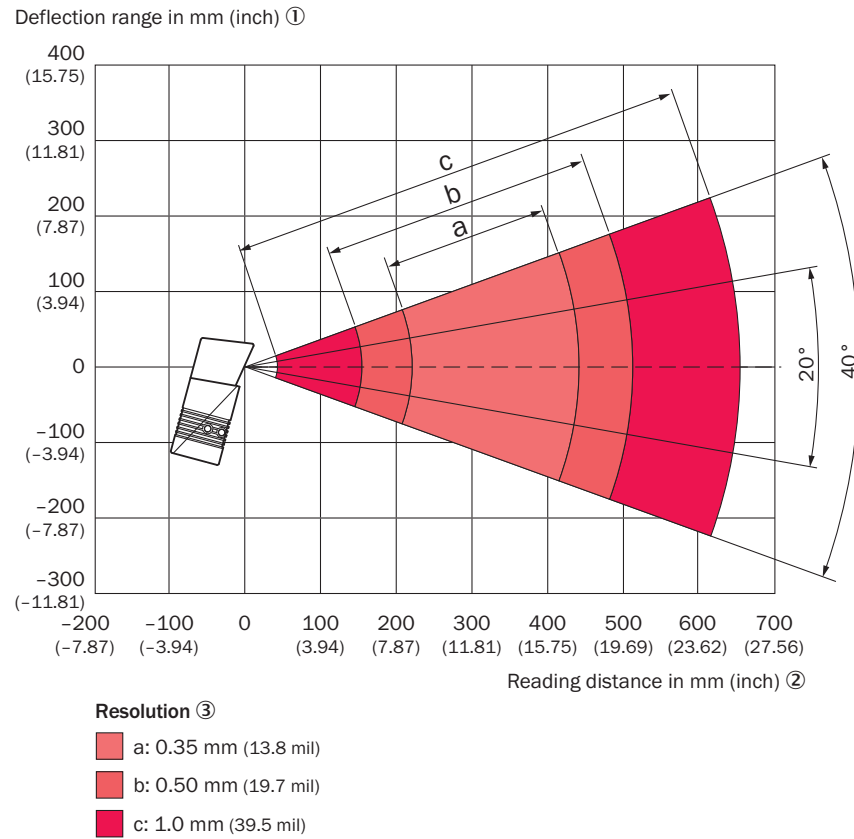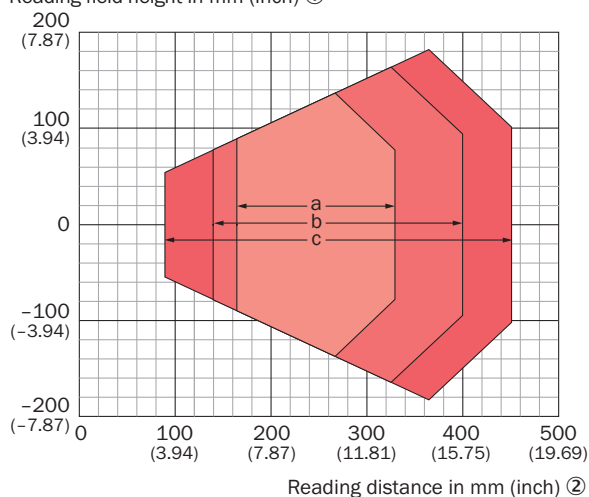
④   Solution

Reading field height in mm (inch) ①

Resolution ③

| | a: 0.35 mm (13.8 mil) | | b: 0.50 mm (19.7 mil) |
| | c: 1.0 mm (39.4 mil) | | |
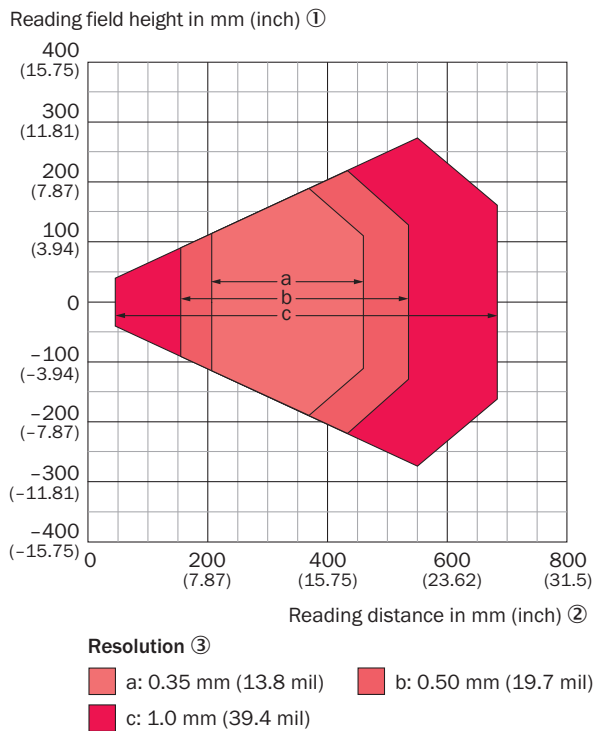
Figure 47: Reading field diagram CLV630, long range, reading window on side

①	Reading field height in mm (inch)
②	Reading distance in mm (inch)
③	Solution

Reading field height in mm (inch) ①

Resolution ③

| | a: 0.35 mm (13.8 mil) | | b: 0.50 mm (19.7 mil) |
| | c: 1.0 mm (39.4 mil) | | |

Figure 48: Reading field diagram CLV630, long range, oscillating mirror, reading window on side

①	Reading field height in mm (inch)
②	Reading distance in mm (inch)
③	Solution

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution ④
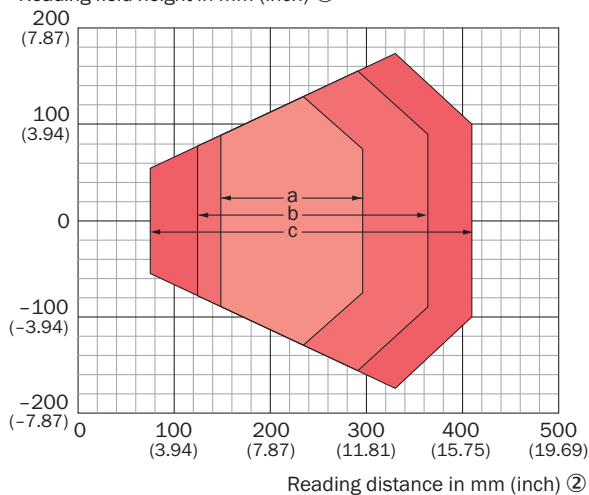
a: 0.35 mm (13.8 mil)   b: 0.50 mm (19.7 mil)

c: 1.0 mm (39.4 mil)

Figure 49: Reading field diagram CLV630, long range, oscillating mirror, oval light spot

①   Reading field height in mm (inch)

②   Reading distance in mm (inch)

③   The depth of field is reduced by approx. 10% for devices with plastic lenses.
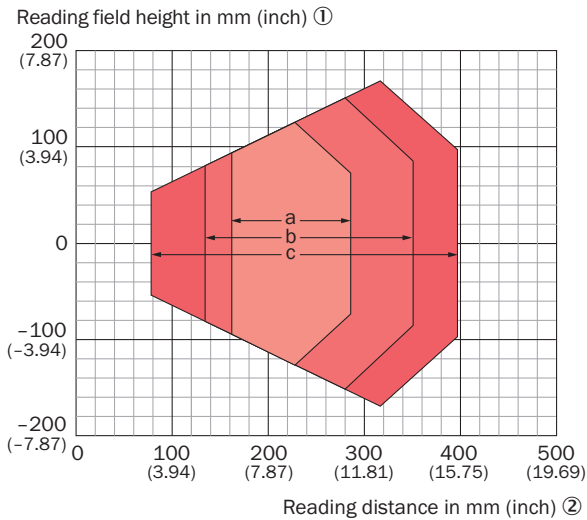
④   Solution

Deflection range in mm (inch) ①

Resolution ③

■ a: 0.35 mm (13.8 mil)

■ b: 0.50 mm (19.7 mil)

■ c: 1.0 mm (39.5 mil)

Figure 50: Oscillating mirror deflection width diagram CLV630, long range, oscillating mirror

①   Deflection width in mm (inch)

②   Reading distance in mm (inch)

③   Solution

12.6.2.2 Mid range

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of
field is reduced by approx. 10 %. ③

Resolution ④

- a: 0.25 mm (9.8 mil)
- b: 0.35 mm (13.8 mil)
- c: 0.50 mm (19.7 mil)

Figure 51: Reading field diagram CLV631, mid range, reading window on front

①　Reading field height in mm (inch)

②　Reading distance in mm (inch)

③　The depth of field is reduced by approx. 10% for devices with plastic lenses.

④　Solution

Reading field height in mm (inch) ①

Resolution ③

- a: 0.25 mm (9.8 mil)
- b: 0.35 mm (13.8 mil)
- c: 0.50 mm (19.7 mil)

Figure 52: Reading field diagram CLV631, mid range, reading window on side

①　Reading field height in mm (inch)
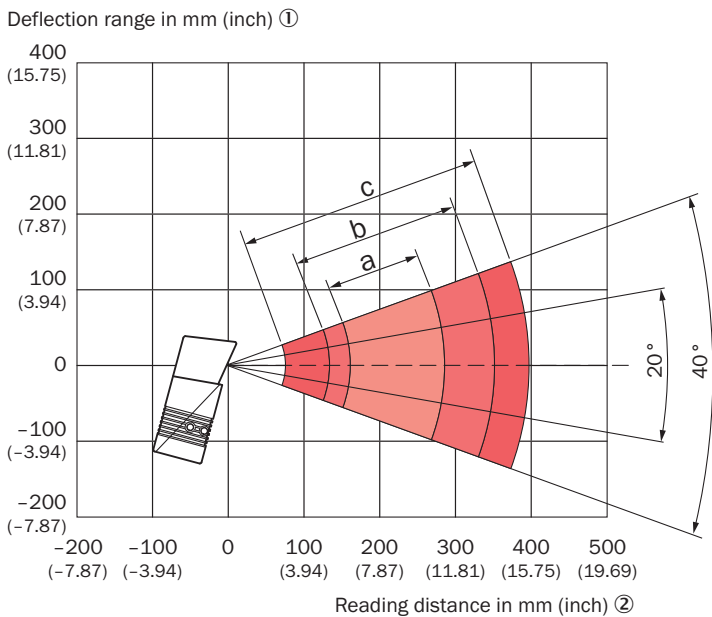
②　Reading distance in mm (inch)

③　Solution

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution ④

a: 0.25 mm (9.8 mil) b: 0.35 mm (13.8 mil)

c: 0.50 mm (19.7 mil)

Figure 53: Reading field diagram CLV631, mid range, oscillating mirror, reading window on side

①   Reading field height in mm (inch)

②   Reading distance in mm (inch)

③   The depth of field is reduced by approx. 10% for devices with plastic lenses.

④   Solution

Deflection range in mm (inch) ①

Resolution ③

a: 0.25 mm (9.8 mil)

b: 0.35 mm (13.8 mil)

c: 0.50 mm (19.7 mil)

Figure 54: Oscillating mirror deflection width diagram CLV631, mid range, oscillating mirror

①   Deflection width in mm (inch)

②   Reading distance in mm (inch)

③   Solution

12.6.2.3   Short range

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution ④

☐ a: 0.20 mm (7.9 mil)   ☐ b: 0.35 mm (13.8 mil)
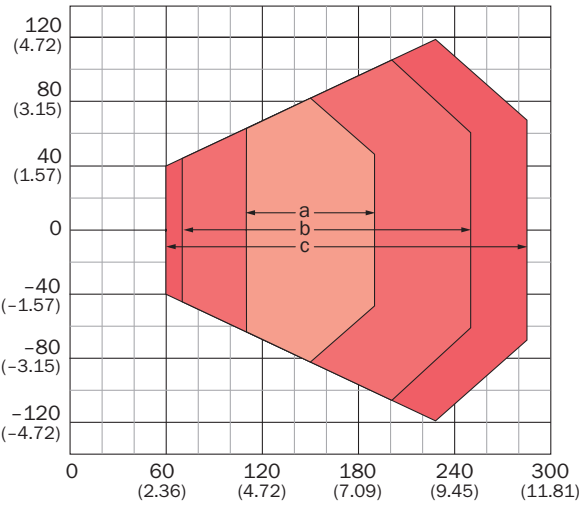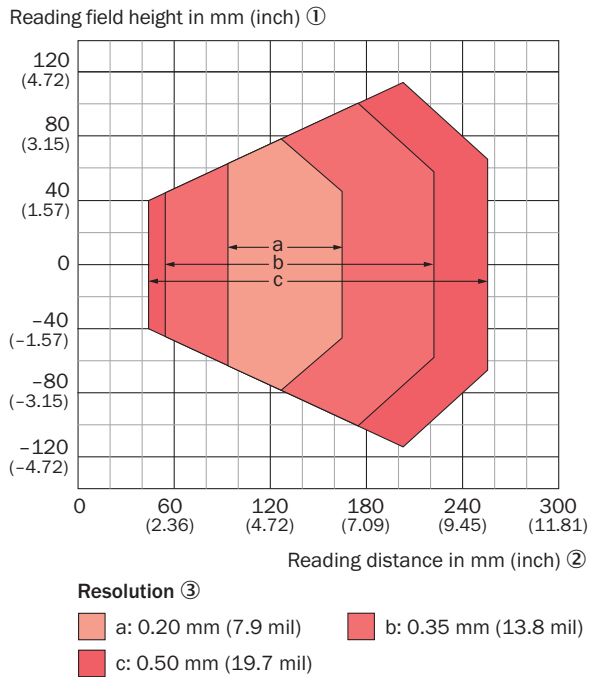☐ c: 0.50 mm (19.7 mil)

Figure 55: Reading field diagram CLV632, short range, reading window on front

①   Reading field height in mm (inch)
②   Reading distance in mm (inch)
③   The depth of field is reduced by approx. 10% for devices with plastic lenses.
④   Solution

Reading field height in mm (inch) ①

Resolution ③

a: 0.20 mm (7.9 mil)   b: 0.35 mm (13.8 mil)

c: 0.50 mm (19.7 mil)

Figure 56: Reading field diagram CLV632, short range, reading window on side

①   Reading field height in mm (inch)

②   Reading distance in mm (inch)

③   Solution
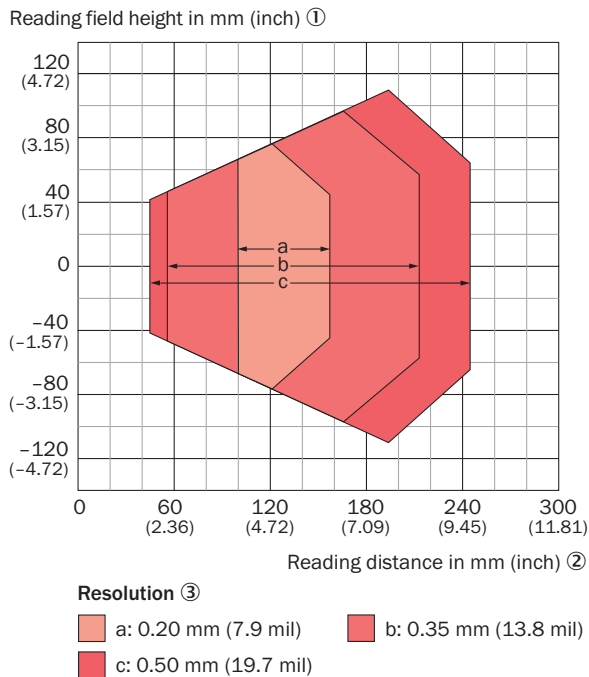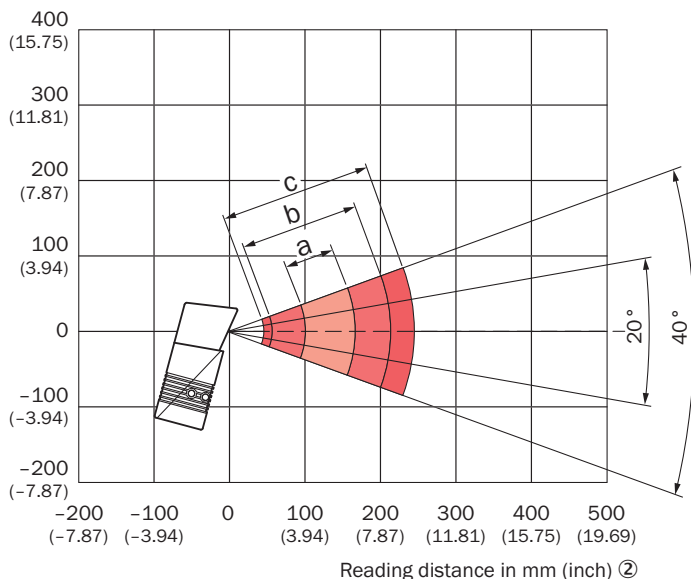
Reading field height in mm (inch) ①

Resolution ③

a: 0.20 mm (7.9 mil)   b: 0.35 mm (13.8 mil)

c: 0.50 mm (19.7 mil)

Figure 57: Reading field diagram CLV632, short range, oscillating mirror, reading window on side

①   Reading field height in mm (inch)

②   Reading distance in mm (inch)

③   Solution

Deflection range in mm (inch) ①

Resolution ③

- ■ a: 0.20 mm (7.9 mil)
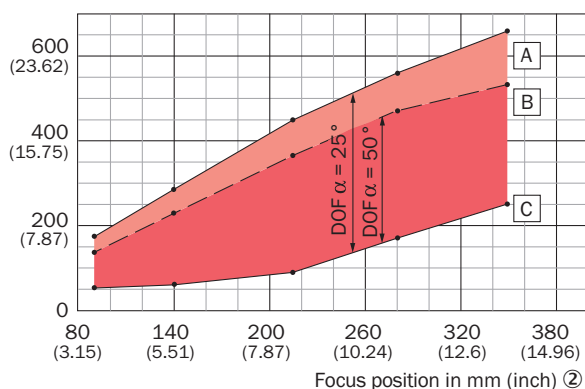- ■ b: 0.35 mm (13.8 mil)
- ■ c: 0.50 mm (19.7 mil)

Figure 58: Oscillating mirror deflection width diagram CLV632, short range, oscillating mirror

①   Deflection width in mm (inch)

②   Reading distance in mm (inch)

③   Solution

12.6.3   Overview of CLV64x reading field diagrams

12.6.3.1   standard resolution

Reading distance in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③
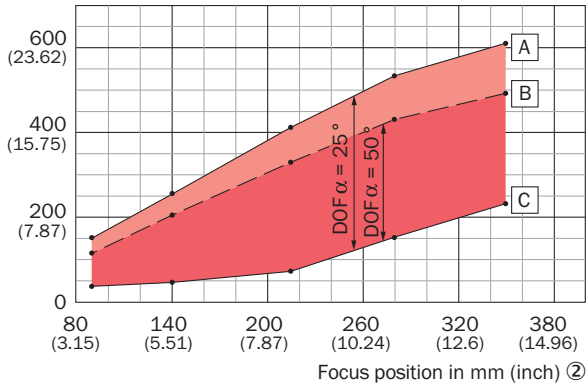
Resolution 0.5 mm (19.7 mil) ④

A   Max. reading distance (aperture angle 25°) ⑤

B   Max. reading distance (aperture angle 50°) ⑥

C   Min. reading distance ⑦

Figure 59: Reading field diagram CLV640, standard density, resolution 0.5 mm (dynamic), reading window on front

①   Reading distance in mm (inch)

②   Focus position in mm (inch)

③   The depth of field is reduced by approx. 10% for devices with plastic lenses.

④   Resolution 0.5 mm (19.7 mil)

⑤   Max. reading distance (aperture angle 25°)

⑥   Max. reading distance (aperture angle 50°)

⑦   Min. reading distance

Resolution 0.5 mm (19.7 mil) ③

| A | Max. reading distance (aperture angle 25°) ④

| B | Max. reading distance (aperture angle 50°) ⑤

| C | Min. reading distance ⑥

Figure 60: Reading field diagram CLV640, standard density, resolution 0.5 mm (dynamic), reading window on side

①   Reading distance in mm (inch)

②   Focus position in mm (inch)

③   Resolution 0.5 mm (19.7 mil)

④   Max. reading distance (aperture angle 25°)

⑤   Max. reading distance (aperture angle 50°)

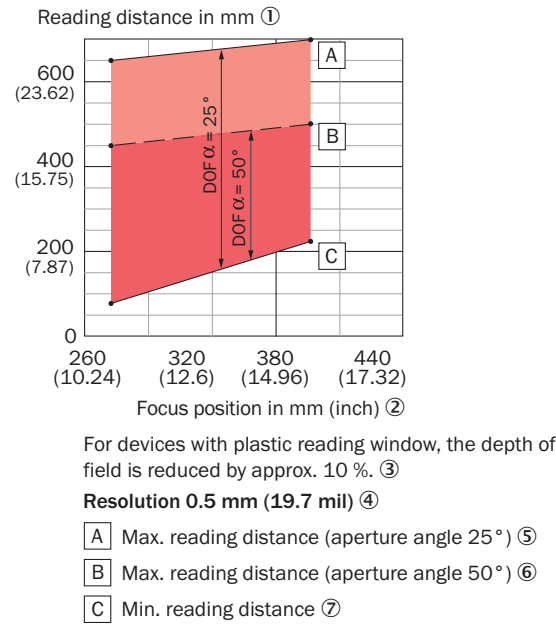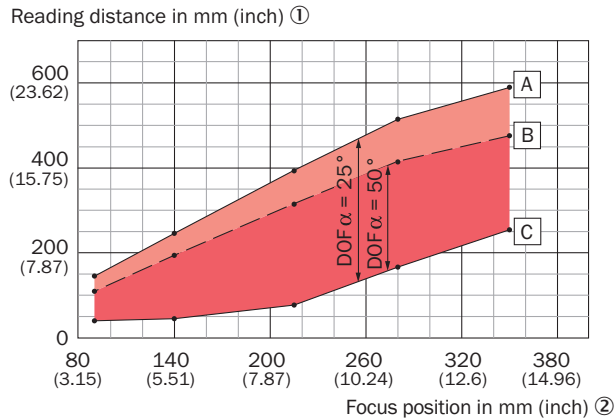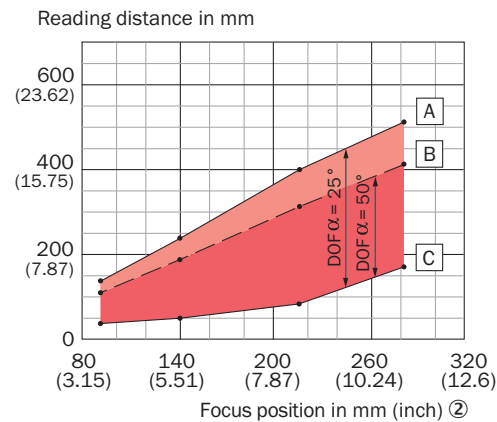⑥   Min. reading distance

Figure 61: Reading field diagram CLV640, standard density, resolution 0.5 mm (dynamic), oval light spot

①	Reading distance in mm (inch)
②	Focus position in mm (inch)
③	The depth of field is reduced by approx. 10% for devices with plastic lenses.
④	Resolution 0.5 mm (19.7 mil)
⑤	Max. reading distance (aperture angle 25°)
⑥	Max. reading distance (aperture angle 50°)
⑦	Min. reading distance

Figure 62: Reading field diagram CLV640, standard density, resolution 0.5 mm (dynamic), oscillating mirror, reading window on side

①	Reading distance in mm (inch)
②	Focus position in mm (inch)
③	The depth of field is reduced by approx. 10% for devices with plastic lenses.

④ Resolution 0.5 mm (19.7 mil)

⑤ Max. reading distance (aperture angle 25°)

⑥ Max. reading distance (aperture angle 50°)

⑦ Min. reading distance

Reading distance in mm

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution 0.5 mm (19.7 mil) ④

A	Max. reading distance (aperture angle 25°) ⑤
B	Max. reading distance (aperture angle 50°) ⑥
C	Min. reading distance ⑦

Figure 63: Reading field diagram CLV640, standard density, resolution 0.5 mm (dynamic), oscillating mirror, oval light spot

① Reading distance in mm (inch)

② Focus position in mm (inch)

③ The depth of field is reduced by approx. 10% for devices with plastic lenses.

④ Resolution 0.5 mm (19.7 mil)

⑤ Max. reading distance (aperture angle 25°)

⑥ Max. reading distance (aperture angle 50°)

⑦ Min. reading distance

> **NOTE**
> The following oscillating mirror deflection widths diagrams are examples for three focus positions.

Deflection range in mm (inch) ①

Reading distance in mm (inch) ②

Resolution ③

■ a: 0.20 mm (7.9 mil)
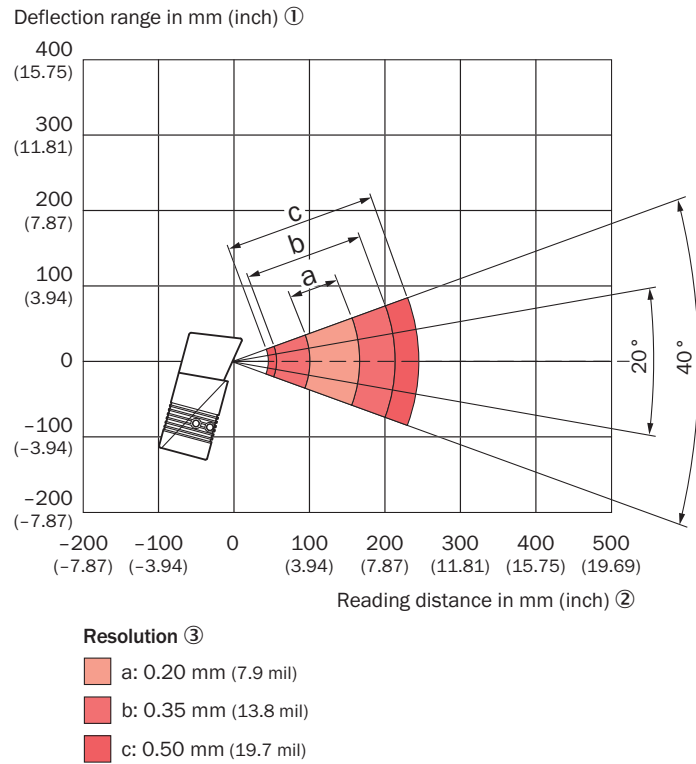
■ b: 0.35 mm (13.8 mil)

■ c: 0.50 mm (19.7 mil)

Figure 64: Oscillating mirror deflection widths diagram CLV640, standard density, focus position 140 mm, oscillating mirror

① Deflection width in mm (inch)

② Reading distance in mm (inch)

③ Solution

Figure 65: Oscillating mirror deflection widths diagram CLV640, standard density, focus position 215 mm, oscillating mirror

①   Deflection width in mm (inch)

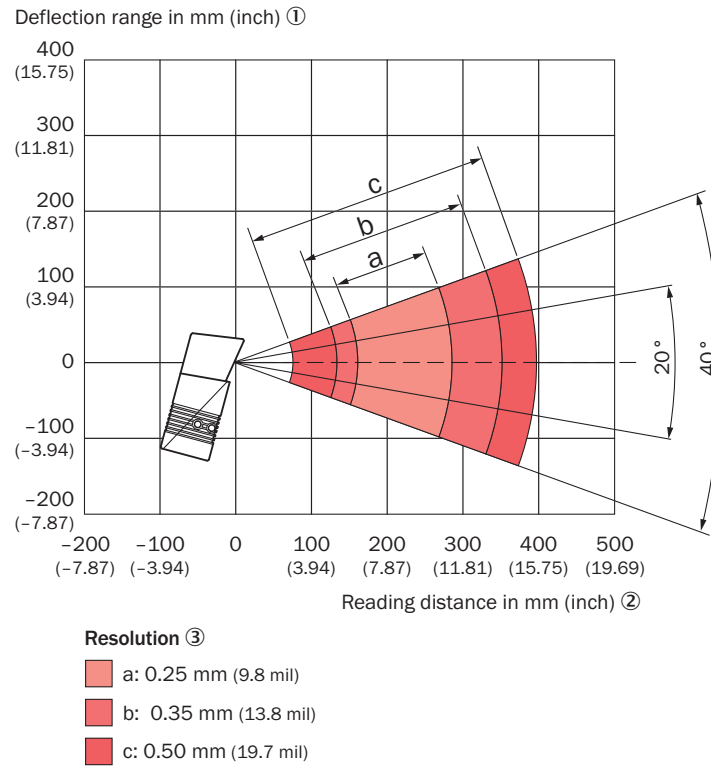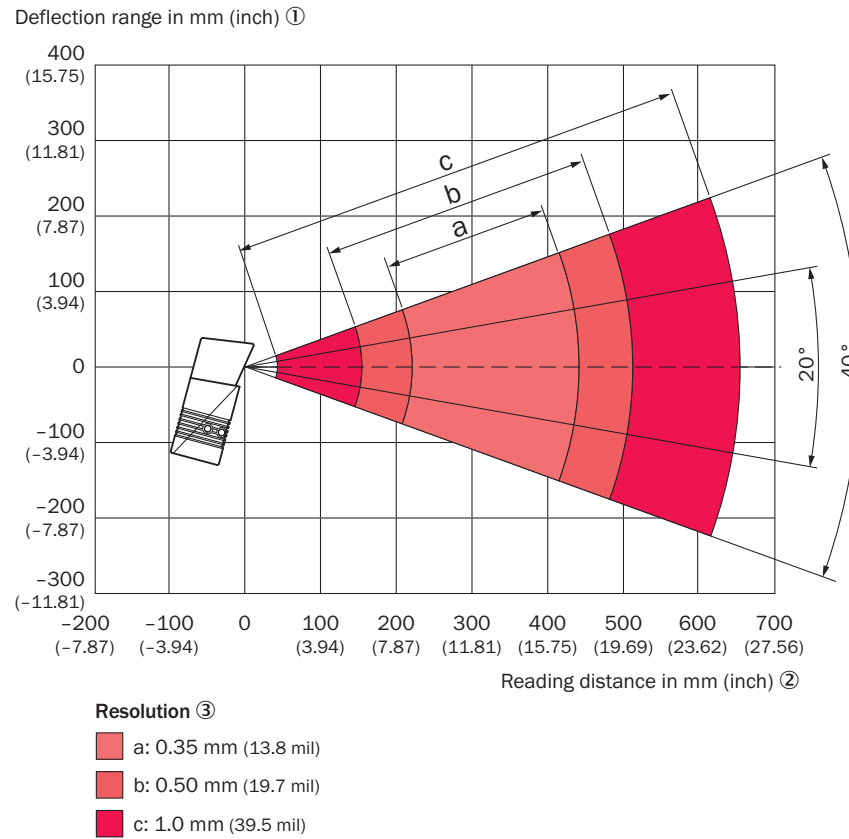②   Reading distance in mm (inch)

③   Solution

Figure 66: Oscillating mirror deflection widths diagram CLV640, standard density, focus position 280 mm, oscillating mirror

①   Deflection width in mm (inch)

②   Reading distance in mm (inch)

③   Solution

12.6.3.2 High resolution

Reading distance in mm (inch) ①

Resolution 0.15 mm (5.9 mil) ③

A Max. reading distance (aperture angle 25°) ④

B Min. reading distance ⑤

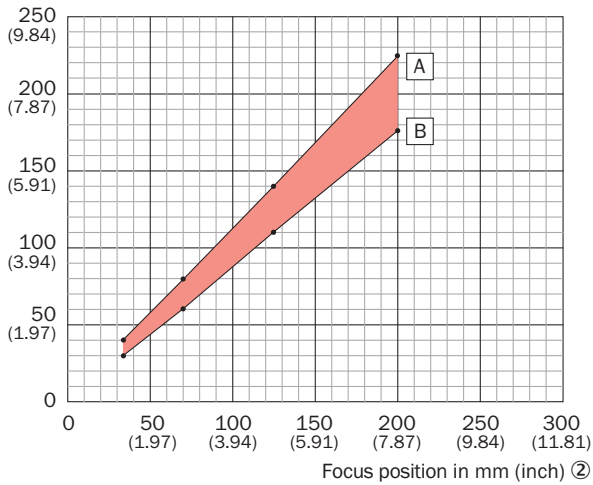*Figure 67: Reading field diagram CLV642, resolution 0.15 mm, reading window on front*

① Reading distance in mm (inch)
② Focus position in mm (inch)
③ Resolution 0.15 mm (5.9 mil)
④ Max. reading distance (aperture angle 25°)
⑤ Min. reading distance

12.6.4 Overview of CLV65x reading field diagrams

12.6.4.1 standard resolution

Reading field height in mm ①

Resolution ③

a: 0.25 mm (9.8 mil)
c: 0.50 mm (19.7 mil)

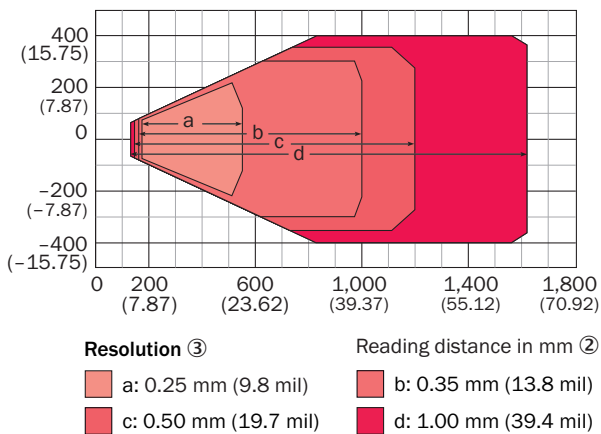Reading distance in mm ②

b: 0.35 mm (13.8 mil)
d: 1.00 mm (39.4 mil)

Figure 68: Reading field diagram CLV650, reading window on front

① Reading field height in mm (inch)
② Reading distance in mm (inch)
③ Solution

Reading field height in mm ①

Resolution ③

- a: 0.25 mm (9.8 mil)
- b: 0.35 mm (13.8 mil)
- c: 0.50 mm (19.7 mil)
- d: 1.00 mm (39.4 mil)

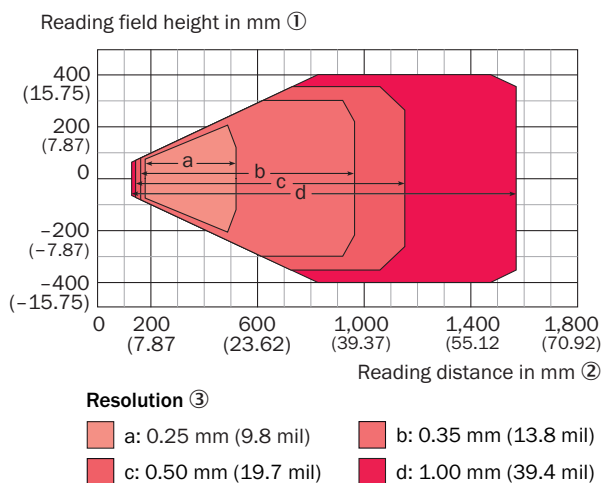*Figure 69: Reading field diagram CLV650, oscillating mirror, reading window on side*

① Reading field height in mm (inch)

② Reading distance in mm (inch)

③ Solution

Reading field height in mm (inch) ①

For devices with plastic reading window, the depth of field is reduced by approx. 10 %. ③

Resolution ④

- a: 0.25 mm (9.8 mil)
- b: 0.35 mm (13.8 mil)
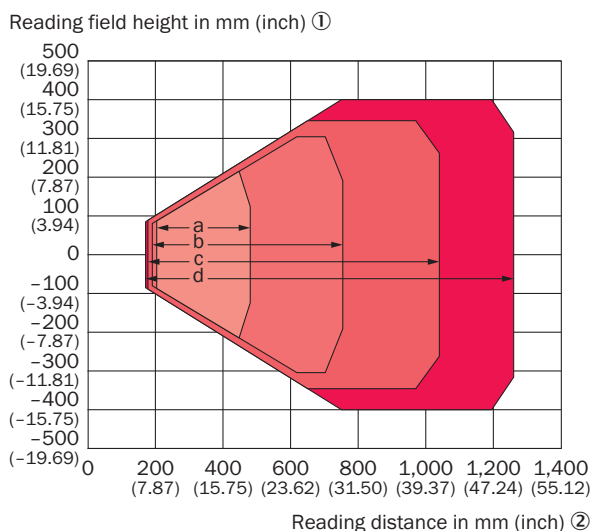- c: 0.50 mm (19.7 mil)
- d: 1.00 mm (39.4 mil)

Figure 70: Reading field diagram CLV650-0120S01, reading window on front, variants with polarizing filters

① Reading field height in mm (inch)

② Reading distance in mm (inch)

③ The depth of field is reduced by approx. 10% for devices with plastic lenses.
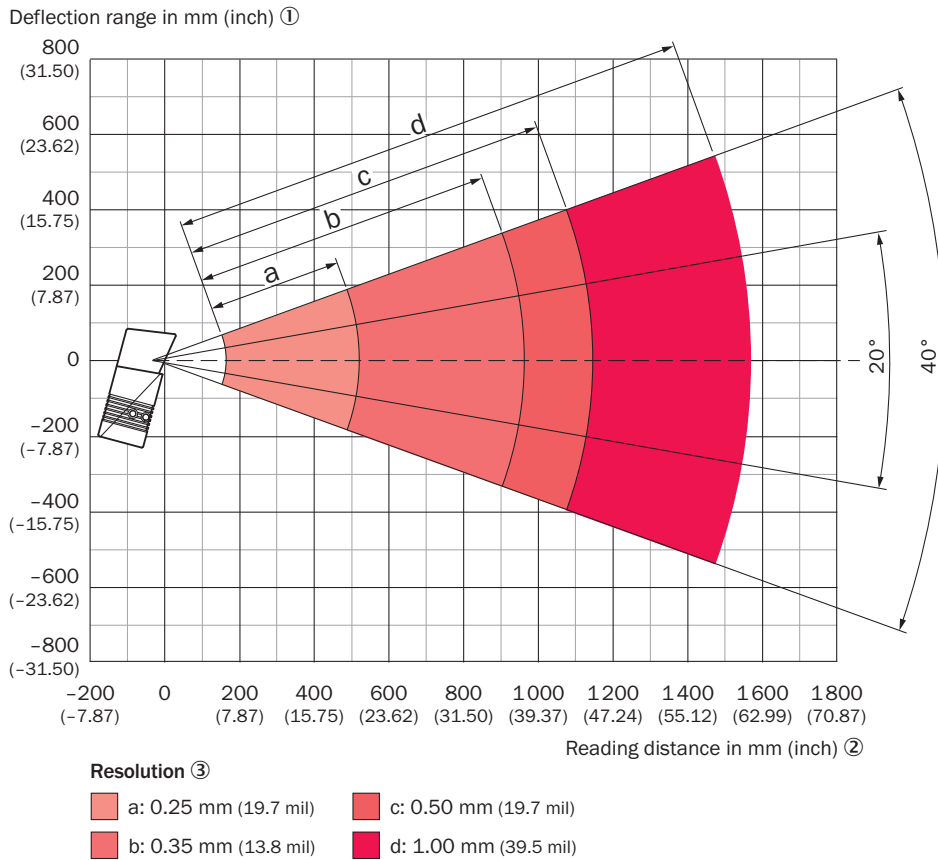
④ Solution

Figure 71: Oscillating mirror deflection widths diagram CLV650, standard density, oscillating mirror

①   Deflection width in mm (inch)

②   Reading distance in mm (inch)

③   Solution

12.6.4.2 Low resolution
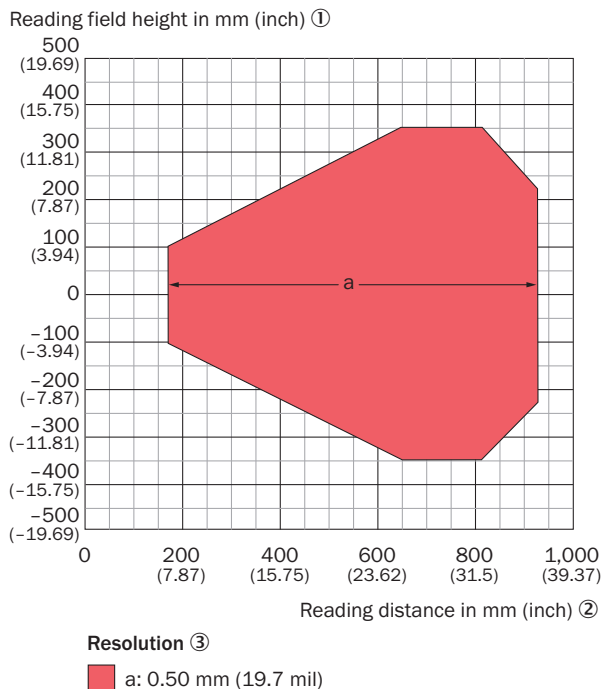
Reading field height in mm (inch) ①

Figure 72: Reading field diagram CLV651, reading window on front

① Reading field height in mm (inch)
② Reading distance in mm (inch)
③ Solution

Reading field height in mm (inch) ①
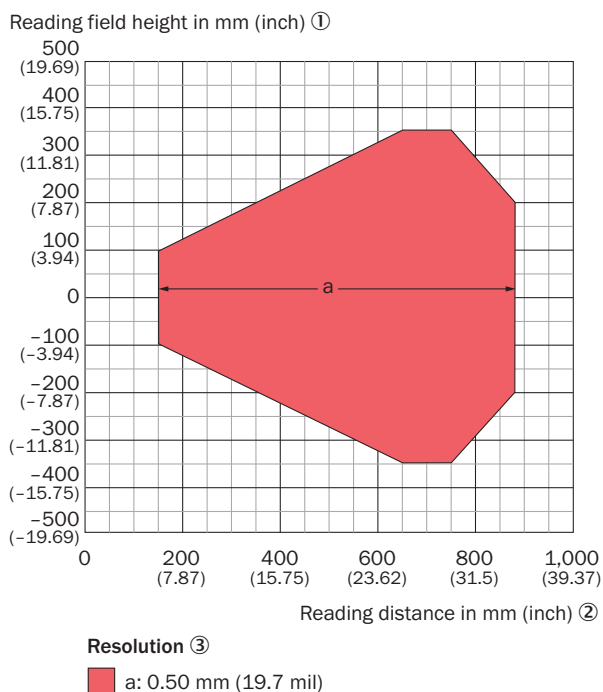
Figure 73: Reading field diagram CLV651, oscillating mirror, reading window on side

① Reading field height in mm (inch)
② Reading distance in mm (inch)
③ Solution

Deflection range in mm (inch) ①
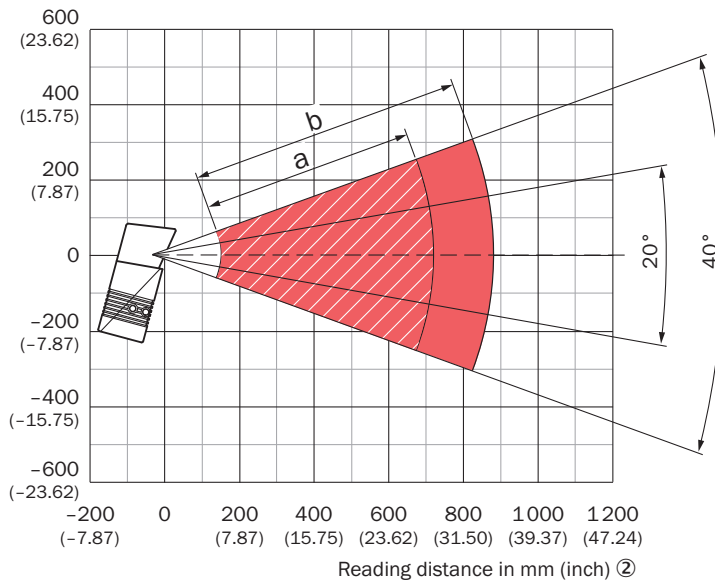
Resolution and tilt ③

a: Resolution = 0.50 mm (19.7 mil), Tilt = 45°

b: Resolution = 0.50 mm (19.7 mil), Tilt = 0°

Figure 74: Oscillating mirror deflection widths diagram CLV651, low density, oscillating mirror

①   Deflection width in mm (inch)
②   Reading distance in mm (inch)
③   Resolution and angle

13 Accessories

13.1 Additional accessories

Accessories such as brackets and cables can be found at:

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

Accessories for devices with heating

Brackets:

- Part no. 2050705
- Part no. 2058082

14 Annex

14.1 Notes on PROFINET

14.1.1 Basic information on PROFINET

SICK recommends familiarizing yourself with the basic information described in the planning guidelines and commissioning guidelines of the PI user organization (PROFIBUS & PROFINET International, homepage: www.profinet.com).

These guidelines can be found in the "Downloads" area at:

- www.profibus.com

14.1.2 General notes on PROFINET wiring

The signal lines must be wrapped in pairs (twisted pairs) and comply with at least CAT5 in line with ISO/IEC 11801 Edition 2.0. Class D. The signal lines must also be shielded and grounded.

SICK recommends using components certified by PROFINET.

More detailed information can be found in the "PROFINET Cabling and Interconnection Technology" Installation Guide.

You can find the document in the "Downloads" area at:

- www.profibus.com

14.1.3 PROFINET Conformance Class

The device complies with PROFINET Conformance Class B (CC-B) and supports the properties defined within.

Further information on the PROFINET Conformance Classes can be found in the document of the PI user organization (PROFIBUS and PROFINET International).

You can find the document in the "Downloads" area at:

- www.profibus.com

14.1.4 General requirements on a switch suitable for PROFINET applications

For PROFINET Conformance Class B and C (CC-B / CC-C), a PROFINET-certified switch which can be configured as a PROFINET device must be used.

For further information, refer to the commissioning guidelines of the PI "Installation Guideline PROFINET Part 2: Network Components".

You can find the document in the "Downloads" area under:

- www.profibus.com

14.1.5 Notes on installing the SICK bar code scanner into a PROFINET network

For 1-port devices, these include:

- LLDP (neighborhood detection) [1]
- I&M 0-4 (device identification) [1]
- Device exchange by topology check [1]
- 16 bit digital "status word" for reading gate result
- 16 bit digital "control word" for controlling the device via PLC
- Heartbeat (for checking communication)
- GSD file for configuring the device using modules via the PLC [1]

[1] Properties of the CC-B

For 2-port devices, these include:

- LLDP (neighborhood detection) [1]
- I&M 0-4 (device identification) [1]
- Device exchange by topology check [1]
- MRP (ring redundancy) [1]
- 16 bit digital "status word" for reading gate result
- 16 bit digital "control word" for controlling the sensor via PLC
- Heartbeat (for checking communication)
- GSD file for configuring the sensor using modules via the PLC [1]

14.1.6 Behavior of the switching outputs of the bar code scanner with "Fieldbus input" reading cycle source

The digital outputs can be configured so that they can show information from other network participants (e.g. external output 1 = fieldbus input).

In the event that a fieldbus is interrupted, these outputs are no longer updated and keep the last value that existed before the interruption.

After switching on the fieldbus (power-up), all digital outputs are set to their "passive" values.

Status of digital outputs with	output value behavior
IOPS = Bad	Contain the last value before cancellation
Connection lost	Contain the last value before cancellation
Switching on the PROFINET network	Values are initialized to "passive"

The reading cycle input can also be controlled by the fieldbus. If the fieldbus is interrupted, the reading cycle input is no longer updated. Reading results can get lost since the reading cycle input keeps the last value from before the interruption.

After switching on the fieldbus (power-up), the reading cycle input is set to its "passive" value.

14.2 EU declaration of conformity / Certificates

The EU declaration of conformity and other certificates can be downloaded from the Internet at:

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

14.3 Certification in accordance with UL60950

The devices in the CLV61x, CLV61x Dual Port, CLV62x, CLV63x, CLV64x, CLV65x series are certified to UL60950-1; the UL file number is E244281-A6. The devices must be supplied by LPS or Class 2 power supply units in order to ensure UL-compliant operation.

UL certification is only valid with corresponding device identification on the type label of the respective device; see see "Type label", page 13.

- Laser power and laser warning notes, see "Hazard warnings and operational safety", page 9.
- IP65 enclosure rating of the devices not checked by UL.

14.4 Dimensional drawings

Current dimensional drawings and CAD data for your device in various electronic formats can be downloaded online:

- www.sick.com/CLV63x
- www.sick.com/CLV64x
- www.sick.com/CLV65x

14.5 Abbreviations used

Table 17: Abbreviations used

CAN	Controlled Area Network. Field bus log based on the CAN bus
CDB	Connection Device Basic
CDF	Connection Device Fieldbus
CDM	Connection Device Modular
CE	Communauté Européenne. European Community
CLV	Code-Leser V-Prinzip [Code reader V principle]
CMC	Connection Module Cloning
CMD	Connection Module Display
CMF	Connection Module Fieldbus
CMP	Connection Module Power
CA	CodeAngle
DOF	Depth Of Field. Depth of field
ESD	Electro-Static Discharge. Electrostatic discharge
GSD	General Station Description (generic station description for PROFIBUS/ PROFINET)
HTML	Hyper Text Markup Language (page description language on the Internet)
I	Input
LED	Light Emitting Diode. Light emitting diode
LPS	Limited Power Supply
MAC	Medium Access Control
MTTF	Mean Time To Failure
MTTR	Mean Time To Repair
O	Output
PCS	Printed Contrast Signal
PROM	Programmable Read Only Memory. Programmable non-volatile memory
RA	Reading Angle
RAM	Random Access Memory. Direct-access volatile memory
ROM	Read Only Memory. Read-only memory (non-volatile)
RTF	Rich Text Format (standardized document format with format description)
SD	Secure Digital
SMART	SICK Modular Advanced Recognition Technology
SOPAS ET	SICK Open Portal for Application and Systems Engeneering Tool (PC software for Windows for the configuration of the device)

PLC	**P**rogammable **L**ogic **C**ontroller
TCP/IP	**T**ransmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol

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