

Laser measurement sensor
LD-LRS36xx



High-Performance, Long-distance Laser Scanner for Outdoor Areas



Software version described

Software/tool	Function	Status
LD-LRS	Firmware	V 1.10 or higher
Device description LD-LRS	Device specific software module for SOPAS ET	V 1.000 or higher
SOPAS ET	Configuration software	V 02.28 or higher

Software access to the LD-LRS is password protected. The default factory setting for the password is as follows:

User level	Password
Authorised client	client

NOTICE

The LD-LRS laser measurement sensor is intended for use in industrial environments. When used in residential areas, it can cause radio interferences.

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 Auto Ident, Reute Plant
 Nimburger Straße 11
 79276 Reute
 Germany

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Version of the operating instructions

The latest version of these operating instructions can be obtained as PDF at www.sick.com.

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Abbreviations

CoLa	Communication Language = proprietary SOPAS ET communication language (ASCII = CoLa-A or binary = CoLa-B)
EEPROM	Electrically Erasable Programmable Read-only Memory
LED	Light emitting diode
RAM	Random Access Memory = volatile memory with direct access
ROM	Read-only Memory = read-only memory (non volatile)
SOPAS ET	SICK OPEN PORTAL for APPLICATION and SYSTEMS ENGINEERING TOOL = configuration software for the configuration of the LD-LRS
USP	Protocol for user-programmed evaluation

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1 About this document

Please read this chapter carefully before working with this documentation and the laser measurement sensor LD-LRS.

1.1 Function of this document

These operating instructions are designed to address the technical personnel in regards to safe mounting, electrical installation, configuration, commissioning and maintenance of the following versions of the laser measurement sensor.

- LD-LRS3600
- LD-LRS3601
- LD-LRS3611

LD-LRS3600 is equipped with a field application and CoLa A/B.

LD-LRS3601 is a raw data measurement sensor with USP and CoLa A/B.

LD-LRS3611 is a raw data measurement sensor with USP, CoLa A/B and extended range.

1.2 Target group

The intended target group for this document is people in the following positions:

Activities	Target group
Mounting, electrical installation, maintenance and replacement	Factory electricians and service engineers
Commissioning, operation and configuration	Technicians and engineers

Tab. 1: Target groups of this document

1.3 Depth of information

These operating instructions contain the following information on the LD-LRS:

- Product description
- Assembly
- Electric installation
- Commissioning and configuration
- Maintenance
- troubleshooting and rectification
- Ordering information
- conformity and approval

Planning and using a laser measurement sensor such as the LD-LRS also require specific technical skills which are not detailed in this documentation.

In addition, an online help is available in the SOPAS ET configuration software supplied; this help provides information on the usage of the software user interface, as well as on the configuration of the LD-LRS.

Further information on the LD-LRS is available from SICK AG, Division Auto Ident, and in the Internet at www.sick.com.

Important All variants of the LD-LRS (3600, 3601, 3611) are referred to as "LD-LRS" for short. The device designation will be given in full, if necessary.

1.4 Symbology used

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

Important Sections marked “Important” provide information about special features of the device.

Explanation Explanations provide background knowledge on technical relationships.

MENU COMMAND This typeface indicates a term in the SOPAS ET user interface.

Terminal output This typeface indicates messages that the LD-LRS outputs via its interfaces.

➤ **Take action ...** Here you must do something. This symbol indicates an instruction to perform an action that contains only one action or actions in warnings where a specific sequence does not need to be followed. Instructions to perform actions that contain several steps in a specific sequence are numbered.



This symbol refers to additionally available documentation.



Software notes show where you can make the appropriate settings and adjustments in the SOPAS ET configuration software.

NOTICE

Note!

A note provides indicates potential hazards that could involve damage or degradation of the functionality of the LD-LRS or other devices.



WARNING

Warning!

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

The safety symbol beside the warning indicates the nature of the risk of accident, e.g. due to electricity. The warning category (DANGER, WARNING, CAUTION) indicates the severity of the hazard.

➤ Read carefully and follow the warning notices!

2 For your safety

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

- Please read this chapter carefully before working with the LD-LRS.

2.1 Authorised personnel

The LD-LRS must only be installed, commissioned and serviced by adequately qualified personnel.

NOTICE

Repairs to the LD-LRS are only allowed to be undertaken by trained and authorised service personnel from SICK AG.

The following qualifications are necessary for the various tasks:

Activities	Qualification
Mounting and maintenance	<ul style="list-style-type: none"> • Basic technical training • Knowledge of the current safety regulations in the workplace
Electrical installation and replacement	<ul style="list-style-type: none"> • Practical electrical training • Knowledge of current electrical safety regulations • Knowledge on the use and operation of devices in the related application (e.g. crane, assembly system)
Commissioning, operation and configuration	<ul style="list-style-type: none"> • Knowledge on the use and operation of devices in the related application (e.g. crane, assembly system) • Knowledge on the software and hardware environment in the related application (e.g. crane, assembly system) • Basic knowledge of the Windows operating system • Basic knowledge of data transmission

Tab. 2: Authorised personnel

2.2 Proper use

NOTICE

The LD-LRS laser measurement sensor is intended for use in industrial environments. When used in residential areas, it can cause radio interferences.

The LD-LRS long-range laser measurement system's superior technology with scanning ranges of up to 250 m automates ship loading operations when using ship-to-shore cranes, which greatly reduces the time spent in the loading port. The high-performance laser optics system performs non-contact scanning of the container stack and precisely detects all obstacles impeding the movement. The LD-LRS provides precise measurement data to determine the container stack profile, thus saving time and ensuring the highest level of handling reliability during loading.

The profile measurement of the filling state of bulk material stockpiles can be converted into a 3D model in order to determine the exact surface structure of the stockpile for controlling the loading system, which then optimizes removal.

In conjunction with the field application, the LD-LRS can also be used for building safety and security and for monitoring a variety of access zones outdoors.

The LD-LRS is a sensor for use outdoors; it can also be used indoors if required.

Important In case of any other usage as well as in case of modifications to the LD-LRS, e.g. due to opening the housing during mounting and electrical installation, or to the SICK software, any claims against SICK AG under the warranty will be rendered void.

NOTICE

The LD-LRS is only allowed to be operated in the ambient temperature range allowed (see [section 9.1 "Data sheet LD-LRS" on page 67](#)).

2.3 General safety notes and protective measures



WARNING

Safety instructions

Please observe the following items in order to ensure the correct and safe use of the LD-LRS.

- The notices in these operating instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.
- When operating the LD-LRS, the national, local and statutory rules and regulations must be observed.
- National/international rules and regulations apply to the installation, commissioning, use and periodic technical inspections of the LD-LRS, in particular
 - the work safety regulations/safety rules
 - other relevant health and safety regulations.
- Manufacturers and operators of the machine/system on which the LD-LRS is installed are responsible for obtaining and observing all applicable safety regulations and rules.
- The tests must be carried out by specialist personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.
- The operating instructions must be made available to the operator of the system where the LD-LRS is used. The operator of the system is to be instructed in the use of the device by specialist personnel and must be instructed to read the operating instructions.
- The LD-LRS is not a device for the protection of people in the context of the related safety standards for machinery.

2.3.1 Electrical installation work

NOTICE

- Only authorised personnel are allowed to perform the electrical installation work.
- Only make and disconnect electrical connections when the device is electrically isolated.
- Select and implement wire cross-sections and their correct fuse protection as per the applicable standards.
- Do not open the housing.
- Observe the current safety regulations when working on electrical systems.

2.3.2 Laser radiation of the LD-LRS



CAUTION

Laser radiation!

The LD-LRS corresponds to laser class 1 (eye-safe) according to EN/IEC 60825-1:2014. Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50. The laser beam is not visible to the human eye.

- Improper use can lead to hazardous radiation exposure.
- Do not open the housing (opening the housing does not prevent the laser from switching on).
- Pay attention to the laser safety regulations as per IEC 60825-1 (latest version).

Important No maintenance is necessary to ensure compliance with laser class 1.

Laser output aperture

The laser output aperture is the view window on the scanner head of the LD-LRS.



Fig. 1: Laser output aperture on the LD-LRS

Laser power

The laser operates at the wavelength $\lambda = 905$ nm (invisible infrared light). The radiation emitted in correct use is not harmful to the eyes and human skin.

2.4 Quick stop and Quick restart

2.4.1 Switch the LD-LRS off

- Switch off the voltage supply (power supply) for the LD-LRS.

The LD-LRS retains parameters stored in the internal, non-volatile memory. Measured values in the memory are lost.

2.4.2 Switch on the LD-LRS

- Switch on voltage supply (power supply) for the LD-LRS.

The LD-LRS restarts operation with the last saved parameters.

2.5 Environmental protection

The LD-LRS has been designed to minimise environmental impact. It uses only a minimum of power.

While working, always act in an environmentally responsible manner. For this reason please note the following information on disposal.

2.5.1 Power consumption

- The LD-LRS draws a maximum of 36 W in operation (however, on power up the power supply must be able to briefly supply 2.1 A).
- In addition the device also draws a maximum of 144 W in cycles for the heating.

2.5.2 Disposal after final de-commissioning

- Always dispose of unserviceable or irreparable devices in compliance with local/national rules and regulations on waste disposal.
- Dispose of all electronic assemblies as hazardous waste. The electronic assemblies are straightforward to dismantle.

Important SICK AG does not accept unusable or irreparable devices that are returned.

3 Product description

This chapter provides information on the special features and properties of the LD-LRS. It describes the construction and the operating principle of the device, in particular the different operating modes.

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

3.1 Scope of delivery

The LD-LRS delivery includes the following components:

Piece(s)	Component	Comment
1	Laser measurement sensor LD-LRS	–
1	Device instructions with electrical circuit diagram for getting started	Is included in the LD-LRS packaging
1	Lens cloth	–
1	20 pin Harting socket	–

Tab. 3: Scope of delivery

Source for obtaining additional information

Additional information about the LD-LRS and its optional accessories can be found in the following places:

Product web page for the LD-LRS

www.sick.com/LD_LRS

- Detailed technical specifications (online data sheet)
- Technical information (supplementary information on telegrams for CoLa A/B, part no.: 8016855 and USP, part no.:8016687)
- These operating instructions are available in German, English and other languages if required.
- Dimensional drawing and 3D CAD dimension models in various electronic formats
- EC declaration of conformity

SOPAS configuration software updates Support is also available from your sales partner:

www.sick.com/worldwide.

3.2 Construction of the LD-LRS

3.2.1 Views of device

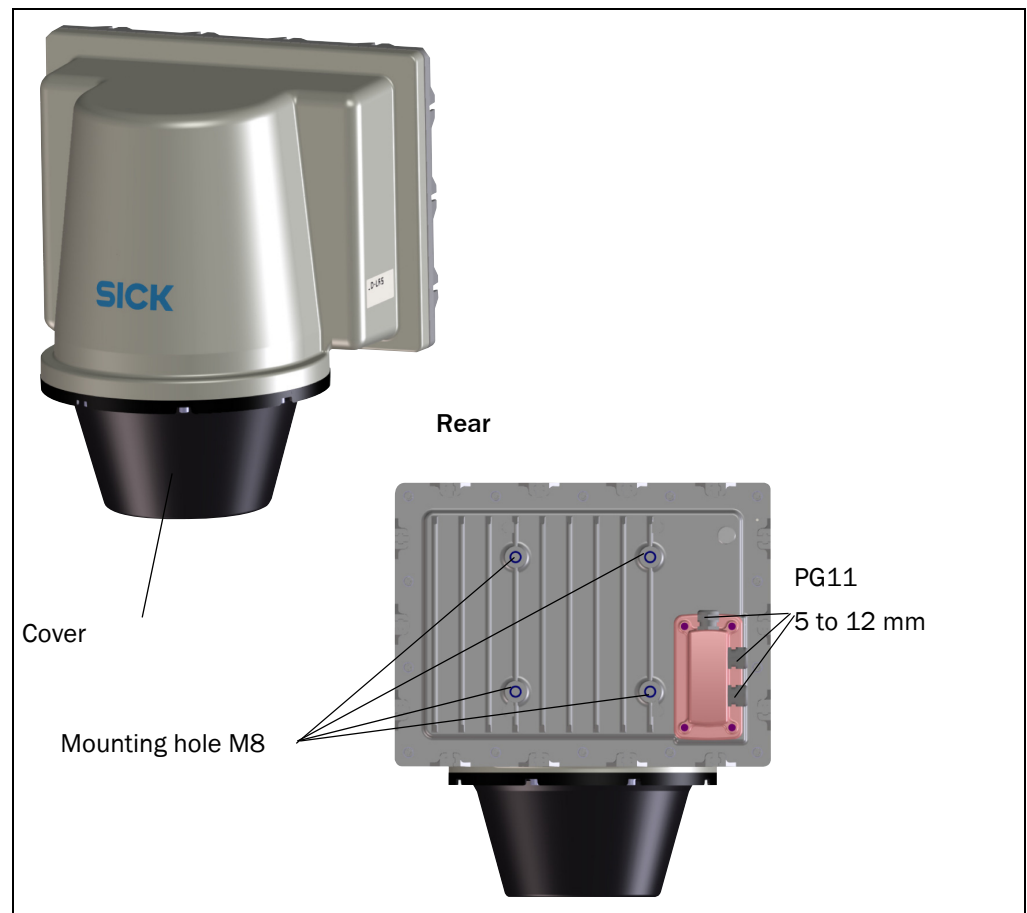


Fig. 2: Views of device

3.2.2 Operating and display elements

User interface

The LD-LRS operates fully automatically in normal operation without the intervention of an operator.

The interactive configuration is carried out using the provided SOPAS ET configuration software. The software used for this purpose runs on a PC with the operating system Windows that is connected to the LD-LRS via one of the interfaces.

Use the graphic scan view in SOPAS ET to verify the generated measured values and to verify the measurement area online. During this process, and depending on the configuration of the device, note that SOPAS ET cannot display the data in real-time and therefore does not display all measured values.

NOTICE

- Intrusion and tech-in function are available for LD-LRS3600 only.
- USP Command is available for LD-LRS3601/3611 only.

3.3 Special features of the LD-LRS

Special features	Specific form
Performance	<ul style="list-style-type: none"> • Contact-free, active measurement • Range up to 250 m • Integrated self-regulating heater • Resolution of angular step width: max. 1/16° interlaced • Max. pulse frequency of laser diode 14.4 kHz • Flexible system configurations • Configurable scan areas <p>output of measured values (raw data)</p> <ul style="list-style-type: none"> • Profile of the field of view in two-dimensional polar coordinates as hex values • Contents of one revolution (360°): incl. number of the profile emitted, profile counter, sector numbers, step width, number of points per sector, time stamp for start/end of each sector, direction at the start/end of each sector, value and direction of the distances measured, status <p>Near range filter (digital)</p> <ul style="list-style-type: none"> • Suppression of near range interference <p>LD-LRS3600: integrated field applications</p> <ul style="list-style-type: none"> • Six configurable evaluation fields assigned to the digital outputs of the LD-LRS (rotational frequency of the scanner head: max. 5 to 15 Hz) • Contour monitoring evaluations programmable by the user <p>LD-LRS3601/3611: User Service Protocol (USP) via Ethernet, CoLa A/B</p> <ul style="list-style-type: none"> • Configuration/measurement request via User Service Protocol (command strings) • USP Ethernet Port: 49152
Safety and convenience	<ul style="list-style-type: none"> • Robust, compact PU/aluminium housing (max. IP 67), CE marking • Laser class 1 • Maintenance-free
Configuration/operation	<ul style="list-style-type: none"> • Configuration using SOPAS ET software for PC • Alternatively using CoLa-A (ASCII) or CoLa-B (Binär) telegrams (command strings)
Electric interfaces	<ul style="list-style-type: none"> • Supply voltage DC 24 V • Data interfaces: Ethernet, RS-422 serial • LD-LRS3600: 4x switch outputs (3x OUTPUT, 1x SYNC/OUTPUT) • LD-LRS3601/3611: 1 x output signal switching device for synchronisation

Tab. 4: Special features of the LD-LRS

3.4 Applications

- Container automation: determining and logging positions
- Piece goods: surveying shape, position and volume of objects
- Bulk materials: determination of volume and contours, determination of angle of repose, stockpile measurement
- Crane control: profile measurement, collision protection, position detection and guidance
- Surveying: floor plan surveying, longitudinal and cross profiles in buildings
- Mining: tunnel and cavern measurement
- Buildings: facility protection, access control, safeguard of facades and areas (LD-LRS3600)

3.5 Operating principle of the LD-LRS

The LD-LRS is an opto-electronic laser measurement system that electro-sensitively scans the contour of its surroundings in a plane with the aid of laser beams.

Electro-sensitively scans the contour of its surroundings in a plane with the aid of laser beams. The LD-LRS measures its surroundings in two-dimensional polar coordinates. If a measurement beam is incident on an object, the position is determined in the form of distance, and direction.

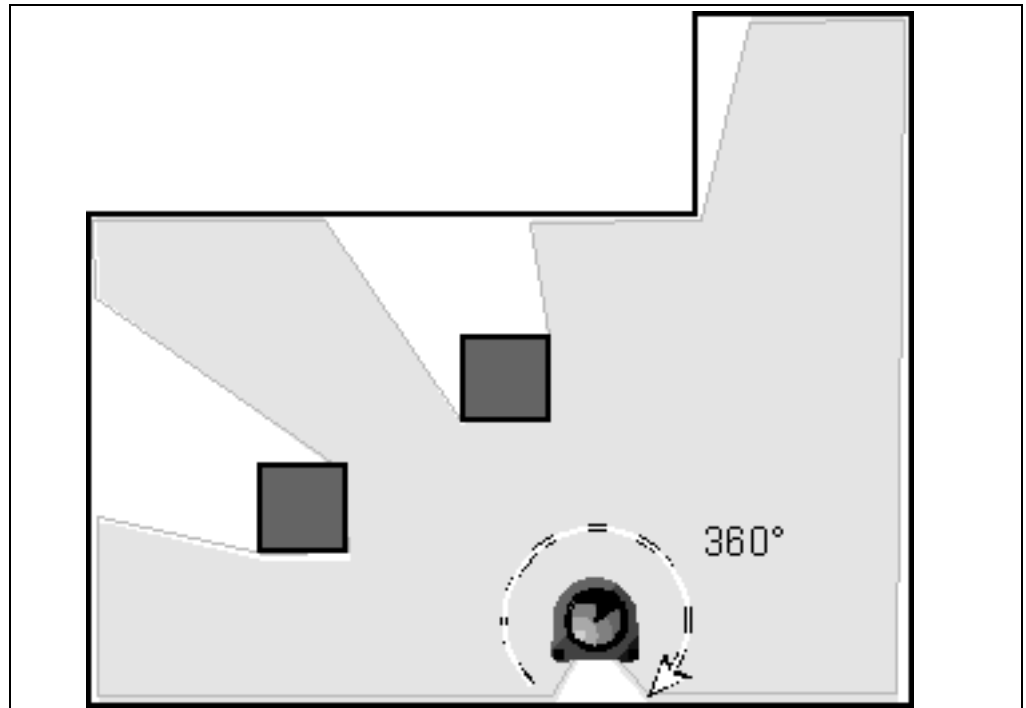


Fig. 3: Example of the measurement result

Scanning takes place in a sector of e.g. 360°. The scanning ranges of the sensors in the LD-LRS are approx. 250 m to bright, natural surfaces (e.g. a white house wall).

3.5.1 Distance measurement

The LD-LRS emits pulsed laser beams through a laser diode. When such a laser pulse hits an object, it is reflected by its surface. The reflection is registered by a photo diode in the receiver of the laser measurement system. From the propagation time that the light requires from emission to reception of the reflection at the sensor, it calculates the distance to the object.

This principle of "pulsed time of flight measurement" is used in a similar way by radar systems. A mirror in the scanner head deflects the emitted laser beams which scan the surroundings circularly. The measurements are triggered in regular angular steps by an angular encoder.

3.5.2 Directional measurement

The scanner head rotates at a selectable frequency of 5 to 15 Hz. During this process, a laser pulse and therefore a distance measurement is triggered after an angular step of 0.25° (adjustable). Distance measurement The highest possible angular resolution during interlace operation is 0.0625° . In interlaced mode, individual scans are taken offset at an angle one to the other with the maximum resolution that is technically possible. Combining the scans externally enables a higher overall resolution to be achieved.

The angular resolution can be selected as integer multiple of 0.125° . This is specified by the angular encoder with 5,760 steps.

3.5.3 Influences of objects on the measurement

The majority of surfaces reflect the laser beam diffusely in all directions. The reflection of the laser beam will vary as a function of the surface structure and colour. Light surfaces reflect the laser beam better than dark surfaces and can be detected by the LD-LRS over larger distances. Brilliant white plaster reflects approx. 100% of the incident light, black foam rubber approx. 2.4%. On very rough surfaces, part of the energy is lost due to shading. The scanning range of the LD-LRS will be reduced as a result.

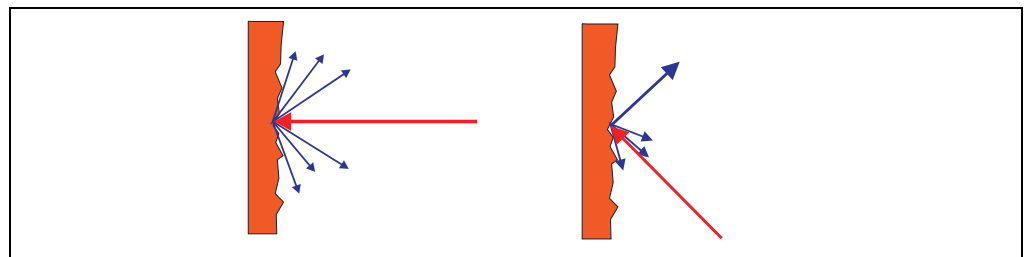


Fig. 4: Diffuse reflection from objects

The reflection angle is the same as the angle of incidence. If the laser beam is incident perpendicularly on a surface, the energy is optimally reflected (on the left). If the beam is incident at an angle, a corresponding energy and scanning range loss is incurred (on the right).

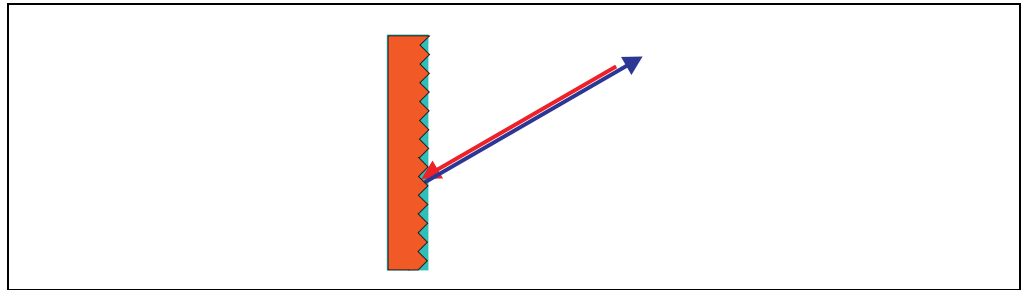


Fig. 5: Directional reflection from reflectors

The incident radiation is not reflected diffusely in all directions by reflectors, but directionally. As a result a large portion of the energy emitted can be received by the LD-LRS. The LD-LRS makes use of this situation to be able to exactly measure the positions of reflectors.

Possible sources of errors

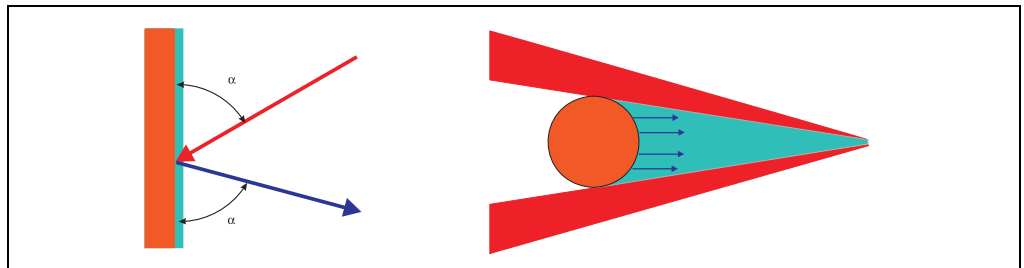


Fig. 6: Possible sources of errors during the measurement

At mirror surfaces (fig. 6, on the left) the laser beam is almost entirely deflected. Instead of the surface of the mirror, it is possible that the object on which the deflected laser beam is incident may be detected.

Objects that are smaller than the diameter of the laser beam (fig. 6, on the right) cannot re-reflect all the energy of the laser light. The energy in the portion of the laser light that is not reflected is lost. This means that the scanning range is less than would be possible theoretically based on the surface of the object.

3.5.4 Scanning range of the LD-LRS

The scanning range of the LD-LRS is dependent on the remission of the objects to be detected. The better a surface reflects the incident radiation, the greater the scanning range of the LD-LRS.

Material	Remission	Measuring range LD-LRSxx0x	Measuring range LD-LRSxx1x
Black photographic cardboard, matte	10%	2.5 ... 80 m	5 ... 120 m
White cardboard	90%	2.5 ... 250 m	5 ... 250 m
Reflective tape	>3000%	2.5 ... approx. 250 m (8.2 ... 820.2 ft)	5 ... approx. 250 m (16.5 ... 820.2 ft)

Tab. 5: Typical remissions and scanning ranges

3.5.5 Beam diameter and distance between measured points

With increasing distance from the LD-LRS the laser beam increases in size. As a result the beam diameter on the surface of the object increases.

The distance-dependent beam diameter is the distance (mm (in)) \times 0.0028 rad + 40 mm (1.6 in).

With increasing distance from the LD-LRS the spacing between the individual measured points also increases. The distance between the measured points is also dependent on the angular resolution configured. With a coarser resolution, the distance is larger, with a finer resolution the distance is smaller.

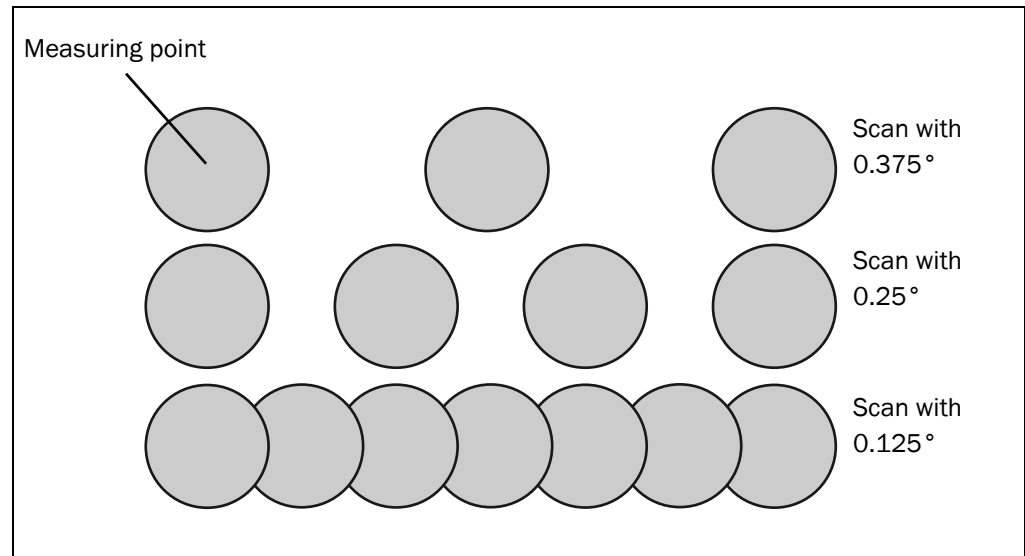


Fig. 7: Schematic representation of the distance between measurement points of different angular resolutions

The two diagrams in [fig. 8](#) and [fig. 11](#) show the beam diameter and the distance between the measured points as a function of the distance from the LD-LRS.

Explanation The grey areas in the diagrams mark the area in which the distance between the measured points is larger than the beam diameter. In these areas there are therefore gaps between the points measured.

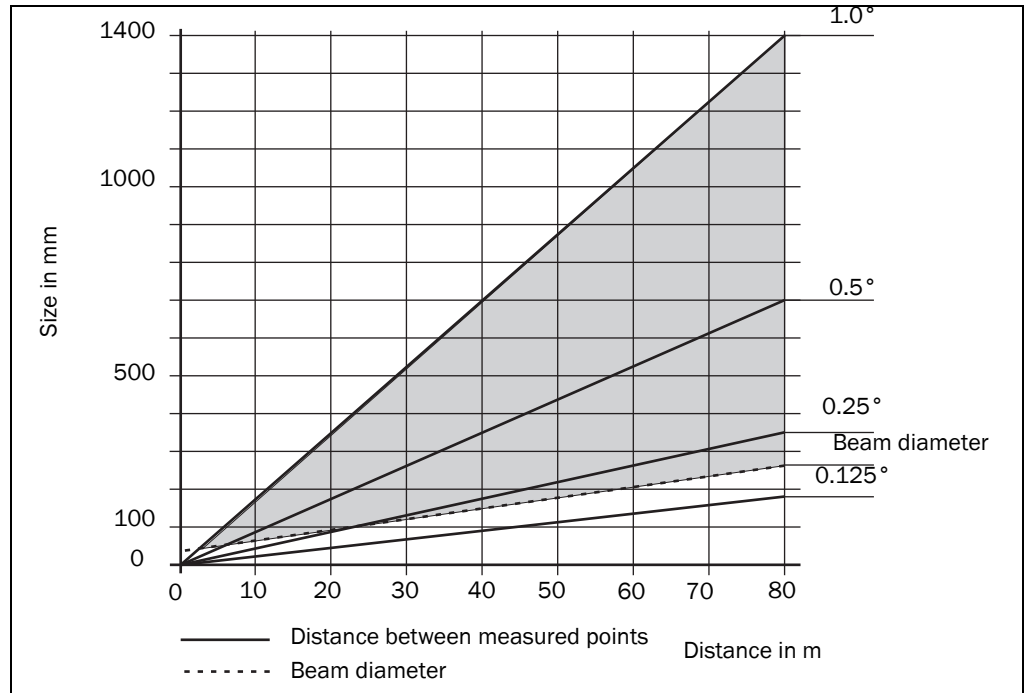


Fig. 8: Beam diameter and distance between measured points at 0 to 80 m

Example for angular resolution 0.125° in fig. 8

Distance 60 m (196.85 ft)

Distance intersection point 60 m (196.85 ft) gives a distance between the measured points of approx. 130 mm (7.87 in).

Distance intersection point 60 m (196.85 ft) with the characteristic curve for beam diameter gives a beam size of approx. 200 mm (7.87 in)

Result: no gaps during scanning

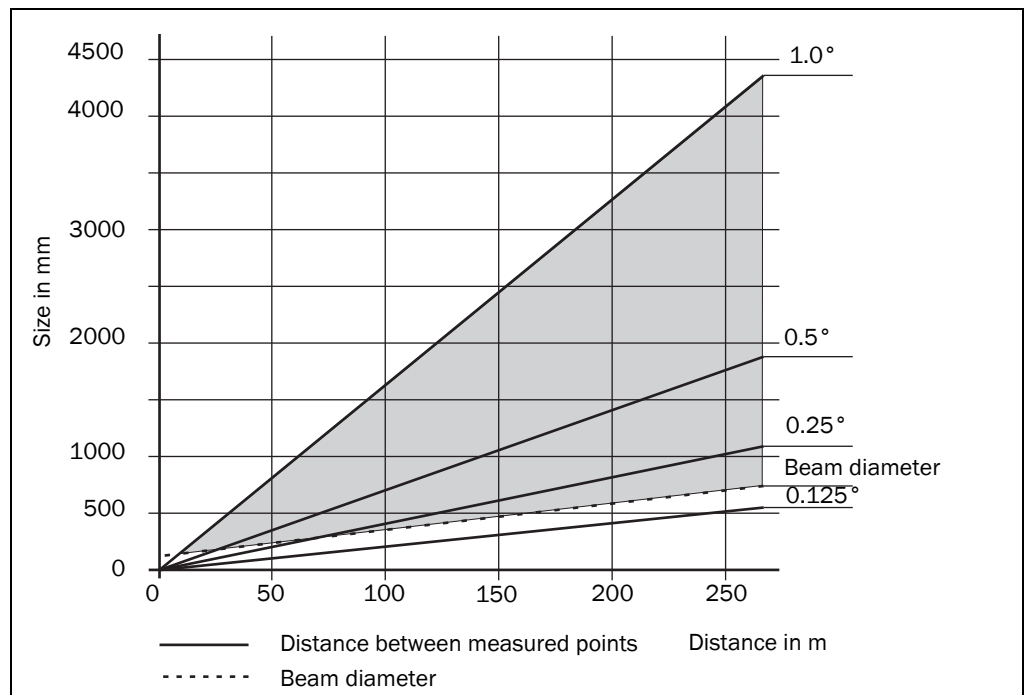


Fig. 9: Beam diameter and distance between measured points at 0 to 250 m

Example for angular resolution 0.5° in fig. 9

Distance 150 m

Distance intersection point 150 m (492.13 ft) gives a distance between the measured points of approx. 1100 mm (43.31 in)

Distance intersection point 150 m (492.13 ft) with the characteristic curve for beam diameter gives a beam size of approx. 450 mm (17.72 in)

Result: gaps of approx. 650 mm (25.59 in) during scanning

Minimum object size: >650 mm (>25.59 in)

3.5.6 Minimum object size

To reliably detect an object, a laser beam must be fully incident on it once. If the beam is partially incident, less energy will be reflected by an object than necessary in some circumstances (see [fig. 6 on page 21](#)).

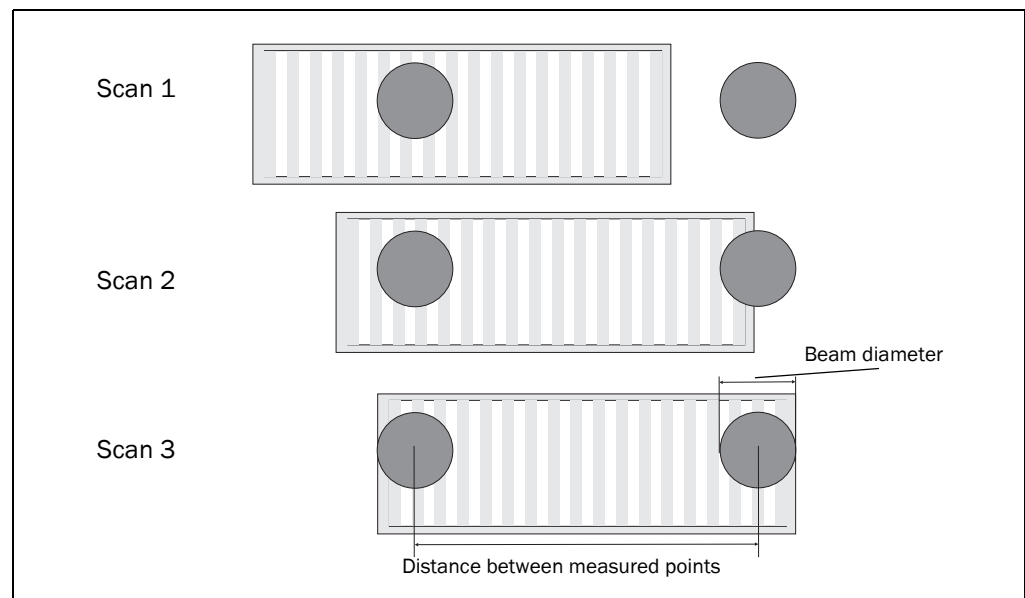


Fig. 10: Minimum object size for detection

Important In the example in [fig. 10](#), the beam is fully incident on a moving object at least once during each scan. It will therefore be reliably detected if it has the necessary remission.

If an object is only as large as the beam diameter, then it will be detected if the laser is fully incident on it and it has the necessary remission.

How to calculate the minimum object size:

Beam diameter + distance between measured points = minimum object size

➤ For beam diameter and distance between measured points as a function of the distance from the LD-LRS see the diagram in [fig. 8](#).

Important

- In particular on the usage of the LD-LRS for the output of measured values, it is necessary for a reliable measurement that the beam is incident on the object several times.
- On the usage of the LD-LRS field application, as a rule the beam must be incident on an object several times in succession for the object to be detected as an infringement of the field.

3.5.7 Maximum and mean pulse frequency

On the LD-LRS the scanner head rotates at a selectable frequency from 5 to 12 Hz.

During this process, a laser pulse is emitted after each angular step of e.g. 0.25° (adjustable).

The faster the scanner head rotates, the faster the measured value output and the finer the angular resolution is configured, the more exactly the contour will be determined.

Important In this case the interface selected on the LD-LRS and the downstream host must be able to transmit and process the volume of data.

NOTICE

During each laser pulse, the laser diode heats up. Like all semiconductors, a laser diode will also be irreparably damaged by excessively high temperatures. For this reason the pulse frequency is limited.

The maximum pulse frequency for the laser diode must never exceed 14.4 kHz. The maximum pulse frequency is given by the number of head revolutions per second and the angular resolution.

The mean pulse frequency must not exceed 10.8 kHz. The mean pulse frequency is given by the maximum pulse frequency and the size of the area scanned.

- For a scan area of 360° the mean pulse frequency is equal to the maximum pulse frequency.
- For a scan area of <360° the mean pulse frequency is lower than the maximum pulse frequency.

Examples for the maximum and mean pulse frequency

	Scan area	Head revolutions	Angular resolution	Maximum pulse frequency	Mean pulse frequency	LD-LRS 3601 3611	LD-LRS 3600
Example 1	360°	15 Hz	1/2°=0.5°	10.8 kHz	10.8 kHz	x	(x)
Example 2	300°	10 Hz	1/4°=0.25°	12 kHz	10 kHz	x	x
Example 3	300°	5 Hz	1/8°=0.125°	12 kHz	10 kHz	x	x

Tab. 6: Typical settings for LD-LRS

(x): Only at raw data scan (Field application)

Calculation example 1

Scan area: 360°

Head revolutions: 15°Hz

Angular resolution: 1/2° = 0.5°

Max. pulse frequency: 15 Hz × 360 × 2= 10.8 kHz

Mean pulse frequency: 10.8 kHz × 360/360 = 10.8 kHz

Calculation example 2

Scan area: 300°

Head revolutions: 10°Hz

Angular resolution: $1/4^\circ = 0.25^\circ$

Max. pulse frequency: $10 \text{ Hz} \times 360 \times 4 = 12 \text{ kHz}$

Mean pulse frequency: $12 \text{ kHz} \times 300/360 = 10 \text{ kHz}$

Calculation example 3

Scan area: 300°

Head revolutions: $5^\circ/\text{Hz}$

Angular resolution: $1/8^\circ = 0.125^\circ$

Max. pulse frequency: $5 \text{ Hz} \times 300 \times 8 = 12 \text{ kHz}$

Mean pulse frequency: $7.20 \text{ kHz} \times 360/360 = 10 \text{ kHz}$

3.6 Output of measured values

The LD-LRS outputs the following measured values at its data interfaces:

- profile of the field of view in two-dimensional polar coordinates as hex values
- contents of one revolution (360°): number of the profile emitted, profile counter,
- sector numbers, step width, number of points per sector, time stamp for start/
- end of each sector, direction at the start/end of each sector, value and direction of the distances measured, status

Important It is only possible to output all measured values of a 360° scan in real-time using the Ethernet interface.

3.7 Field application (LD-LRS3600)

With the aid of the integrated field application, the LD-LRS3600 evaluates up to six evaluation fields within its scan area. Using the field application, you can e.g. implement systems for collision protection, for building surveillance or for access monitoring.

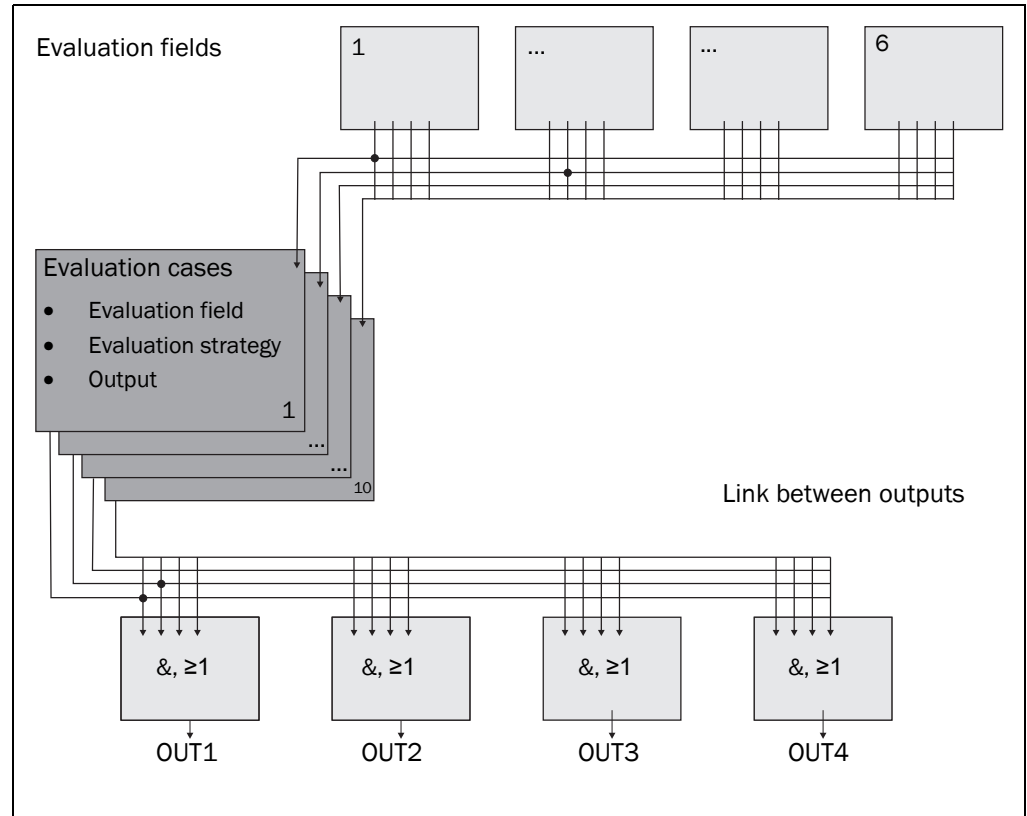


Fig. 11: Principle of field application

By means of up to ten evaluation cases, the LD-LRS is adjusted to the evaluation situation. For an evaluation case you select one of six configurable evaluation fields, an evaluation strategy, and an output activating the evaluation case. For each output you select a link that specifies the result of the output if more than one evaluation case acts on that output.

In the example in [fig. 11](#), evaluation field 1 is used in evaluation case 1, and evaluation field 2 in evaluation case 2. Both evaluation cases act on output OUT1. If the results of the evaluation cases have an AND relation, the output only switches when both evaluation cases indicate an event.

The field application is active in the default delivery status.

Important When you activate or deactivate the field application, the parameter display in the SOPAS is adjusted accordingly.

How to deactivate the field application of the LD-LRS3600:

- In the PROJECT TREE, LD-LRS36xx, PARAMETER, open BASIC SETTING. You can activate and deactivate the field application in the APPLICATION SELECTION area by selecting RAW DATA SCAN.

3.7.1 Evaluation cases





An evaluation case determines which evaluation field is evaluated in which way and which output it is acting on. In the LD-LRS you can configure up to six evaluation cases. All configured evaluation cases are active simultaneously.

For each evaluation case, you configure the following in SOPAS ET:

- The evaluation strategy,
- The evaluation field,
- The output onto which the evaluation case acts
- The response time of the output

In the PROJECT TREE, LD-LRS36xx, PARAMETER, open the device page EVALUATION CASES.

The existing evaluation cases are displayed in a table in the EVALUATION CASES area. You can run the following functions using the buttons above the table:

Symbol	Meaning	Comment
	Create evaluation case	You can create a new evaluation case using this button. The CREATE EVALUATION CASE dialog box will open.
	Edit evaluation cases	You can edit an existing evaluation case using this button. <ul style="list-style-type: none"> ➤ For this purpose, mark one of the evaluation cases in the table.
	Copy evaluation case	You can copy an existing evaluation case using this button. During this process, all parameters for the existing evaluation case are copied to the new evaluation case. <ul style="list-style-type: none"> ➤ For this purpose, mark an evaluation case in the table.
	Delete evaluation case	You can delete an existing evaluation case from the table using this button. <ul style="list-style-type: none"> ➤ For this purpose, mark one of the evaluation cases in the table.

Tab. 7: Buttons for managing the evaluation cases

Evaluation strategy

In SOPAS ET you select from three possible evaluation strategies:

- Blanking

The LD-LRS evaluates the entire area of the field. Objects smaller than the specified blanking size are ignored but still visualised as blue dot. An object triggers an intrusion only if it is larger than the configured blanking size. In this case, it appears as red dot. Additionally the area which is indicating the expansion of the intruding object, is displayed in the zoom, if the corresponding section, zoom or active tamper protection after prolonged trigger time is selected.

- Contour

The LD-LRS checks the existence of a contour, which must permanently remain completely within the evaluation field. As a result the LD-LRS can detect, e.g., that a door is opening outwards or that the position of the LD-LRS is being changed.

Also crawling beneath a vertical evaluation field or the deflection of the laser beam by a mirror can be detected.

Using blanking the lack of part of a contour can be blanked up to a certain size.

- Blanking with tracking

An object triggers an intrusion only if it is larger than the configured blanking size and slower than the configured object speed. In this case, it appears as red dot. If the object is smaller than the configured blanking size, it causes no intrusion but is visualised as blue dot. The zoom also shows the dimensions of the intruding object.

For diagnostics for the function of the evaluation strategy refer to [section “Evaluation strategy” on page 28](#).

Response time

You define a response time for the evaluation strategies blanking, contour, and blanking with tracing. The response time for the output means that objects in the evaluation field or the lack of objects in the contour of the evaluation field will not immediately result in the response of the output. Objects must therefore be scanned several times if a response time is configured (for a scanning frequency of 10 Hz and a response time of 1000 ms for example 10 times).

Important Take into account this response time if you use a downstream system, e.g. for stopping a vehicle or plant. You must then, e.g., increase the stopping distance accordingly.

Tamper protection

If blanking or blanking with tracing is configured, small objects in the near range of the LD-LRS can cause blind spots in which no detection takes place. To prevent this situation arising, you can configure the TAMPER PROTECTION OPTION.

The tamper protection option switches the evaluation field if ...

- an object that is smaller than or of the same size as the blanked object size can be found in front of the laser output aperture of the LD-LRS over a response time configured for tamper protection.
- the LD-LRS is blanked for longer than the response time configured for tamper protection.

Evaluation range

For the evaluation case, you select a field out of the already configured evaluation fields. Its form must match the evaluation strategy ([section 3.7.2 “Evaluation fields” on page 30](#)).

Output

Choose one of the outputs for the evaluation case. If several evaluation cases act on an output, you must define how the results from the evaluation cases are to be linked together using logical operators

([section 3.7.8 “Linking the evaluation cases at the output” on page 39](#)).

Important The respective output must be configured for the „application“ SOPAS: „Applikation“ (see Parameter / IOs / Digital Outputs).

Important Do not mix up the negation of the result with the setting Active High/Active Low of the outputs ([section 3.7.8 “Linking the evaluation cases at the output” on page 39](#)).

3.7.2 Evaluation fields

With the help of the integrated field applications you can configure up to six evaluation fields. Size and shape of these evaluation fields can be configured almost arbitrarily.

The evaluation fields can be marked with SOPAS ET, depending on the requirements of their application. Evaluation fields can have the following properties:





- **Segmented**
You create the evaluation field in individual segments by setting each individual point of the field. The field can be almost any shape.
- **Rectangular**
The evaluation field created is rectangular; the size and angle of rotation of the rectangle can be changed. But it is always of rectangular shape.
- **Starting at LD-LRS**
At a distance from LD-LRS („island field“)



You configure the evaluation fields in SOPAS ET:

In the PROJECT TREE, LD-LRS36xx, PARAMETER, open the device page EVALUATION CASES.

In the area OVERVIEW TABLE EVALUATION FIELDS, you can create, copy, edit or delete fields.

Symbol	Meaning	Comment
	New evaluation field	Using this button you can create a new evaluation field. The ENTER FIELD PARAMETERS dialog box is opened.
	Edit evaluation field	You can edit an existing evaluation field using this button. ➤ For this purpose mark one of the evaluation fields in the table and then click the button.
	Copy evaluation field	You can copy an existing evaluation field using this button. During this process, all parameters in the existing field are copied to the new field. ➤ For this purpose mark one of the existing evaluation fields in the table and then click the button.
	Delete evaluation field	You can delete an existing evaluation field using this button. ➤ For this purpose mark an evaluation field in the table and then click the button.

Tab. 8: Buttons for managing the evaluation fields

Entering the parameters of the evaluation field



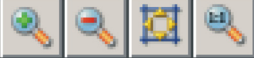

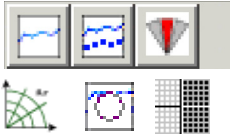
Fig. 12: Selection of the method for creating evaluation fields

You can ...

- adapt the field editor view to your needs or your application ([section 3.7.3 “Adapting the field editor view” on page 32](#)).
- create an evaluation field manually using the drawing tools ([section 3.7.4 “Setting end points for a field” on page 33](#) and [section “Creating and editing a rectangular evaluation field” on page 35](#)).
- teach-in an evaluation field with the aid of the LD-LRS (see [section 3.7.6 “Teaching-in an evaluation field” on page 38](#)).
- teach-in the reference contour for an evaluation field (see [section 3.7.7 “Defining the contour as a reference” on page 39](#)).

3.7.3 Adapting the field editor view

To be able to work optimally with the field set editor, you can change the screen layout.

Symbol	Meaning	Comment
	Zoom	<p>Using these buttons you can make the following changes to the view:</p> <ul style="list-style-type: none"> • Zoom in • Zoom out • Zoom in/zoom out on all active points of the field • Zoom in/zoom out to default size
	Rotate	<p>You can rotate the field editor view using the input field or the buttons beside the input field. In this way you can change the view, for example, to suit your application.</p> <ul style="list-style-type: none"> ➤ Enter the angle of rotation ° in the input field. Or ➤ Change the angle of rotation of the view in steps using the arrow buttons beside the field on the right.
	Views	<p>Using these buttons you can make the following changes to the view:</p> <ul style="list-style-type: none"> • Display measurement contour as a line or as individual points • Show the LD-LRS scan line • Show other fields. You can then see the existing fields as a contour. • Change between Cartesian and polar view • Mirror the view on the LD-LRS i.e. you no longer see the LD-LRS from above, but from below.

Tab. 9: Buttons for changing the field editor view

3.7.4 Setting end points for a field

First set the end points for an evaluation field. The end points represent the outer limit of the evaluation field. The evaluation field starts at the laser scanner in this step. If the evaluation field is only to start a certain distance from the laser scanner, start points must be set (see [section 3.7.5 "Setting start points for a field" on page 38](#)).

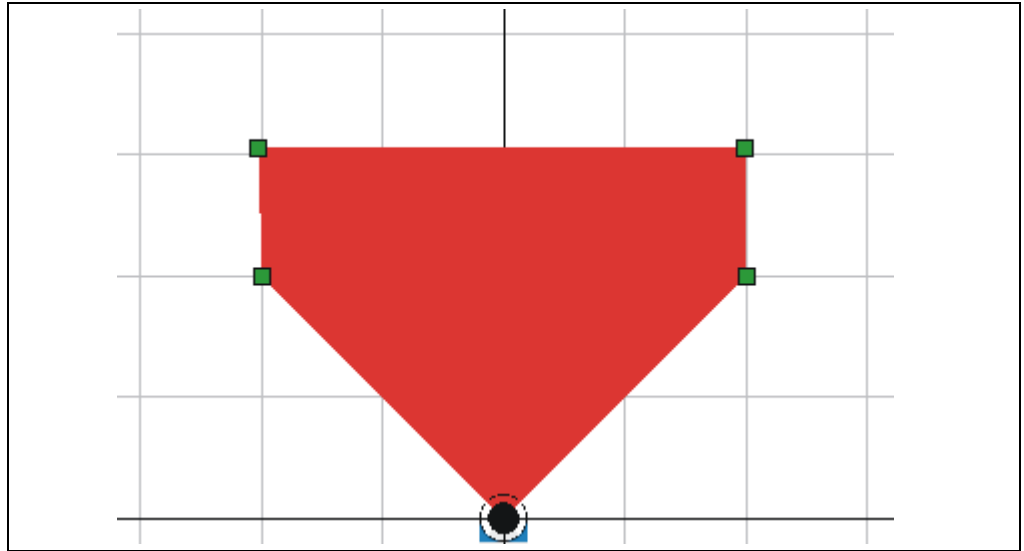


Fig. 13: End points for a field

How to set end points:

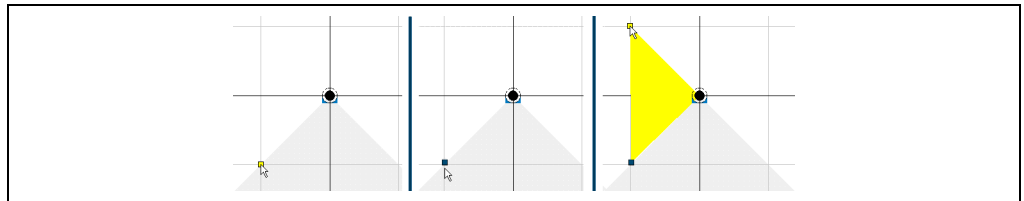


Fig. 14: Setting end points 1

- Choose the symbol shown on the toolbar.
- Move the mouse pointer over the co-ordinate field in the field editor.
The possible point is displayed as a yellow square.

Important You can only set points in the measurement area of the LD-LRS.

- Click the position where you want to set the point.
The point is displayed as a green square.
- Move the mouse pointer to the next point on the field.
The field you are creating is shown in yellow.

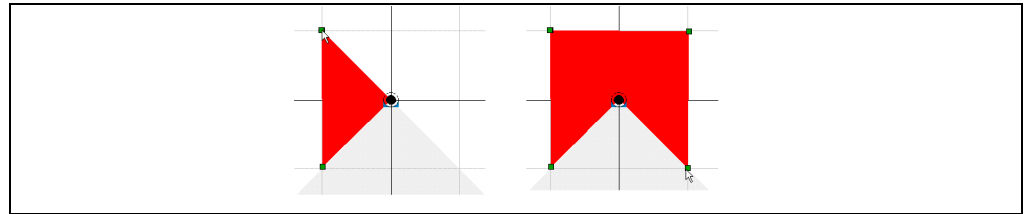


Fig. 15: Setting end points 2

- Click the position where you want to set the point.
The field you just created is now shown in red.
- Complete the field by setting further points.

- Declaration**
- The coordinates of the mouse pointer are shown in the fields in the COORDINATE area.
 - The coordinates of the points set are shown in the FIELD POINTS area.

How to move end points:

You can move one end point individually or several end points at the same time.

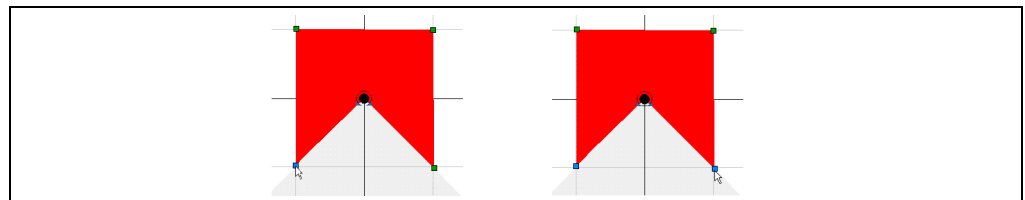


Fig. 16: Moving end points 1

- Choose the symbol shown on the toolbar.
- Click one of the points for the evaluation field.
- Or:
- Keep the **[CTRL]** key pressed and click further points for the evaluation field.
The points clicked are marked in blue.

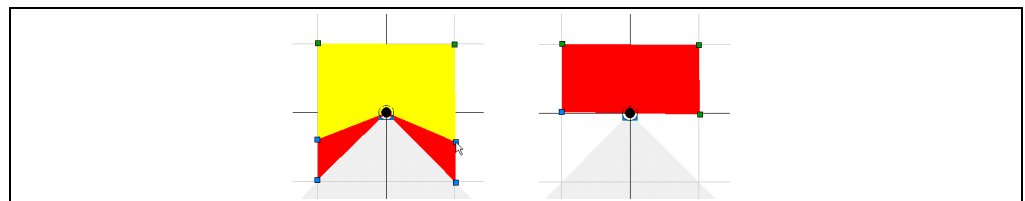


Fig. 17: Moving end points 2

- Keep the mouse button pressed and move the point(s).
The field you are creating is shown in yellow.
- Release the mouse button at the position where you want to position the points.
The field now produced is again shown in red.

How to delete end points:

You can delete one end point individually or several end points at the same time.

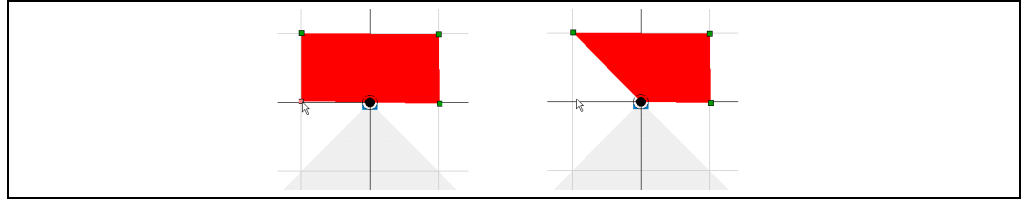


Fig. 18: Deleting end points 1

- Choose the symbol shown on the toolbar.
- Double-click one of the points for the evaluation field.
The point is deleted.

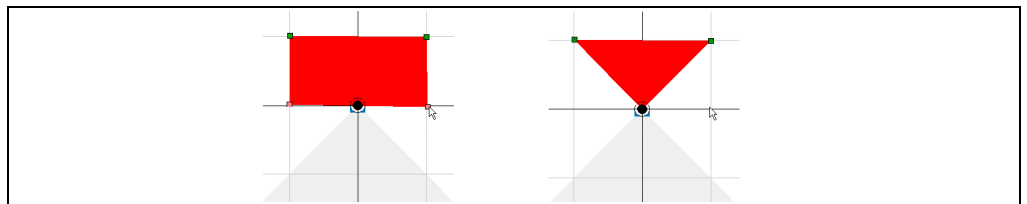


Fig. 19: Deleting end points 2

Or:

- Keep the **[CTRL]** key pressed and click further points for the evaluation field.
The points clicked are marked in red.
- Press the **[Del]** key.
The points are deleted.

Creating and editing a rectangular evaluation field

If, during the selection of the basic parameters you selected the RECTANGLE option, then there is already a rectangular field in the field editor. You can move, increase or reduce in size, and rotate this field.

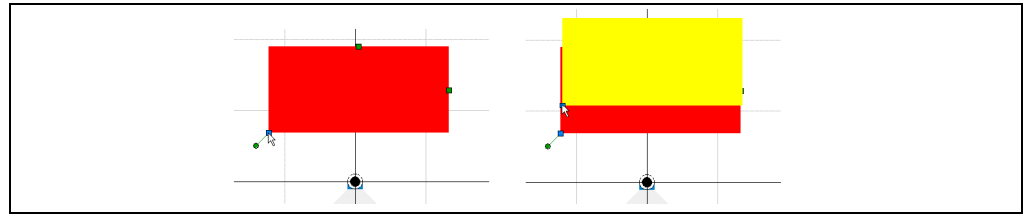
How to move a rectangular evaluation field:

Fig. 20: Moving a rectangular field

- Choose the symbol shown on the toolbar.
- Click the bottom right point of the field.
The point changes to blue.
- Hold down the mouse button and drag the field.
During the movement the field is shown in yellow. As soon as you release the mouse button, the field is shown in red again.

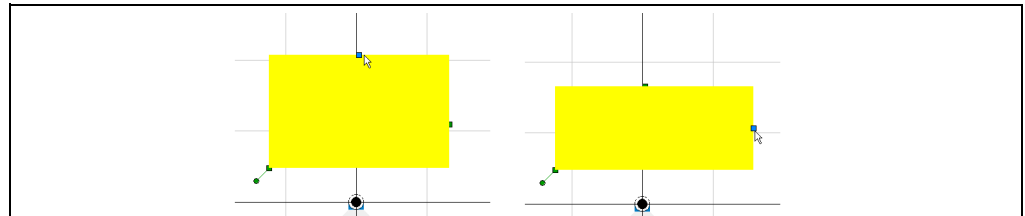
How to increase or reduce the size of a rectangular evaluation field:

Fig. 21: Increasing or reducing the size of a rectangular field

- Choose the symbol shown on the toolbar.
- Click the top point or the right point for the field.
The point changes to blue.
- Keep the mouse button pressed and drag to increase and reduce the size of the field.
During the movement the future field is shown in yellow. As soon as you release the mouse button, the field is shown in red again.

How to rotate a rectangular evaluation field

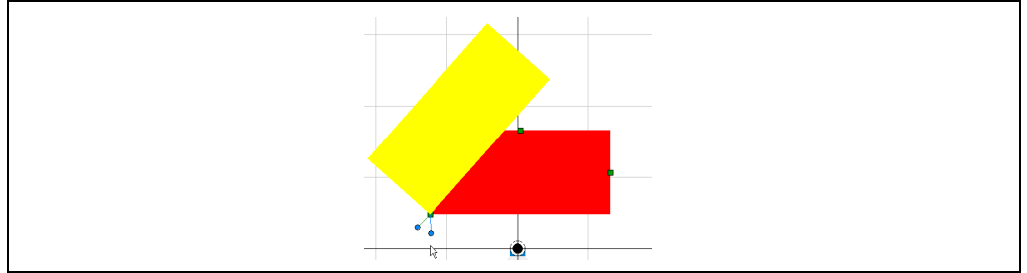


Fig. 22: Rotating a rectangular field

- Choose the symbol shown on the toolbar.
- Click the round point at the bottom left corner of the field.
The point changes to blue.
- Keep the mouse button pressed and rotate the field about the bottom left point.
During the movement the future field is shown in yellow. As soon as you release the mouse button, the field is shown in red again.

How to change the evaluation field by making entries:

- In the FIELD POINTS area, click the EDIT button.
You can now edit the fields in the FIELD POINTS area.
- In the BASE POINT area, enter the X and Y coordinates for the bottom left point of the evaluation field.
- Enter the angle of rotation in ° in the ROTATION field.
- Enter the dimensions of the evaluation field in the WIDTH and LENGTH fields.
- Click on the PREVIEW button.
The new evaluation field is displayed in yellow.
- In the CONFIRM CHANGES dialog box, click the YES button.
The changes are applied and the evaluation field is displayed in red

3.7.5 Setting start points for a field

By setting start points you can implement fields that only start a certain distance from the laser scanner. Using such fields it is, for instance, possible to walk or drive through the area between the laser scanner and the evaluation field.

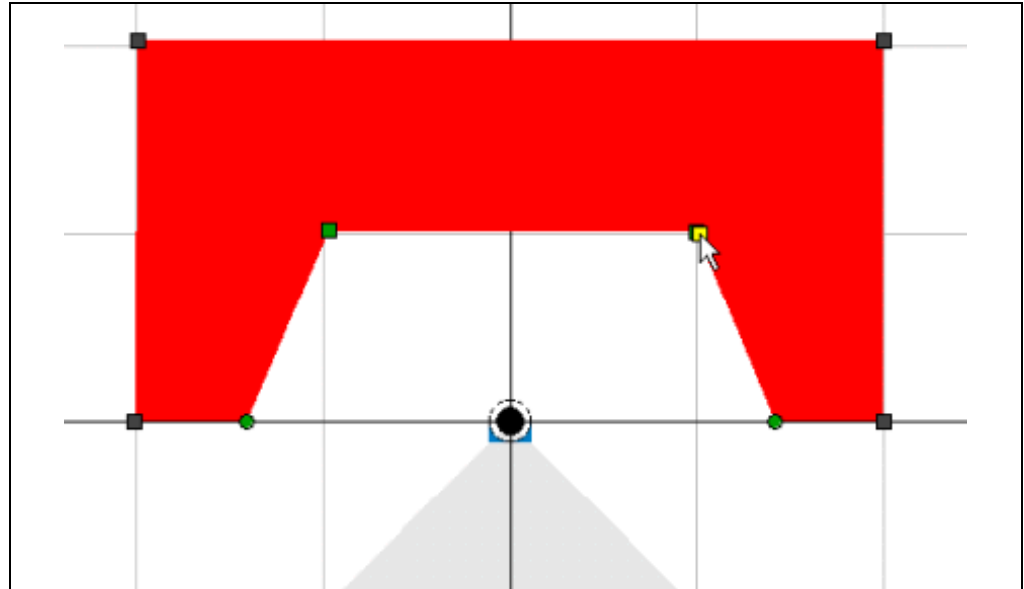


Fig. 23: Starting points for a field

For information on how to set, move or delete start points, see [section 3.7.4 “Setting end points for a field” on page 33](#)

When start points are set, the field editor may set points that are required for physical reasons in certain circumstances. You can move these points like any others, but you cannot delete them.

- The points that you have set using the mouse are shown as squares.
- The points that have been set automatically are shown as circles.

3.7.6 Teaching-in an evaluation field

Instead of drawing an evaluation field using the field editor, you can also use teach-in. The laser scanner scans the visible room contour several times. From the data obtained SOPAS determines the contour of the field. You can edit an evaluation field you have taught-in:

Move the individual points of the field using the mouse until the field is of the required shape and size (see [section 3.7.4 “Setting end points for a field” on page 33](#)).

3.7.7 Defining the contour as a reference

With the contour as reference function, an evaluation field with start and end points is used as a contour segment. The contour monitoring strategy is allocated to this field using the evaluation case.

Within the contour segment, the contour of an object (e.g. a house wall) must cover the entire width of the segment, i.e. an object must always be present (the scanned contour is used as a reference).

The LD-LRS reacts if the scanned contour is no longer completely within the tolerance band, e.g. due to a change in the position of the laser scanner (tamper protection).

3.7.8 Linking the evaluation cases at the output

If several evaluation cases act on an output, you must define how the results from the evaluation cases are to be linked together using logical operators. The related results can be linked using an AND or an OR operator.

PROJECT TREE, LD-LRS..., PARAMETER, NETWORK/INTERFACES/IOS, DIGITAL OUTPUTS.

The outputs are configured as Active low by default. You can also configure them as Active high.

Resetting an output

In the default setting, the outputs are reset to inactive state immediately.

You can configure a delay of up to 10 s (e.g. to activate a horn or to send the output signal to a PLC).

Alternatively you can reset the output via an input. The output is only reset if the associate input enters the configured status.

3.7.9 Diagnostics for the function of the evaluation strategy

You can find the INTRUSION DISPLAY under PROJECT TREE, LD-LRS..., FIELD EVALUATION MONITOR. There you can choose the view for the field intrusion.

- None
- Normal
- Freeze
- Single
- Tracking

Intrusion display: None

The objects are not displayed. If the scan line is activated, the scan line will be updated permanently. Depending on the output setting, a field infringement can be active low or active high.

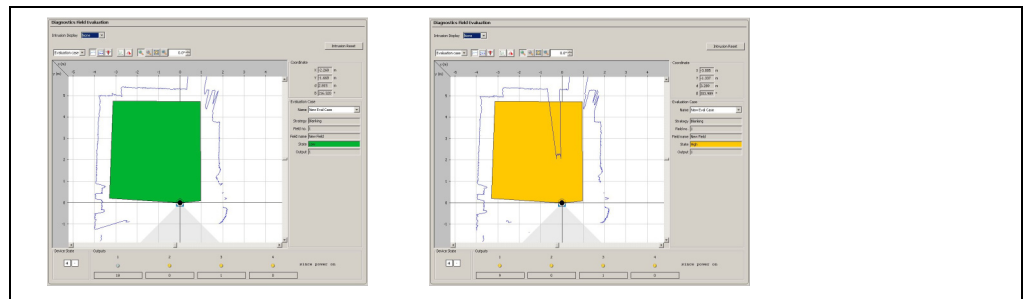


Fig. 24: Intrusion display none (no objects)

Intrusion display: Normal

Display of the actual triggering object depending on the settings of object size and output. If one or more objects are triggering (Field color green -> yellow), these will be displayed in the field until the field will be cleared again (yellow -> green). If the scan line is activated, the scan line will be updated permanently.

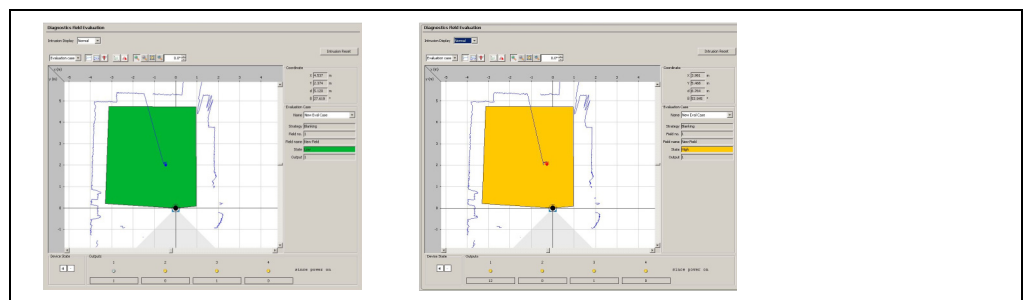


Fig. 25: Intrusion display normal (with objects).

Left: small object, too small for an alarm. Right: object is visualized in red, Field intrusion

Intrusion display: Freeze

Display of triggering objects of the last intrusion depending on the setting of object size and output. If one or more objects are triggering (Field color green -> yellow), these will be displayed until a new triggering happens. The field must be cleared in-between). If the scan line is activated, the scan line which has triggered, will be frozen until a new triggering.

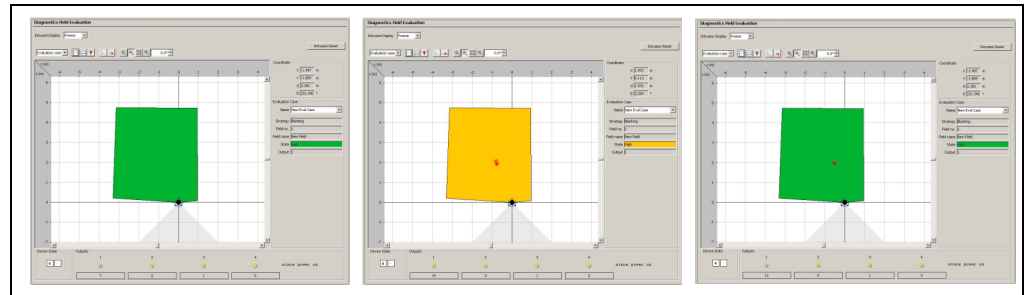


Fig. 26: Intrusion display freeze (Clear field, but the object remains. Frozen until new field intrusion.)

Intrusion display: Single

Display of the triggering objects of the first field intrusion. If one or more objects are triggered (Field color green -> yellow), the objects will be displayed, until "Reset Intrusion" is activated. If the scan line is activated, the scan lines which have triggered, will be frozen until "Reset Intrusion" is activated

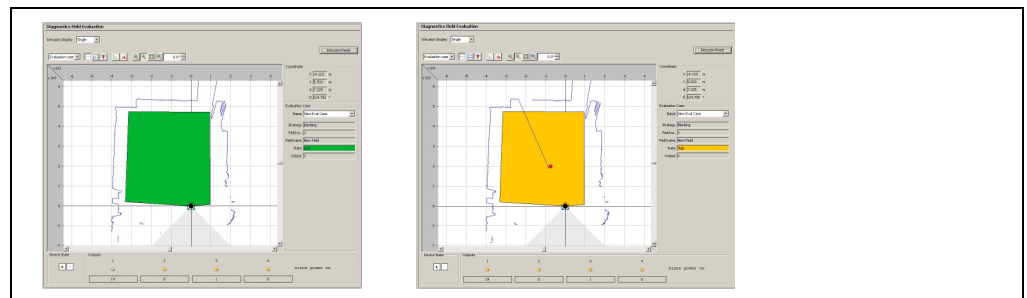


Fig. 27: Intrusion display single (display freezes upon intrusion until reset)

Intrusion display: Tracking

Permanent display of the actual object movement. All objects are displayed, even if they are not triggering the alarm (too small, only short appearance in the field). If the scan line is activated, the scan line will be updated permanently.

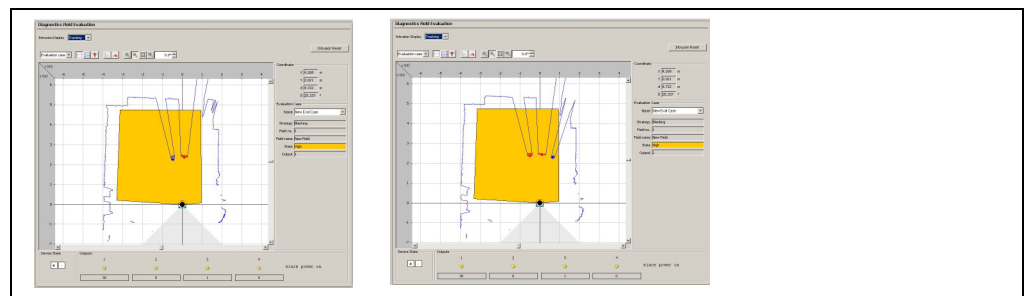


Fig. 28: Intrusion display: Tracking

3.8 Integration of the LD-LRS in other control systems

Recommendation The integration of an LD-LRS in other control systems requires sound programming skills in the area of control. In addition knowledge of the data exchange between a laser measurement sensor such as the LD-LRS and the external computer are required, e.g. IPC.

3.8.1 Data interfaces

The LD-LRS has a serial host interface and an Ethernet interface. The LD-LRS is configured with the aid of SOPAS ET via these interfaces. The LD-LRS also communicates with the external computer via its interfaces.

3.8.2 Data communication using telegrams

The LD-LRS sends telegrams over the interfaces described above to communicate with a connected external computer, for configuration purposes and the transmission of measured values. The following functions can be run using telegrams:

- setting parameters by a computer for the configuration of the LD-LRS
- querying parameters and status logs by the computer
- requesting contour measured values (if necessary incl. the contour measured values) by a computer, subsequent answer LD-LRS

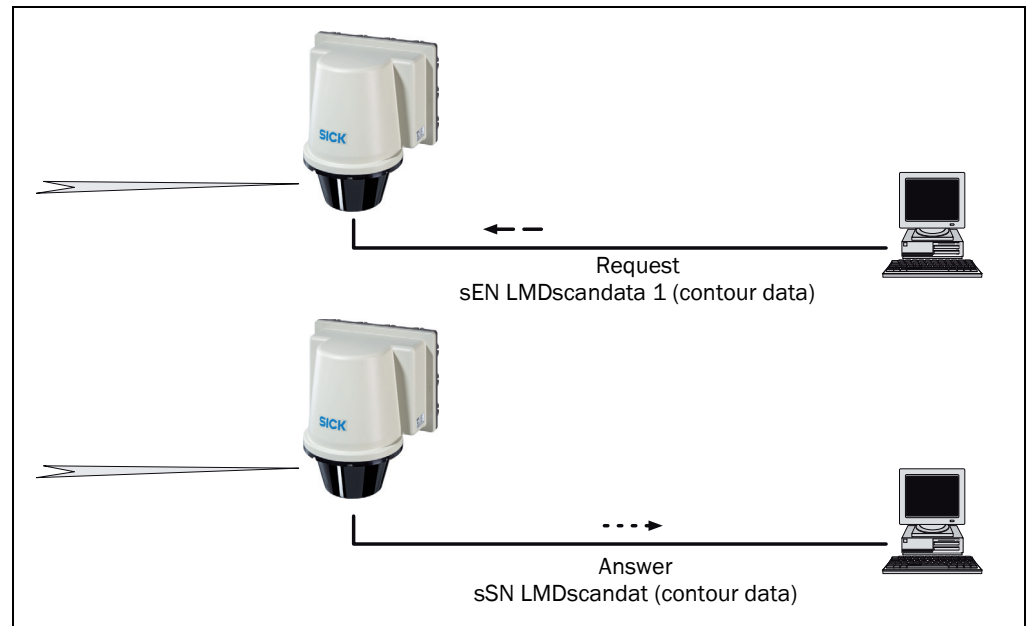


Fig. 29: Requesting contour data

The telegrams each comprise a frame and the data. See "Telegram listing USP", part no.: 8016687, "Telegram listing CoLa-A/B", part no.: 8016855.

3.8.3 Digital output

The LD-LRS has a digital output that is used for the synchronisation of the internal clock on the LD-LRS and the external computer's clock. The output supplies a 10 ms long pulse or of a duration depending on the rotational frequency depending on the synchronisation method (see section [3.8.4 on page 44](#)). The pulse is output dependent on the synchronisation method.

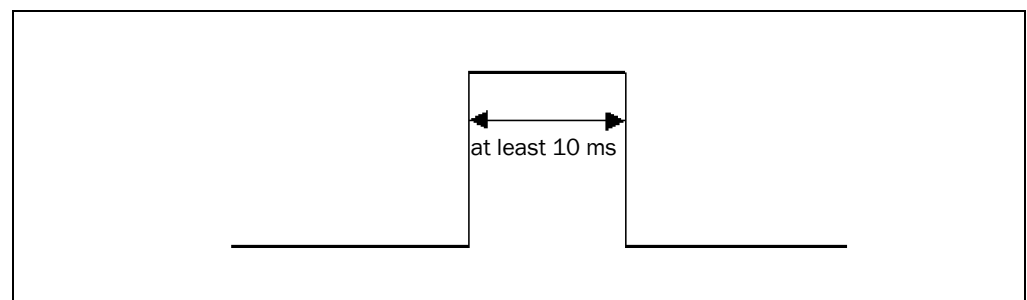


Fig. 30: Pulse for synchronisation

3.8.4 Synchronisation of the external clock and the clock in the LD-LRS

For precise control, it is necessary to synchronise as accurately as possible the contour data from the LD-LRS and the calculations on the external computer.

The internal time stamp in the LD-LRS is added to the measured data from the LD-LRS. The internal time stamp in the LD-LRS is a 32-bit counter that counts up by 1 every 1 ms.

To synchronise the internal time in the LD-LRS with the system time in control system, the LD-LRS provides three options.

1. via telegram

The computer requests the internal time from the LD-LRS using a telegram. The LD-LRS writes its internal time in a telegram and sends it to the computer. However, there can be a delay of up to 3 ms on sending the data, as a result there is certain amount of inaccuracy.
2. via telegram "Timer Read"

The computer requests the internal time from the LD-LRS using a telegram. The hardware output supplies a pulse of at least 10 ms (fig. 30) in length as soon as the internal time stamp is written to the telegram. When the telegram is subsequently received by the vehicle computer, the computer can add to the time in this telegram the delta between the pulse and the reception. As a result the external computer can determine the actual time in the LD-LRS.
3. via Index (pulse on the hardware output)

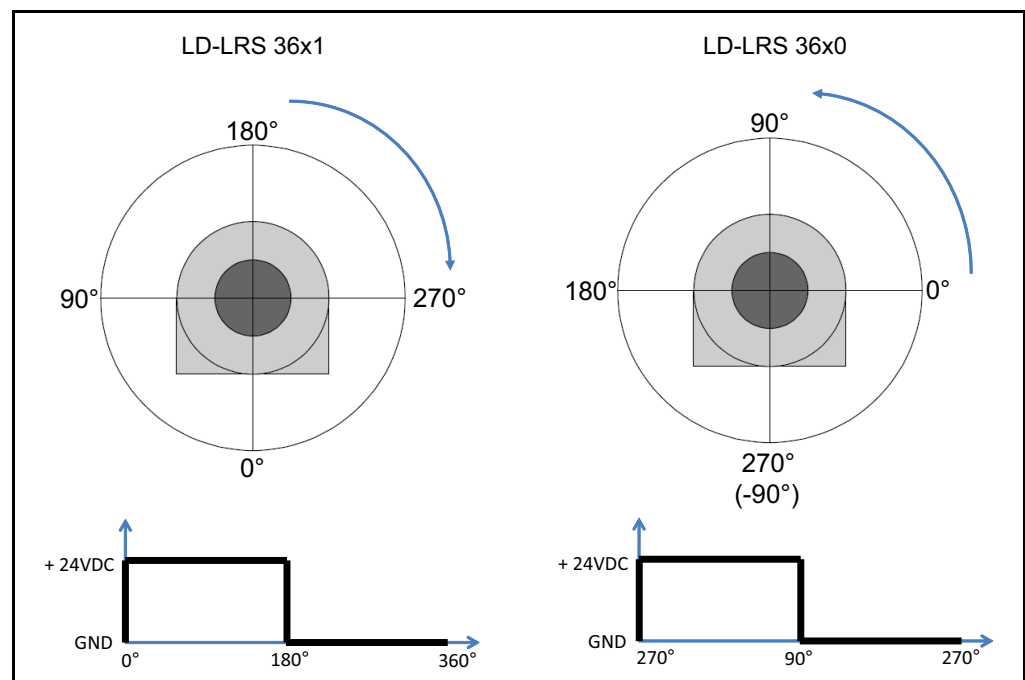


Fig. 31: Pulse on the head position

The LD-LRS outputs a signal according to the scanner head position. This signal is used e.g. to synchronise scans with the position of a pivoting device for 3D measurement.

Important Program the external computer so that it responds to the front edge of the output pulse

3.9 Planning

3.9.1 System requirements of the LD-LRS

For commissioning and operating the LD-LRS, the following are required at the user:

- Supply voltage DC 24 V \pm 15%, generated as per IEC 60364-4-41 (VDE 0100, part 410), output power minimum 40 W (see [section 5.3.1 “Supply voltage” on page 51](#))
- For the heater (LD-LRSx100 only): supply voltage DC 24 V (maximum residual ripple 6 V), maximum current consumption 6 A (cyclical)
- Standard Intel Pentium PC or compatible, at least Pentium III, 500 MHz
 - RAM: minimum 256 MB, 512 MB recommended
 - operating system: MS Windows 2000, XP, VISTA or 7
 - monitor: minimum 256 colours, 65,536 colours recommended;
Screen resolution at least 800 × 600
 - hard disc: minimum 220 MB free memory
 - DVD drive
 - data interface RS422 or Ethernet (see [section 5.3.3 “General conditions for the data interface” on page 52](#)), if necessary RS422 converter, if PC interface and interface on the LD-LRS do not match

3.9.2 Mounting requirements

The LD-LRS must be mounted stable.

The following accessories are available for the LD-LRS.

- Mounting kit Art.-No. 2018303 with mounting material
- Mast mounting kit Art.-No. 2018304 with mounting material

As an alternative you can use a strong stable mounting bracket that provides adjustable alignment of the LD-LRS in the X- and Y axis. The LD-LRS weighs approx. 9.1 kg (20.1 lb).

3.9.3 Distance between LD-LRS and the object/surface to be measured

The measurement area on the LD-LRS starts at 2.5 m (5 m with extended range) in front of the optics (light output window).

To prevent false measurements, in the case of the recessed installation of the LD-LRS the increase in the size of the laser beam with increasing distance is to be taken into account.

If mounted poorly, objects in the scan range may be continuously detected as the laser beam is always incident on them.

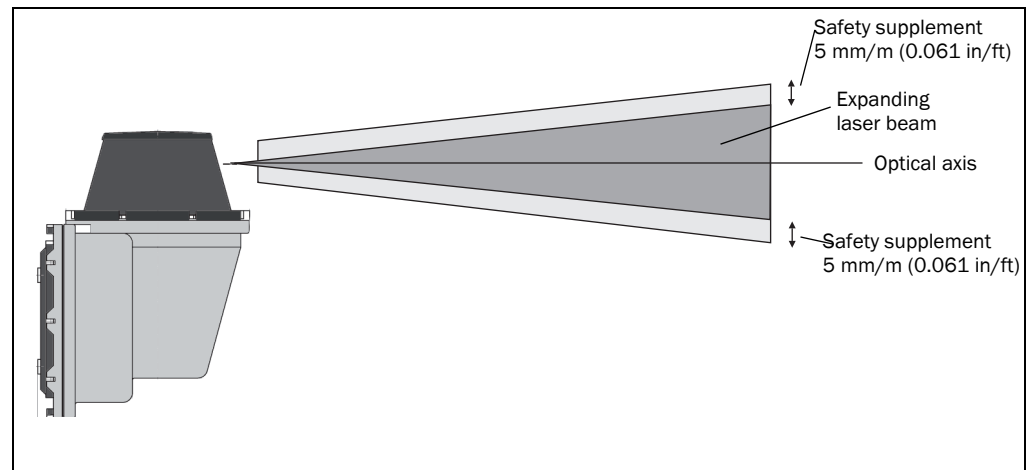


Fig. 32: Increase in the size of the beam and safety supplement

The distance-dependent increase in the size of the beam can be calculated using the formula:

$$\text{Beam diameter} = (\text{distance (mm (in))} \times 2.8 \text{ mrad}) + 40 \text{ mm (1.6 in)}^{1)}$$

The following table shows a few values as examples:

Distance in m	5	10	15	20	25	30	40	50	60	70
Beam diameter [mm]	54	68	82	96	110	124	152	180	208	236

Tab. 10: Beam diameter at different distances from the LD-LRS

For the assessment of whether the laser beam can be incident on an object, the distance of half the beam diameter from the optical axis is used.

Important Use a safety supplement of 5 mm (0.2 in) per metre top and bottom (see [fig. 32 on page 46](#)).

3.9.4 Reflectors

Reflectors are shown in the measuring profile as particularly reflective targets. These can be detected by an external algorithm and used as a reference. The recommended 983-10 reflective tape (part no. 5320565) can be obtained as an accessory from SICK AG by quoting REF-DG.

1) Due to the transmit lens.

4 Assembly

Important Do not open the housing for the LD-LRS. If the housing is opened, any warranty claims against SICK AG will be rendered void.

4.1 Overview of the mounting steps

- select mounting method for the LD-LRS
- mounting and adjusting the LD-LRS

4.2 Preparations for mounting

4.2.1 Components to be mounted

- LD-LRS (weight approx. 9.1 kg (20.1 lb))

4.2.2 Material and accessories necessary

- Mounting kit Art.-No. 2018303 with mounting material (not included)
 - Mast mounting kit Art.-No. 2018304 with mounting material (not included)
- or
- Fixing bracket supplied by the user:
 - Stable mounting bracket that provides adjustable alignment of the LD-LRS in the X and Y axis
 - 4 screws M8 for LD-LRS. Screw length dependent on the wall thickness of the bracket used.

4.3 Mounting and adjustment of the device

NOTICE

Risk of damage to the device!

The maximum screw length in the M8 blind threaded hole is 9 mm (0.35 in). Longer screws will damage the LD-LRS.

- Use screws of suitable length.

The LD-LRS is mounted using blind tapped holes and M8 screws (see [section 9.2.1 “Dimensional drawing LD-LRS” on page 69](#)).

For secure mounting at least 4 M8 screws with washers and locking washers are required. The supply of power must be switched off.

Important So that precipitation (rain, fog, etc.) can drain away more effectively and/or to reduce dust-fall, mount the device upside down (cover facing downward) and the connecting plug facing downward.

Requirements for ingress protection IP 67

To achieve IP 67 enclosure rating, the inspection cover must not be removed.

Similarly, the male connector on the rear must be screwed tight and the PG connectors in the male connector must be sealed with the dummy covers.

1. Align the LD-LRS.

2. Tighten screws.
3. Check the alignment.

Mounting with bracket for the LD-LRS

The LD-LRS can be mounted on flat surfaces with the aid of the SICK fixing bracket part no. 2018303. The slots on the fixing bracket permit rotation by $\pm 7.5^\circ$ for the fine alignment of the LD-LRS.

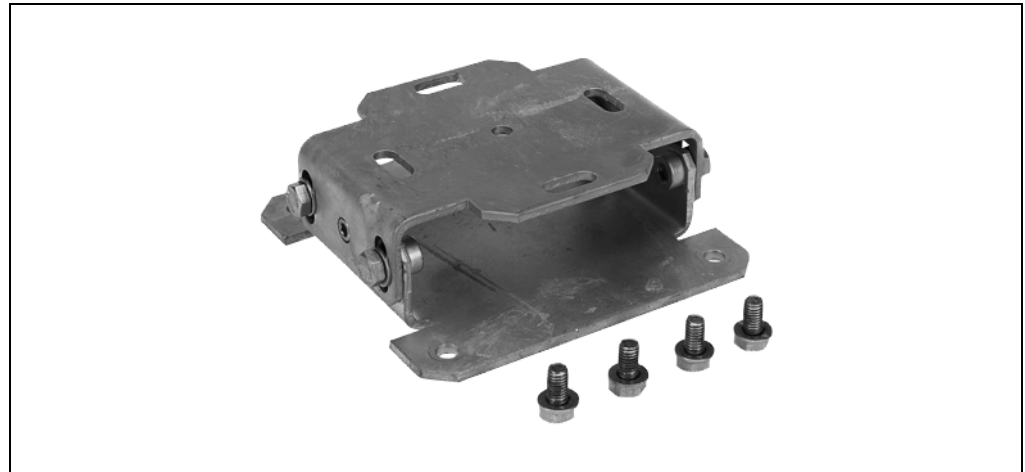


Fig. 33: Fixing bracket for LD-LRS

The dimensions of the fixing bracket are shown in [fig. 44](#)

Mounting with mast bracket for the LD-LRS

The LD-LRS can be mounted on a mast with the aid of SICK fixing bracket part no. 2018304 and part no. 2018303.



Fig. 34: Mast bracket for LD-LRS

The dimensions of the fixing bracket are shown in [fig. 45](#)

The LD-LRS is fastened to the mast with the aid of the steel clamping strip part no. 5306222 and the steel clamping strip lock part no. 5306221.

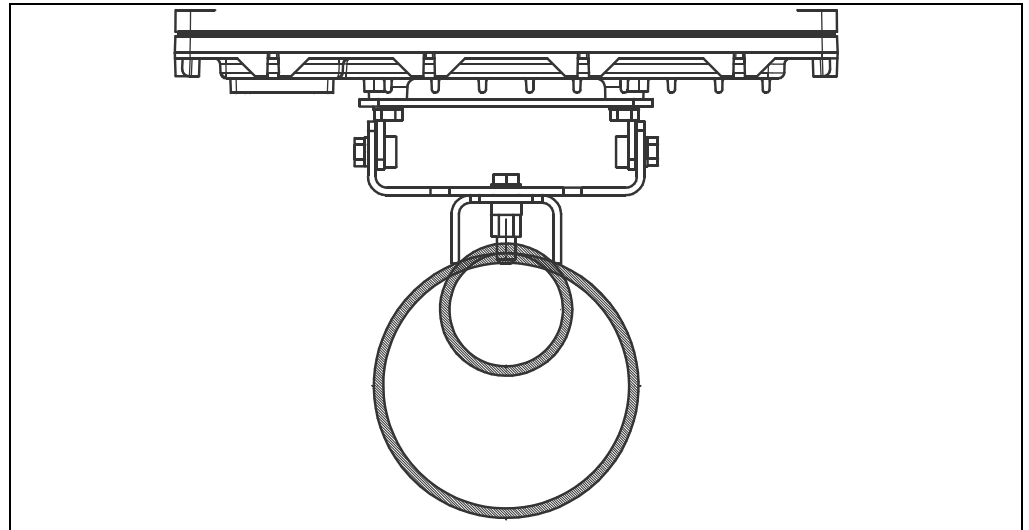


Fig. 35: Mounting the LD-LRS to a mast

4.4 Dismantling the LD-LRS

1. Switch off the supply voltage.
2. Remove the connection cables.
3. Undo screws for mounting the LD-LRS to the fixing and remove device.

5 Electric installation

NOTICE

Only authorised personnel are allowed to perform the electrical installation work.

- Do not open the housing.
- Observe the current safety regulations when working on electrical systems.

Switch the entire machine/system offline!

The machine/system could inadvertently start up while you are connecting the device.

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

5.1 Overview of the installation steps

1. Wire switching outputs (application-dependent).
2. Temporarily connect PC (configuration).
3. Wire data interface for operation.
4. Connect supply voltage to the LD-LRS.

5.2 Connections of the LD-LRS

5.2.1 Connections of the LD-LRS

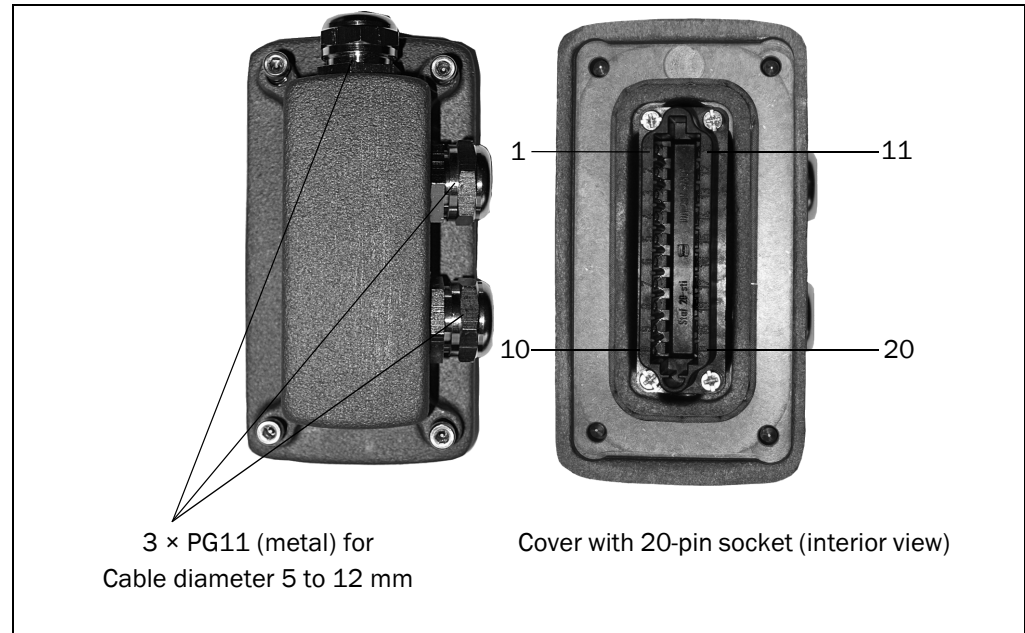


Fig. 36: Connections of the LD-LRS

The cable(s) are laid through the PG cable entries. There are screw connections on the rear of the 20-pin socket insert for laying the wires.

Terminal block for LD-LRS,

Pin	Signal	Interface	Function
1	DC 24V_HZG		Supply voltage for heater
2	DC 24V		Supply voltage for electronics
3	OUT1	Output signal 1	Function depending on application
4	OUT3	Output signal 3	Function depending on application
5	-		Reserved
6	TD-	RS-422	Sender -
7	TD+	RS-422	Sender +
8	-		
9	TPOP	Ethernet OUT	Sender +
10	TPON	Ethernet OUT	Sender -
11	GND_HZG		Heating ground
12	GND		Electronics ground
13	OUT2	Output signal 2	Function depending on application
14	OUT4	Output signal 4	Function depending on application
15	GND_Data		Data interfaces ground
16	RD-	RS-422	Receiver-
17	RD+	RS-422	Receiver+
18	-		
19	TPIP	Ethernet IN	Receiver+
20	TPIN	Ethernet IN	Receiver-
Housing	-	-	Screen

Tab. 11: Pin assignment of the "Power" connection on the LD-LRS

5.3 Preparing the electrical installation

5.3.1 Supply voltage

DC 24 V $\pm 15\%$ as per IEC 60364-4-41 (pay attention to permitted cable lengths in [tab. 12 on page 52](#))

The LD-LRS draws the following power:

- on switching on without switching outputs wired maximum 36 W
- in operation typically 12 W, plus a maximum of 12 W with switching output wired

The supply of power/the external power supply for the supply of power must be able to provide at least 40 W continuous power, if the switching output is wired at least 65 W continuous power.



WARNING

Use safety transformer!

The output circuit of the power supply must be safely electrically isolated from the input circuit, this feature is normally provided by a safety transformer in accordance with IEC 742 (VDE 0551).

Heater

DC 24 V (maximum residual ripple 6 V), maximum current consumption 6 A (cyclical)

5.3.2 Wire cross-sections

- Wire all connections with copper cables!
- Use the following wire cross-sections:
 - supply voltage at least 0.25 mm² (0.01 in²), if local supply of power (power supply) in the immediate vicinity
 - supply voltage at least 1 mm² (0.4 in²) at maximum length of 20 m (65.62 ft), if connection is made to an existing DC 24 V supply
 - data interface minimum 0.25 mm² (0.01 in²)
- Lay all cables such that there is no risk of tripping and all cables are protected against damage.

On the usage of a typical power supply with a nominal voltage of DC 24 V ±5%, the following maximum cable lengths are allowed for the supply of the operating voltage:

Wire cross-section	Cable length
0.25 mm ² (0.01 in ²)	5 m (16.4 ft)
0.5 mm ² (0.02 in ²)	10 m
1,0 mm ² (0.4 in)	20 m

Tab. 12: Maximum cable lengths for the supply voltage

5.3.3 General conditions for the data interface

The table below shows the recommended maximum length of cable as a function of the data transmission rate selected.

Interface type	Transmission rate	Maximum cable length
RS-422	115,200 Bd	100 m

Tab. 13: Maximum length of cable for the data interface

Important

- Use screened cable (twisted-pair) with at least 0.25 mm² (0.01 in²).
- To prevent interference, do not lay data cable in parallel with power supply and motor cables over a long run, e.g. in cable ducts.

5.4 Undertaking electrical installation on the LD-LRS

5.4.1 Equipment

- Tool
- digital multimeter (current/voltage measurement)

NOTICE

Only connect in electrically isolated state!

- Ensure the power supply to which the LD-LRS is connected is switched off.

5.4.2 Connection to the Ethernet interface

Pre-assembled cables are available to configure the LD-LRS via the Ethernet interface.

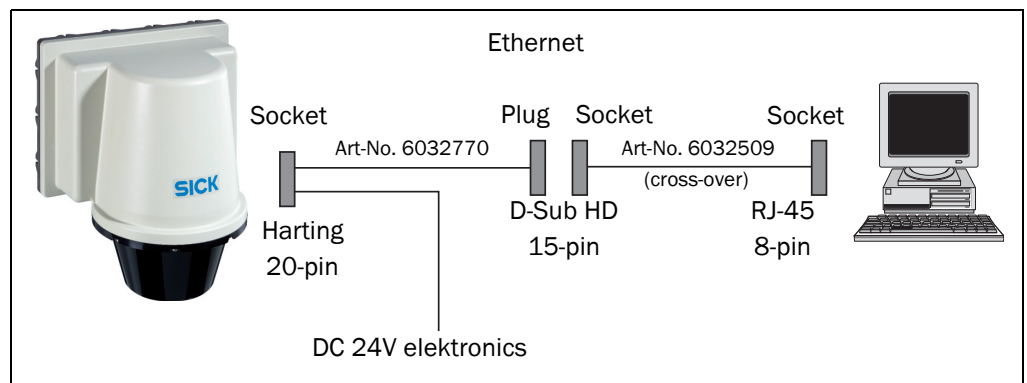


Fig. 37: Ethernet connection

5.4.3 Connection at the RS-422 interface

A screened cable is required for the wiring of the RS422 interface.

- Pay attention to max. cable length as per [section 5.3.3 “General conditions for the data interface” on page 52](#).

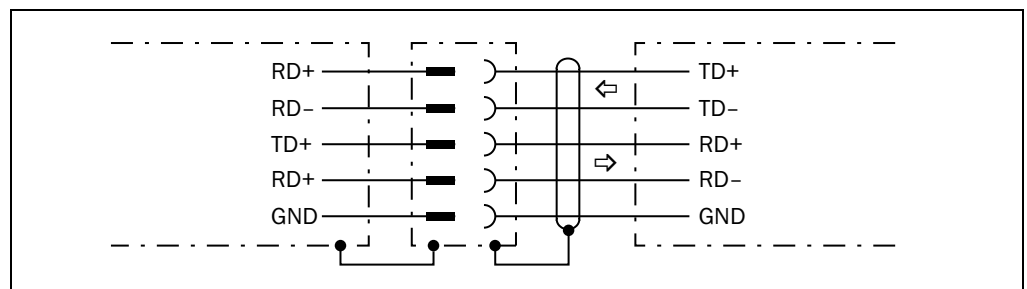


Fig. 38: Wiring the RS422 interface

6 Commissioning and configuration



WARNING

The LD-LRS must be commissioned only by adequately qualified personnel.

Before you operate a machine/system equipped with the LD-LRS for the first time, make sure that the system is first checked and released by qualified personnel. On this issue, observe the notes in [chapter 2 “For your safety” on page 11](#).

Commissioning, configuration and diagnostics are undertaken using the SOPAS ET configuration software supplied.

6.1 Overview of the commissioning steps

- Mounting and electrical installation must be undertaken.
- Install SOPAS ET configuration software.
- Establish communication with the LD-LRS.
- Create a custom parameter set using SOPAS ET and save in non-volatile memory in the LD-LRS.
- Test LD-LRS for correct function.

6.2 SOPAS ET configuration software

The interactive configuration is carried out using SOPAS ET. Using this configuration software, you can configure and test the measurement properties, the analysis behaviour and the output properties of the LD-LRS as required. The configuration data can be saved as a parameter set (project file) on the PC and archived.

Help for the program user interface as well as for the different options can be found in SOPAS ET:

- menu HELP, HELP F1: comprehensive online help for the program interface and for the different options
- HELP window (on the bottom left in the program user interface): context sensitive help for the visible dialog
- tool tips: Move the mouse pointer over an input field. A short text (“tool tip”) with information about valid entries appears.

Primary functions are:

- selection of the menu language (German/English)
- establishment of the communication with the LD-LRS
- password-protected configuration with different operating levels
- diagnostics of the LD-LRS

6.2.1 Installation of SOPAS ET

Download the latest SOPAS ET software on the internet www.sick.com.

The download's size is about 150MB. It includes the setup.exe installing the SOPAS Engineering Tool.

To complete the installation, follow the instructions.

6.2.2 SOPAS ET default setting

Parameter	Value
Language for the user interface	English (the software must be re-started after a change)
Units of length	Metric
User group (operating level)	Machine operator
Download the parameters to the LD-LRS	Immediate on change, temporary in the LD-LRS RAM
Upload the parameters from LD-LRS	After switching online, automatic
Window layout	3 (project tree, help, working area)
Serial communication	COM1: default: 115.2000 Bd, 8 data bits, no parity, 1 stop bit

Tab. 14: SOPAS ET default setting

6.3 Establish communication with the LD-LRS

Important For communication via TCP/IP, the TCP/IP protocol must be active on the PC.

On the connection of PC/host, following this sequence:

1. Switch on the PC.
2. Connect PC to the LD-LRS using data cable.
3. Switch on the supply voltage for the LD-LRS.
The LD-LRS performs a self-test and initialises itself.

6.3.1 Connect the data interfaces

- Connect the PC to the LD-LRS using the Ethernet cable (see [fig. 37 on page 53](#))
or
- Connect the PC (serial interface) to the LD-LRS (see [fig. 38 on page 53](#))

6.3.2 Starting SOPAS ET and opening the scan assistant

1. Start SOPAS ET.
By default SOPAS ET opens the program window with the English user interface.
2. To change the language setting, in the start dialog box click CANCEL and using the menu TOOLS, OPTIONS change the language for the user interface to GERMAN.
3. If the language setting has been modified, quit SOPAS ET and re-start.
4. In the dialog box, choose the option CREATE NEW PROJECT and confirm with OK.
5. In the main window in SCAN ASSISTANT click the CONFIGURATION button.
The SCAN ASSISTANT dialog box appears.

6.3.3 Configuring the serial connection

1. In the SCAN ASSISTANT dialog box, under SERIAL CONNECTION, STANDARD PROTOCOL, activate the ACTIVATE SERIAL COMMUNICATION checkbox.
2. Click ADVANCED... button.
3. In COLA DIALECT choose the ASCII option.
4. Choose following PORT SETTINGS: 8 data bits, no parity, 1 stop bit.
5. Confirm the settings with OK.
The ADVANCED SCAN SETTINGS dialog box is closed.
6. Confirm the settings in the SCAN ASSISTANT dialog box with OK.
The SCAN ASSISTANT dialog box is closed.

6.3.4 Configuring the Ethernet connection

The factory setting for the Ethernet interface of the LD-LRS is as follows:

- IP address: 192.168.1.10
- Subnet mask: 255.255.255.0
- TCP/ IP port for SOPAS ET: 2112
- CoLa- A (ASCII) and CoLa-B (binary) selectable

Configuring with fixed IP address

Important Deactivate all programs on your PC/notebook that access Ethernet or TCP/IP.

1. From the START MENU, click CONTROL PANEL and choose NETWORK CONNECTIONS.
2. Right-click the LOCAL AREA CONNECTION icon, and then choose PROPERTIES.
3. On the GENERAL tab, highlight INTERNET PROTOCOL (TCP/IP), and then click PROPERTIES
4. Select USE THE FOLLOWING IP ADDRESS, and enter the following IP address:
192.168.1. x (e.g. 1).
5. Confirm with OK.

Then adjust the IP configuration for the LD-LRS in SOPAS ET.

1. In the NETWORK SCAN ASSISTANT dialog box, under INTERNET PROTOCOL, INTERNET PROTOCOL, activate the ENABLE IP COMMUNICATION checkbox and deactivate ENABLE AUTOIP checkbox
2. Click ADD button.
3. Enter in SINGLE ADDRESS 192.168.1.10
4. Confirm the settings in the NETWORK SCAN ASSISTANT dialog box with OK.
The ADD ADDRESS dialog box is closed.

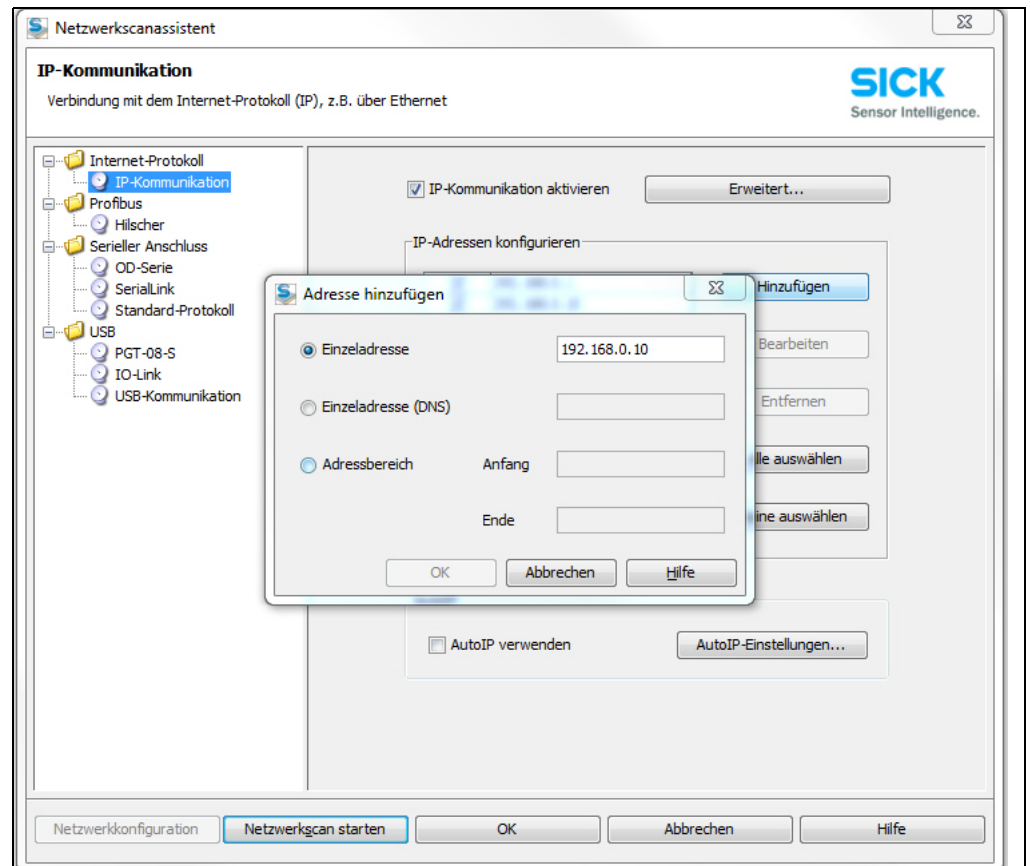


Fig. 39: IP communication with fixed IP address

5. Click ADVANCED... button
6. Under TCP PORT(S) activate port 2112 and confirm with OK.

Configuring with AutoIP

Important Deactivate all programs on your PC/notebook that access Ethernet or TCP/IP.

1. In the NETWORK SCAN ASSISTANT dialog, under INTERNET PROTOCOL, IP COMMUNICATION, select the ACTIVATE IP COMMUNICATION checkbox and the USE AUTOIP checkbox.
2. Click AUTO IP CONFIGURATION Button
3. Click SEARCHING FOR SENSORS Button to verify that the device is CONNECTABLE
4. If the status is NOT CONNECTABLE , highlight the device and follow instructions 5.-7. If the status is CONNECTABLE, close the dialog box with OK and start the NETWORK SCAN
5. Click CHANGE IP CONFIGURATION

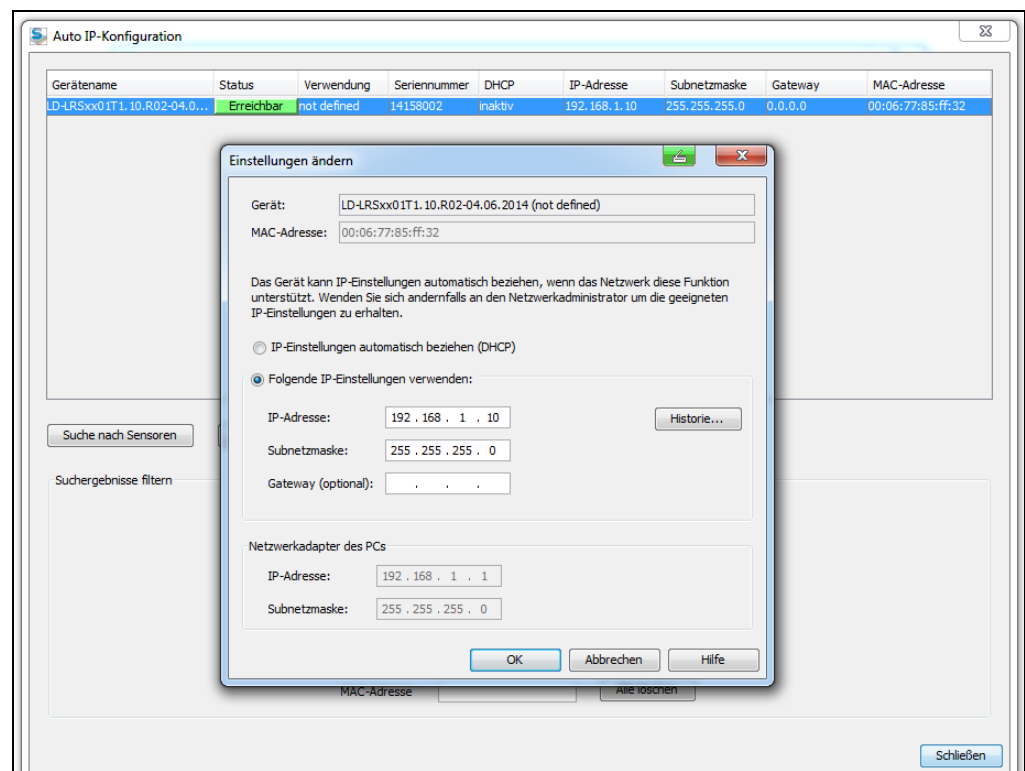


Fig. 40: Configuring with AutoIP

6. Enter the IP ADDRESS of your PC NETWORK ADAPTER incremented by one in IP ADDRESS under USE THE FOLLOWING IP SETTINGS, e.g.
IP address under PC Network adapter = 169.192.88.120
IP ADDRESS under USE THE FOLLOWING IP SETTINGS = 169.192.88.121
7. Confirm the settings in the NETWORK SCAN ASSISTANT dialog box with OK. The SCAN ASSISTANT dialog box is closed.

6.3.5 Performing scan

1. In the NETWORK SCAN ASSISTANT dialog box, click on the NETWORK SCAN button.
2. Choose devices listed and accept using ADD.
A scan is performed for devices connected via the connection. SOPAS ET adds the devices found to the project tree and uploads the actual parameter set from the device.

6.4 Initial commissioning

The LD-LRS is adapted to the local measurement situation using SOPAS ET. For this purpose a custom parameter set is created using SOPAS ET.

The parameter set is then loaded into the LD-LRS (download). This action is performed either immediately (SOPAS ET option IMMEDIATE DOWNLOAD) or manually (SOPAS ET command DOWNLOAD ALL PARAMETERS to the device).

Important Once the configuration has been completed, the parameter set must be saved in non-volatile memory in the LD-LRS. In addition, the parameter set should be saved as a project file (spr file with configuration data) on the PC and archived.

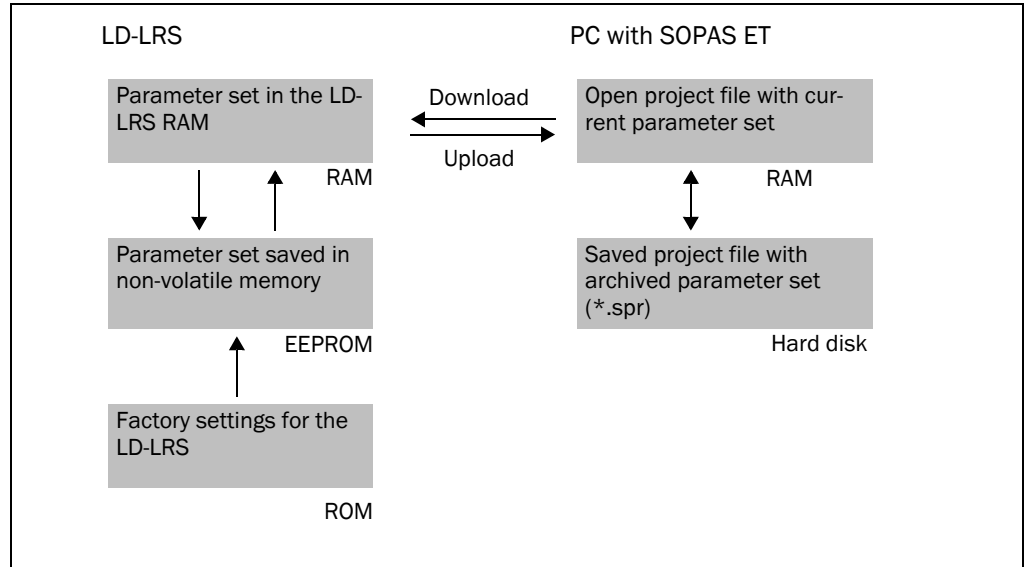


Fig. 41: Principle of data storage

6.4.1 Configuring the LD-LRS

You can configure the LD-LRS in two ways:

- interactively using SOPAS ET
This section describes the interactive configuration.
- using configuration telegrams
On this subject please read [section 3.8.2 “Data communication using telegrams” on page 43](#).

Interactive configuration using SOPAS ET

All parameters that can be configured for the LD-LRS are combined into a corresponding device description (sdd file) for SOPAS ET. You can open this file using the device description project tree.

The valid range of values and the default are listed in the PARAMETER INFO window (right mouse button when the pointer is positioned over the parameter).

Important Software access to the LD-LRS is password protected. You should change the password after successful configuration for it to retain its security function.

User level	Password
Authorised client	client

Tab. 15: Password LD-LRS



Use the project tree in SOPAS ET to configure the parameters necessary for your application.

NOTICE

Do not switch off the voltage supply during configuration!

Switching off the voltage supply during configuration causes all parameters already configured to be lost.

1. From the OPTIONS menu select the LOGIN DEVICE command and log in to the system using the password "client" as AUTHORISED CLIENT.
2. Configure the LD-LRS for the required application with the aid of the parameters in SOPAS ET.



Help for the program user interface as well as for the different options can be found in SOPAS ET.

6.5 Connection and test measurement



Use the graphic scan view in SOPAS ET to verify the generated measured values and to verify the measurement area online.

1. Select LD-LRS36xx, MONITOR, SCAN DISPLAY in the project tree.
2. To start the measurement, click the PLAY button.
3. Compare the measurement line with the required result.

Important

- The SCAN VIEW in the MONITOR is dependent on the available computing power of the PC and is **not** output in real-time. For this reason not all measured values are displayed. The same limitation also applies when saving measured values displayed in a file - The monitor displays the measured values without filtering, i.e. filters cannot be checked using the monitor.
4. After completing the test measurement successfully, save the configuration permanently to the LD-LRS: Menu LD-LRS, PARAMETER, SAVE PERMANENT.

7 Maintenance

Important Claims under the warranty rendered void!

The housing screws of the LD-LRS are sealed. Claims under the warranty against SICK AG will be rendered void if the seals are damaged or the device opened. The housing is only allowed to be opened by authorised service personnel.

7.1 Maintenance during operation

The LD-LRS is maintenance-free apart from the maintenance measures listed below. No maintenance is necessary to ensure the retention of laser class 1.

Recommendation To obtain the full performance of the LD-LRS, the cover on the LD-LRS must be regularly checked for contamination. This applies particularly in harsh operating environments (dust, powder, moisture, finger marks).

NOTICE

Damage to the optics in the LD-LRS!

The covers for the LD-LRS are made of plastic. The optical power is reduced by scratches and smearing on the front screen.

- Do not use aggressive detergents.
- Do not use abrasive cleaning agents.
- Only use fabric cleaning cloths or paper towels free of wood and fluff.
- Avoid scratching and scouring movements on the cover.

NOTICE

Performance reduction due to contamination of the cover!

Static charges cause dust particles to be attracted to the cover of the LD-LRS. You can prevent this effect by using the antistatic plastic cleaner (part no. 5600006) and the SICK lens cloth (part no. 4003353).



Fig. 42: Cover for the LD-LRS

How to clean the cover of the LD-LRS:

1. Switch off the LD-LRS while performing cleaning.
2. Use a clean and soft brush to remove dust from the cover.
3. Then wipe off the optics using a clean and damp cloth.

Important If the optics are scratched or damaged (crack, fracture), the optics must be replaced. Contact SICK service.

7.2 Exchanging a LD-LRS

As all external cable connections end in the plug connectors, it is not necessary to re-install the device electrically on a device replacement. The replacement unit can then be simply connected.

If the LD-LRS is to be replaced, proceed as follows:

1. Switch off the voltage supply for the LD-LRS.
2. Remove the connection cables from the LD-LRS.
3. Mounting the replacement device (see [chapter 4 "Assembly" on page 47](#)).
4. Open project file (spr file with configuration data) using SOPAS ET and transfer configuration to the device (see [fig. 41 on page 59](#)).

8 Troubleshooting

Important Claims under the warranty rendered void!

The housing screws of the LD-LRS are sealed. Claims under the warranty against SICK AG will be rendered void if the seals are damaged or the device opened. The housing is only allowed to be opened by authorised service personnel.

This chapter describes how to identify and rectify errors and malfunctions during the operation of the LD-LRS.

8.1 In the event of fault



WARNING

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

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

8.2 Monitoring error and malfunction indications

The LD-LRS monitors itself in operation:

- After switching on the supply voltage the LD-LRS runs through a self-test prior to initialisation (loading the parameter set and initialisation of the device functions); during this self-test the device checks important hardware components.
- During operation the LD-LRS continuously monitors the function of the rotation of the scanner head.
- If the LD-LRS detects a device error during the self-test or in operation, the coded errors can be read with the aid of the user protocol services.

8.3 Troubleshooting and rectification

Failure	Possible cause	Remedy
1. SOPAS ET cannot communicate with the LD-LRS.	<ul style="list-style-type: none"> Supply voltage for the LD-LRS not switched on 	<ul style="list-style-type: none"> ➤ Check supply voltage (see section 9.1 “Data sheet LD-LRS” on page 67). ➤ Check whether supply cables are correctly fitted in the connection plug. ➤ Check whether cables are connected to the correct terminals. ➤ Increase wire cross-section. ➤ Disconnect supply voltage and re-connect. If the red LED is still illuminated, inform SICK
	<ul style="list-style-type: none"> PC not connected to LD-LRS 	<ul style="list-style-type: none"> ➤ Connect PC to LD-LRS (use data cable to suit interface type).
	<ul style="list-style-type: none"> Wrong interface selected 	<ul style="list-style-type: none"> ➤ Select interface in SOPAS ET as per the connection made to the PC.
	<ul style="list-style-type: none"> Another application on the PC is already accessing the interface. 	<ul style="list-style-type: none"> ➤ Check assignment of the interface, if necessary quit related application.
	<ul style="list-style-type: none"> Pay attention to sequence when switching on the LD-LRS and the PC connected. 	<ul style="list-style-type: none"> ➤ 1. Switch on the PC. 2. Connect PC to LD-LRS. 3. Switch on LD-LRS.
2. Measurements in the near range with no objects present	<ul style="list-style-type: none"> Contaminated or scratched optics 	<ul style="list-style-type: none"> ➤ Carefully clean optics using soft, fluff-free cloth. If the optics are scratched, contact SICK service.
3. The LD-LRS is not detecting existing objects.	<ul style="list-style-type: none"> Smoke and dust 	<ul style="list-style-type: none"> ➤ Check whether the scanner head is clean and dry.
4. The LD-LRS is not transmitting a measured result.	<ul style="list-style-type: none"> Wiring fault in the data connection 	<ul style="list-style-type: none"> ➤ Check wiring.
5. Frequent CRC error on the RS422 interface.	<ul style="list-style-type: none"> Data transmission time critical 	<ul style="list-style-type: none"> ➤ Increase the baud rate.

Tab. 16: Troubleshooting and rectification

8.4 Detailed error analysis

Communication errors can occur on the transfer of telegrams to the LD-LRS. The LD-LRS then returns an error code that you can evaluate (see „Telegrammlisting USP“, part no.: 8016687, "Telegrammlisting CoLa-A/B", article no.: 8016855).

8.5 SICK support

If a fault cannot be rectified with the measures stated, the LD-LRS may be faulty. The LD-LRS cannot be repaired or its functionality restored by the user after a failure.

However, quick replacement of a LD-LRS by the user is possible. On this subject see [chapter 7.2 "Exchanging a LD-LRS" on page 63](#).

In case of a fault that cannot be rectified, please contact SICK service:

- In Germany: Technical support hotline of SICK Vertriebs-GmbH
Phone +49 211 5301-301
Fax. +49 211 5301-302
E-mail: kundenservice@sick.de.
 - Please contact your local SICK branch or SICK subsidiary when not in Germany.
 - For telephone number and e-mail addresses see rear of these operating instructions.
 - For postal addresses see also www.sick.com.
- Do not send device without consultation with SICK service.

Important Repairs to the LD-LRS are only allowed to be undertaken by trained and authorised service personnel from SICK AG.

8.5.1 Monitor

Using the monitor you can display the measured data, the detected reflectors and the position of the LD-LRS.



PROJECT TREE, LD-LRS, MONITOR, SCAN DISPLAY

LD-LRS

9 Technical data

9.1 Data sheet LD-LRS

Characteristic	LD-LRS3600	LD-LRS3601	LD-LRS3611
Output of measured values			
Measuring range ¹⁾	2.5 to 80 m, 10% remission 2.5 to 250 m, 90% remission max. 2.5 to 250 m		5 to 120 m, 10% remission 5 to 250 m, 90% remission max. 5 to 250 m
Usable scan angle ²⁾	max. 360°		
Angular resolution (step width)	0.0625° (raw data mode); 0.125°; 0.1875°; 0.25°; 0.375°; 0.5°; 0.75°; 1°		
Scanning frequency	5-15 Hz, rotational direction CCW	5-15 Hz, rotational direction CW	
Systematic error at 25 °C ¹⁾	±38 mm up to 80 m ±63 mm starting from 80 m		
Measurement resolution	1/256 m up to 250 m in USP interface, 4 mm up to 250 m (CoLa-A/B);		
Statistical error distance (1 sigma) ¹⁾	30 mm at 20 ... 90 % remission		
Temperature drift typ.	typ. ±0,6 mm/K		
General data			
Beam divergence	5.0 mrad		
Laser diode (wavelength)	infrared light ($\lambda = 905 \text{ nm}$)		
Pulse frequency	max. 14.4 kHz (max. 12 kHz above 360°)		
Laser class of the device	class 1 as per EN/IEC 60825-1:2014 (Identical laser class for issue EN/IEC 60825-1:2007), eye safe, 21 CFR 1040.10 and 1040.11 expect for deviations pursuant to Laser Notice No. 50, dated June 24, 2007		
RS-422 data interface	19,200; 38,400; 57,600; default: 115,200 Bd		
Data format	variable; default: 8 data bits, 1 stop bit, no parity		
Output signal switching device	100 MBit/s, TCP/IP		
Ethernet protocols	CoLa-A/B (Port 2112), CoLa-A (Port 2111)	CoLa-A/B (Port 2112), CoLa-A (Port 2111), USP (Port 49152)	
Serial protocols	CoLa-A		
Switching outputs	4 x (OUT1 to OUT4) semiconductor output, active high, maximum output current 0.5 A at DC 24 V	1 x (OUT1 for synchronisation); maximum output current 0.5 A at DC 24 V	
Operating voltage for electronics	DC 24 V ±15%/IEC 60364-4-41 (VDE 0100 part 410)		
Operating voltage for heater	DC 24 V (maximum residual ripple 6 V), maximum current consumption 6 A (cyclical)		
EMC test	switching on: max. 36 W (1.5 A) at DC 24 V, on power up briefly 2.1 A		
Housing	PUR-IHS: Polyurethane integral foam		
Enclosure rating	III according to EN 61140 (2002-03)		

Tab. 17: Data sheet LD-LRS

Characteristic	LD-LRS3600	LD-LRS3601	LD-LRS3611
International protection rating	IP 67 according to EN 60529 (1991-10); A1 (2002-02)		
Vibration test	According to IEC 60068-2-6, table 2c (frequency range 10 ... 150 Hz, amplitude 0,35 mm or 5 g)		
Weight	Approx. 9.1 kg (20.1 lb)		
Ambient operating temperature/ storage temperature	-25 ... +50 °C / -20 ... +70 °C		
Max. relative air humidity	5 ... 85 %, non-condensing		

Tab. 17: Data sheet LD-LRS

- 1) Values at typ. 25 °C. Condition: Laser beam completely incident on the object, warm-up time of 30 min observed.
- 2) You can choose between different combinations of scan angle, scan frequency, and angular resolution.

LD-LRS

9.2 Dimensional drawings

9.2.1 Dimensional drawing LD-LRS

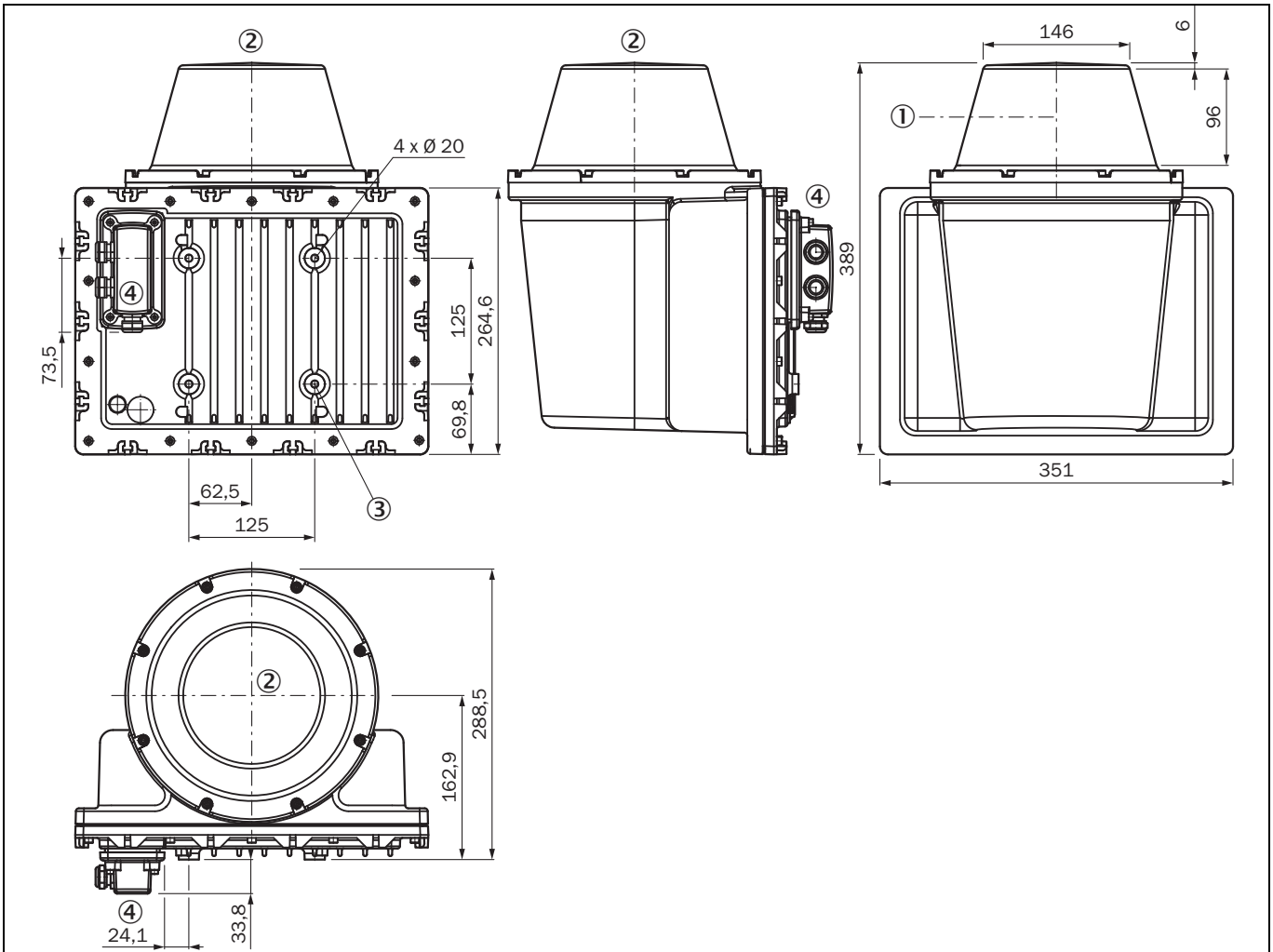


Fig. 43: Dimensions LD-LRS

- ① Optical axis
- ② Zero level
- ③ Mounting hole (M6x12)
- ④ Harting socket

9.2.2 Dimensional drawing bracket for LD-LRS

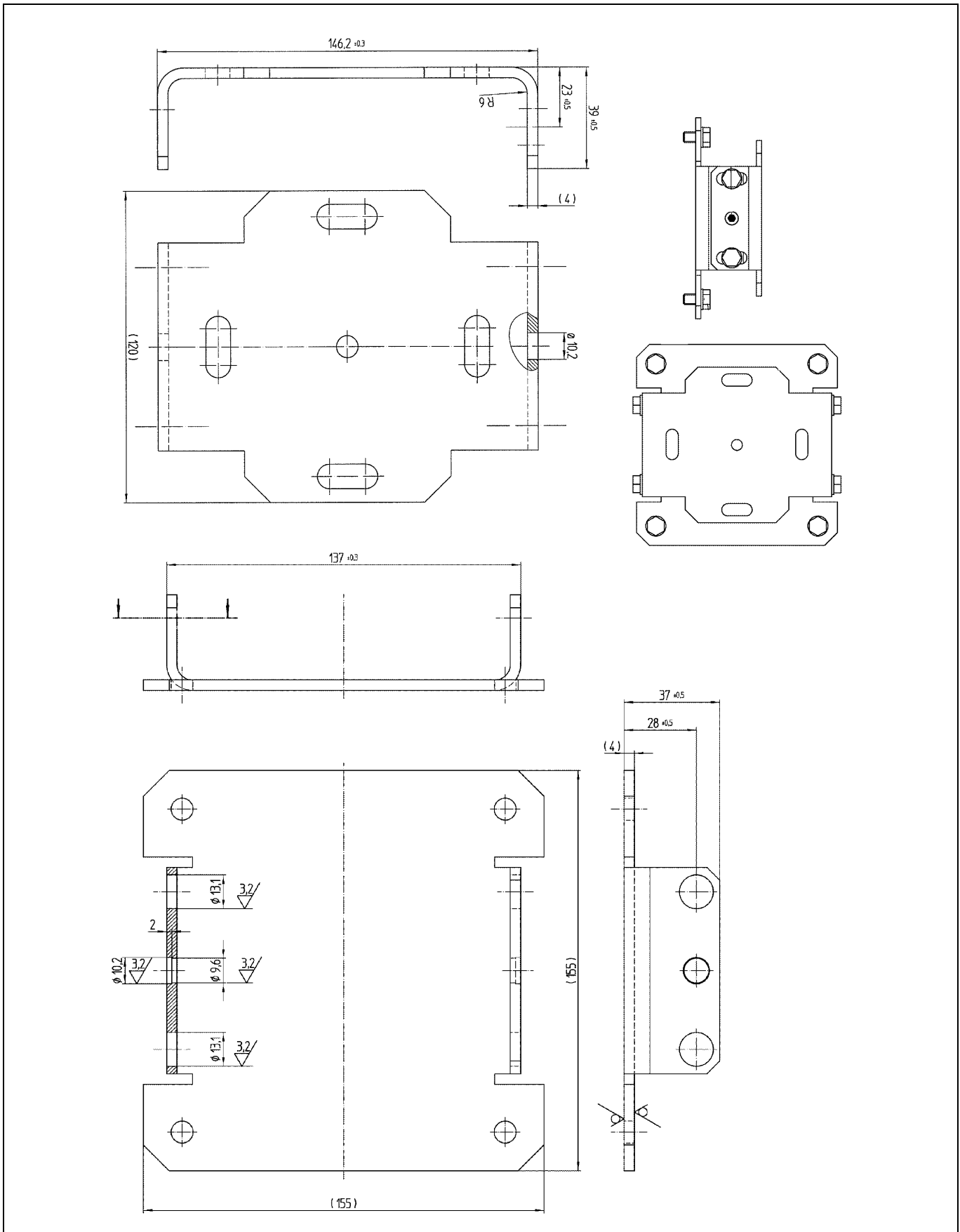


Fig. 44: Dimensional drawing bracket for LD-LRS

LD-LRS

9.2.3 Dimensional drawing mast bracket for LD-LRS

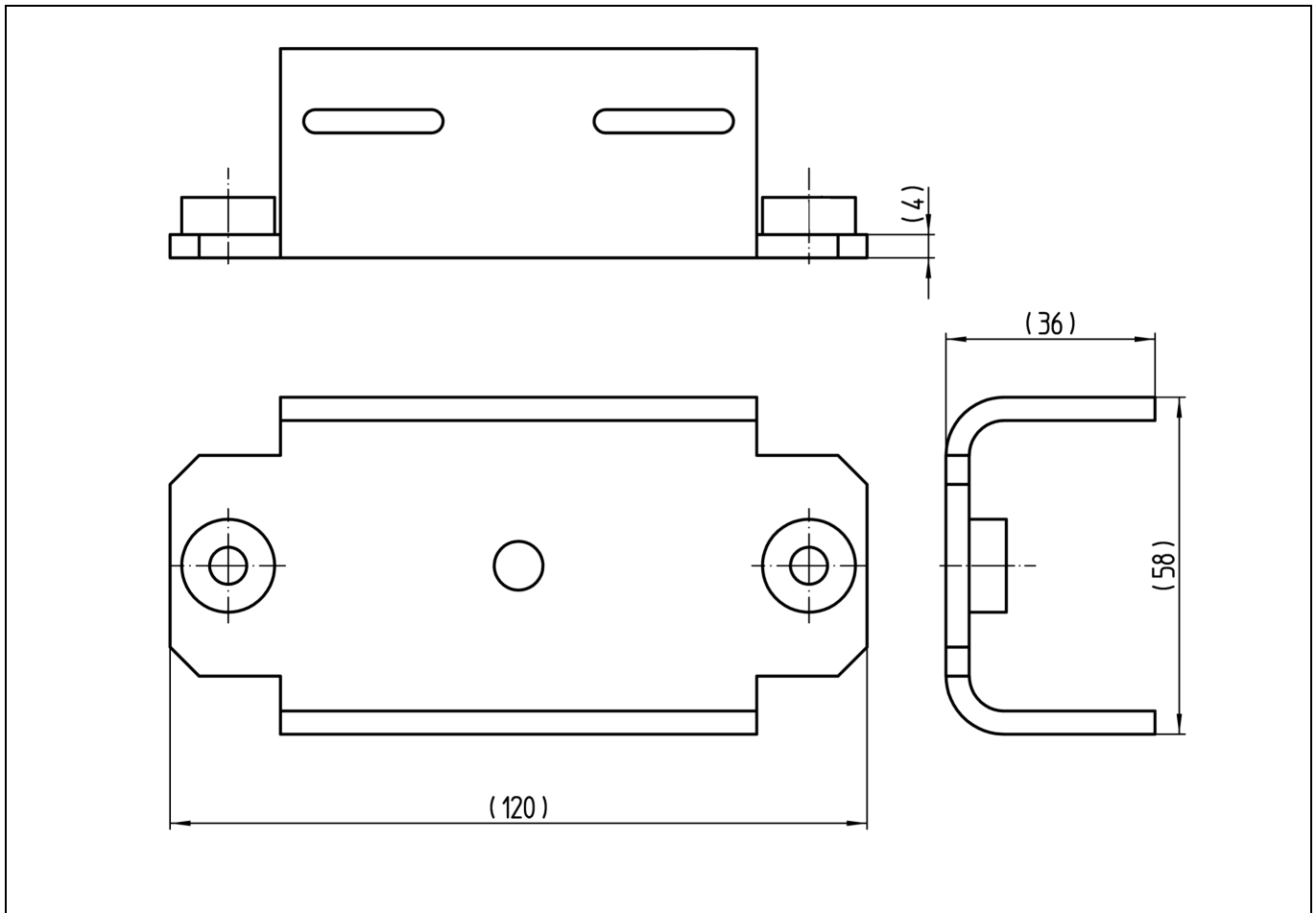


Fig. 45: Dimensional drawing mast bracket for LD-LRS

10 Annex

10.1 Overview of the annexes

The annex contains the following supplementary information:

- Data communication using the data interfaces
- Ordering information
- Glossary
- Illustration containing the EU declaration of conformity

10.2 Glossary

Download

Transmission of the parameter set that has been modified offline in the SOPAS ET configuration software from the PC to the LD-LRS. SOPAS ET transmits either always a complete copy to the memory (RAM) of the LD-LRS (menu COMMUNICATION, DOWNLOAD ALL PARAMETERS TO DEVICE) or only the parameter that has just been edited (menu COMMUNICATION, DOWNLOAD MODIFIED PARAMETERS TO DEVICE). With menu LD-LRS, PARAMETER, SAVE PERMANENT, the parameter set is saved permanently in the EEPROM of the LD-LRS.

Parameter set

Data set using which the functions implemented in the LD-LRS are initialised and activated. Is transmitted from the LD-LRS to SOPAS ET and in the reverse direction using UPLOAD or DOWNLOAD respectively.

Remission

Remission is the quality of reflection at a surface. The basis is the Kodak standard, known worldwide in, among other areas, photography. The surface-related magnitude of the remission is the remission value.

Scan

A scan includes all measured values determined related to the scan angle.

SOPAS ET

Configuration software, used for the offline configuration (adaptation to the read situation on-site) and the online operation of the LD-LRS in dialog mode.

Upload

Transmission of the parameter set from the LD-LRS to the PC into the SOPAS ET configuration software. Prerequisite for the modification of the current parameter set.


Interlace function

The interlace function offers a higher angular resolution than the native resolution by combining several individual scans with a low resolution. The individual scans are started with an offset of the angular step of the desired total resolution and issued subsequently with a scan number each. In an external computer, the individual scans are combined to a total scan with higher resolution. By means of SOPAS or a telegram command, the effective angular resolution, the rotational frequency, the multisampling and the scan area can be set. The effective rotational frequency is the rotational frequency of the individual scans divided by the interlace multiplier. The scanner firmware calculates the corresponding angular resolution for the individual scan.

10.3 EC declaration of conformity

fig. 46 shows page 1 of the EC declaration of conformity (size reduced).

If necessary download the complete EC declaration of conformity (with list of the standards met) as a PDF from the related product page on the SICK website www.sick.com.



EU Declaration of conformity

en Ident-No. : 9199618

The undersigned, representing the following manufacturer


SICK AG
Merkuring 20
22143 Hamburg
Germany

herewith declares that the product


LD-LRS36xx

is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications referenced overleaf have been applied.

Reute, 24.04.2014



.....
i.V. Pastor
(Manager R&D Distance & Ranging)



.....
ppa. Walter
(Manager Production Division Identification & Measuring)

Fig. 46: Illustration containing the EU declaration of conformity

Australia

Phone +61 3 9457 0600
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Austria

Phone +43 22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg

Phone +32 2 466 55 66
E-Mail info@sick.be

Brazil

Phone +55 11 3215-4900
E-Mail marketing@sick.com.br

Canada

Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic

Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile

Phone +56 2 2274 7430
E-Mail info@schadler.com

China

Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark

Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland

Phone +358-9-2515 800
E-Mail sick@sick.fi

France

Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany

Phone +49 211 5301-301
E-Mail info@sick.de

Hong Kong

Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary

Phone +36 1 371 2680
E-Mail office@sick.hu

India

Phone +91 22 6119 8900
E-Mail info@sick-india.com

Israel

Phone +972 4 6881000
E-Mail info@sick-sensors.com

Italy

Phone +39 02 274341
E-Mail info@sick.it

Japan

Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia

Phone +6 03 8080 7425
E-Mail enquiry.my@sick.com

Mexico

Phone +52 (472) 748 9451
E-Mail mario.garcia@sick.com

Netherlands

Phone +31 30 2044 000
E-Mail info@sick.nl

New Zealand

Phone +64 9 415 0459
0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway

Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland

Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania

Phone +40 356 171 120
E-Mail office@sick.ro

Russia

Phone +7 495 775 05 30
E-Mail info@sick.ru

Singapore

Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia

Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia

Phone +386 591 788 49
E-Mail office@sick.si

South Africa

Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea

Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain

Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden

Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland

Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan

Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand

Phone +66 2645 0009
E-Mail Ronnie.Lim@sick.com

Turkey

Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates

Phone +971 4 88 65 878
E-Mail info@sick.ae

United Kingdom

Phone +44 1727 831121
E-Mail info@sick.co.uk

USA

Phone +1 800 325 7425
E-Mail info@sick.com

Vietnam

Phone +84 945452999
E-Mail Ngo.Duy.Linh@sick.com

Further locations at www.sick.com