

Laser Measurement Systems of the LMS100 Product Family



In full view in all weathers –
compact and economical



Software version described

Software/tool	Function	Status
LMS100/111/151-10000	Firmware	V 1.23
LMS122/123-10000	Firmware	V 1.00
LMS123-11000	Firmware	V 1.10
Device description LMS100/111/151	Device specific software module for SOPAS ET	V 01.10.00 or higher
Device description LMS122/123	Device specific software module for SOPAS ET	V 01.00.00 or higher
SOPAS ET	Configuration software	V 02.18 or higher

Software access to the LMS100/111/151 is password protected. As supplied the following passwords are defined:

User level	Password
Maintenance personnel	main
Authorised client	client

Software access to the LMS122/123 is password protected. As supplied the following passwords are defined:

User level	Password
Operator	-
Operator	main
Integrator	client

A password is not defined for the Operator user level as supplied.

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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.

Table of contents

- 1 About this document 9**
- 1.1 Function of this document 9
- 1.2 Target group 9
- 1.3 Depth of information 9
- 1.4 Symbology used 10
- 2 For your safety 11**
- 2.1 Authorised personnel 11
- 2.2 Correct use 11
- 2.3 General safety notes and protective measures 12
- 2.4 Quick stop and Quick restart 14
- 2.5 Environmental protection 14
- 3 Product description 16**
- 3.1 Delivery 16
- 3.2 Device variants 16
- 3.3 Special features of the LMS 18
- 3.4 Controls and status indicators 18
- 3.5 Operating principle of the LMS 20
- 3.6 Applications 28
- 3.7 Measurement of objects 28
- 3.8 Field application 34
- 3.9 Inputs and outputs 39
- 3.10 Data interfaces 41
- 3.11 Data communication using messages 42
- 3.12 Planning 43
- 4 Mounting 46**
- 4.1 Overview of the mounting steps 46
- 4.2 Preparations for mounting 46
- 4.3 Mounting steps 46
- 4.4 Dismanteling the system 53
- 5 Electrical installation 54**
- 5.1 Overview of the installation steps 54
- 5.2 Connections of the LMS 54
- 5.3 Preparing the electrical installation 58
- 5.4 Perform electrical installation on the LMS 59
- 6 Commissioning and configuration 67**
- 6.1 Overview of the commissioning steps 67
- 6.2 SOPAS ET configuration software 67
- 6.3 Establish communication with the LMS 68
- 6.4 Initial commissioning 70
- 6.5 Connection and test measurement 72
- 7 Maintenance 73**
- 7.1 Maintenance during operation 73
- 7.2 Exchanging an LMS 73
- 8 Troubleshooting 74**
- 8.1 In the event of faults or errors 74
- 8.2 Error displays of the LEDs 74
- 8.3 Indications of the 7-segment display 75
- 8.4 Detailed error analysis 75

9	Technical specifications	76
9.1	Data sheet LMS laser measurement system	76
9.2	Dimensional drawings	81
10	Annex	86
10.1	Overview of the annexes	86
10.2	Messages	86
10.3	Ordering information	107
10.4	Glossary	108
10.5	EC Declaration of Conformity	109

Abbreviations

ATEX	Atmosphère explosible = synonym for explosion protection
BCC	Block character check
CAN	Controller area network = standardised fieldbus system with message-based protocol for exchanging data
CoLa	Communication Language = proprietary SOPAS ET communication language (ASCII = CoLa-A or binary = CoLa-B)
CS	Checksum
EEPROM	Electrically erasable programmable read-only memory
HTML	Hypertext markup language = page description language on the Internet
LED	Light Emitting Diode
LMS	SICK AG laser measurement system
RAM	Random access memory = volatile memory with direct access
ROM	Read-only memory (permanent)
SOPAS ET	SICK OPEN PORTAL for APPLICATION and SYSTEMS Engineering Tool = configuration software for the configuration of the LMS100 ... LMS151
VdS	Formerly "Verband der Sachversicherer e.V." – in 1997 the technical departments of the former organisation were transferred to VdS Schadenverhütung GmbH. This is a subsidiary of the Gesamtverband der Deutschen Versicherungswirtschaft e.V. (GDV = Association of German insurers)

Tables

Tab. 1: Target groups of this document 9

Tab. 2: Authorised personnel 11

Tab. 3: Delivery 16

Tab. 4: Device variants 16

Tab. 5: Special features of the LMS variants 18

Tab. 6: Meaning of the LEDs 19

Tab. 7: Input combination examples LMS100/111/151 35

Tab. 8: Input combination examples LMS122/123 35

Tab. 9: Frame for the messages with ASCII coding 43

Tab. 10: Frame for the messages with binary coding 43

Tab. 11: Beam diameter at different distances from the LMS 45

Tab. 12: Terminal assignment of the LMS100 55

Tab. 13: Pin assignment of the “Ethernet” connection on the LMS100 55

Tab. 14: Pin assignment of the “Auxiliary interface” connection on the LMS100 56

Tab. 15: Terminal assignments on the LMS122/123 56

Tab. 16: Pin assignment of the “Ethernet” connection on the LMS122/123 57

Tab. 17: Pin assignment of the “Auxiliary interface” connection on the LMS122/123 .. 57

Tab. 18: Pin assignment of the “Power” connection on the LMS111/LMS151 57

Tab. 19: Pin assignment of the “RS-232” connection on the LMS111/LMS151 57

Tab. 20: Pin assignment of the “I/O” connection on the LMS111/LMS151 58

Tab. 21: Pin assignment of the “Ethernet” connection on the LMS111/LMS151 58

Tab. 22: Pin assignment of the “Auxiliary interface” connection
on the LMS111/LMS151 58

Tab. 23: Maximum cable lengths for the data interfaces 59

Tab. 24: SOPAS ET default setting 68

Tab. 25: Connect the data interfaces 68

Tab. 26: Passwords LMS100/111/151 71

Tab. 27: Passwords LMS122/123 71

Tab. 28: Error displays of the LEDs 74

Tab. 29: Indications of the 7-segment display 75

Tab. 30: Data sheet LMS100 ... LMS151 76

Tab. 31: Variable types 86

Tab. 32: Hash values of the passwords 97

Tab. 33: Consumables 107

Figures

Fig. 1: Laser output aperture of the LMS 13

Fig. 2: Laser warning label on the LMS 14

Fig. 3: Device variants 17

Fig. 4: Status indicators 19

Fig. 5: Measuring principle of the LMS 20

Fig. 6: Principle of operation for pulse propagation time measurement 20

Fig. 7: Reflection of the laser beam at the surface of an object 21

Fig. 8: Reflection angle 21

Fig. 9: Degree of reflection 22

Fig. 10: Mirror surfaces 22

Fig. 11: Object smaller than diameter of the laser beam 22

Fig. 12: Scanning range of the LMS100/LMS111/LMS122/LMS123
as a function of the target remission 23

Fig. 13: Scanning range of the LMS151 as a function of the target remission 23

Fig. 14: Beam expansion 24

Fig. 15: Schematic layout of the distance between measured points
at different angular resolutions 24

Fig. 16: Beam diameter and distance between measured points
at 0 to 20 m (0 to 65.62 ft) 25

Fig. 17: Beam diameter and distance between measured points
of LMS151 at 0 to 50 m (0 to 164.04 ft) 26

Fig. 18: Minimum object size for detection 26

Fig. 19: Measured value message request 30

Fig. 20: Continuous measured value output 31

Fig. 21: Principle of operation of the measurement of the second reflected pulse 32

Fig. 22: Shading of reflections 33

Fig. 23: Principle of the field application 34

Fig. 24: Protection against tampering due to shading and glare 37

Fig. 25: Examples of different evaluation field shapes 38

Fig. 26: Logical operators for inputs and outputs 40

Fig. 27: Increase in the size of the beam and safety supplement 44

Fig. 28: Direct mounting 47

Fig. 29: Mounting with mounting kit 1a 48

Fig. 30: Mounting with mounting kit 1b 48

Fig. 31: Mounting with mounting kit 2 and 3 49

Fig. 32: Weather protection hood 190° 50

Fig. 33: Weather protection hood 270° 50

Fig. 34: Mounting kit for the weather protection hood 51

Fig. 35: Quick-action mounting kit for the weather protection hood 51

Fig. 36: Placement of two LMS opposed to each other 52

Fig. 37: Crosswise placement of two LMS 52

Fig. 38: Placement of two LMS with parallel offset52

Fig. 39: Placement of two LMS with parallel offset, one of these upside down53

Fig. 40: Placement of two LMS upside down, parallel offset53

Fig. 41: Placement of two LMS with parallel offset, one of these upside down53

Fig. 42: LMS100 ... LMS151: RS-232 connection at the auxiliary interface60

Fig. 43: LMS100 ... LMS151: Ethernet connection using the Ethernet cable60

Fig. 44: LMS111/LMS151: connection of the voltage supply61

Fig. 45: LMS111/LMS151: “RS-232” connection62

Fig. 46: LMS111/LMS151: “I/O” connection62

Fig. 47: Connecting digital inputs as non-floating62

Fig. 48: Connecting digital inputs as floating63

Fig. 49: Wiring encoder inputs63

Fig. 50: Connection of the outputs to a PLC, non-floating (active high)64

Fig. 51: Connection of the outputs to a PLC, non-floating (active low)64

Fig. 52: Connection of the outputs to a PLC, floating (active high)64

Fig. 53: Connection of the outputs to a PLC, floating (active low)64

Fig. 54: Connection to an object protection system65

Fig. 55: Connection to an object protection system, resistance monitored65

Fig. 56: Connection of the LMS122/123 to an object protection system65

Fig. 57: Connection of the LMS122/123 to an object protection system,
resistance monitored66

Fig. 58: Wiring of the CAN interface66

Fig. 59: Wiring the RS-232 interface66

Fig. 60: Principle of data storage70

Fig. 61: Dimensional drawing LMS100/LMS122/LMS12381

Fig. 62: Dimensional drawing LMS111/LMS15182

Fig. 63: Dimensional drawing, mounting kit 1a83

Fig. 64: Dimensional drawing, mounting kit 1b83

Fig. 65: Dimensional drawing, mounting kit 284

Fig. 66: Dimensional drawing, mounting kit 384

Fig. 67: Dimensional drawing weather protection hood 190°85

Fig. 68: Dimensional drawing weather protection hood 270°85

Fig. 69: Illustration containing the EC Declaration of Conformity 109

1 About this document

Please read this chapter carefully before working with this documentation and the LMS100 ... LMS151 laser measurement system.

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 laser measurement system variants:

- LMS100 (indoor)
- LMS111 (outdoor)
- LMS122/123 (indoor, for object protection systems)
- LMS151 (outdoor, with extended functionality)

Important In the following the variants are termed “LMS” for short, except in cases where exact differentiation is necessary.

1.2 Target group

The intended audience 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 LMS:

- product description
- mounting
- electrical installation
- commissioning and configuration
- maintenance
- fault, error diagnosis and troubleshooting
- ordering information
- conformity and approval

Planning and using laser measurement systems such as the LMS 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 LMS.

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

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 LMS 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 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 indicates potential hazards that could involve damage or degradation of the functionality of the LMS 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 LMS.

2.1 Authorised personnel

The LMS laser measurement system must be installed, commissioned and serviced only by adequately qualified personnel.

NOTICE

Repairs to the LMS 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 an HTML browser (e.g. Internet Explorer) • basic knowledge of data transmission

Tab. 2: Authorised personnel

2.2 Correct use

The LMS is an electro-sensitive distance measurement system for stand-alone or network operation. It is suitable for applications in which precise, electro-sensitive measurements of contours and surroundings are required. It is also possible to realise systems, for instance, for collision protection, for building surveillance or for access monitoring.

It must be initialised only by qualified personnel and only in industrial environments.

NOTICE

In case of any other usage as well as in case of modifications to the LMS, 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.

The LMS is only allowed to be operated in the ambient temperature range allowed (see [section 9.1 "Data sheet LMS laser measurement system" on page 76](#)).

2.3 General safety notes and protective measures



WARNING

Safety notes

Please observe the following items in order to ensure the correct and safe use of the LMS.

- 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 LMS, 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 laser measurement system, in particular:
 - the work safety regulations/safety rules
 - other relevant health and safety regulations
- Manufacturers and operators of the system on which the LMS 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 LMS is fitted. 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 LMS 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 from the laser measurement system



CAUTION

Laser radiation!

The LMS corresponds to laser class 1 (eye safe) as per EN 60825-1 (for publication date see laser warning label on the device). Complies with 21 CFR 1040.10 with the exception of the deviations as per Laser Notice No. 50, July 26, 2001. The laser beam cannot be seen with the human eye.

- Incorrect usage can result in hazardous exposure to laser radiation.
- Do not open the housing (opening the housing will not switch off the laser).
- 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 window of the optics cover on the LMS.

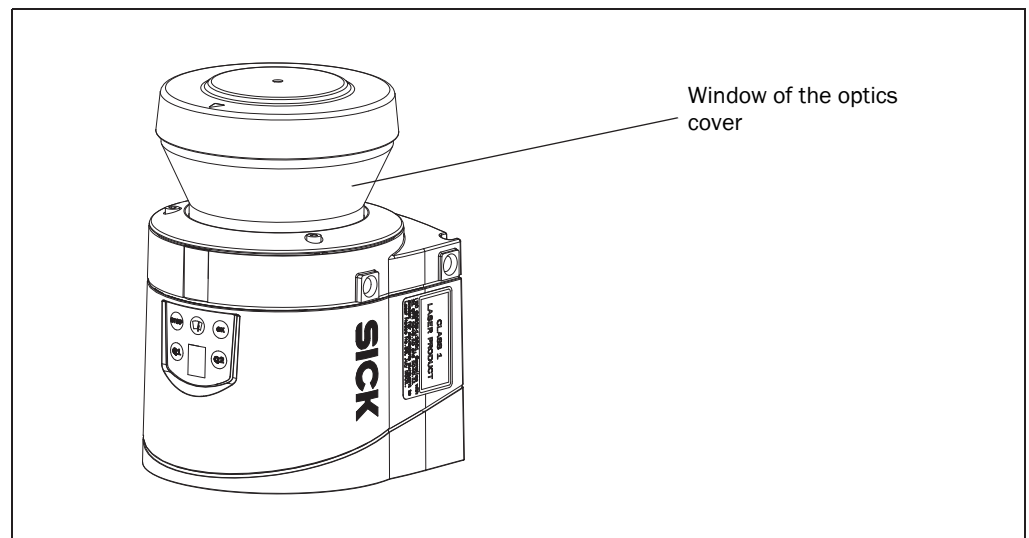


Fig. 1: Laser output aperture of the LMS

Laser power

The laser operates at a wavelength $\lambda = 905 \text{ nm}$ (invisible infrared light). The radiation emitted in normal operation is not harmful to the eyes and human skin.

Laser warning label

The laser warning is on the LMS on the right side of the housing.

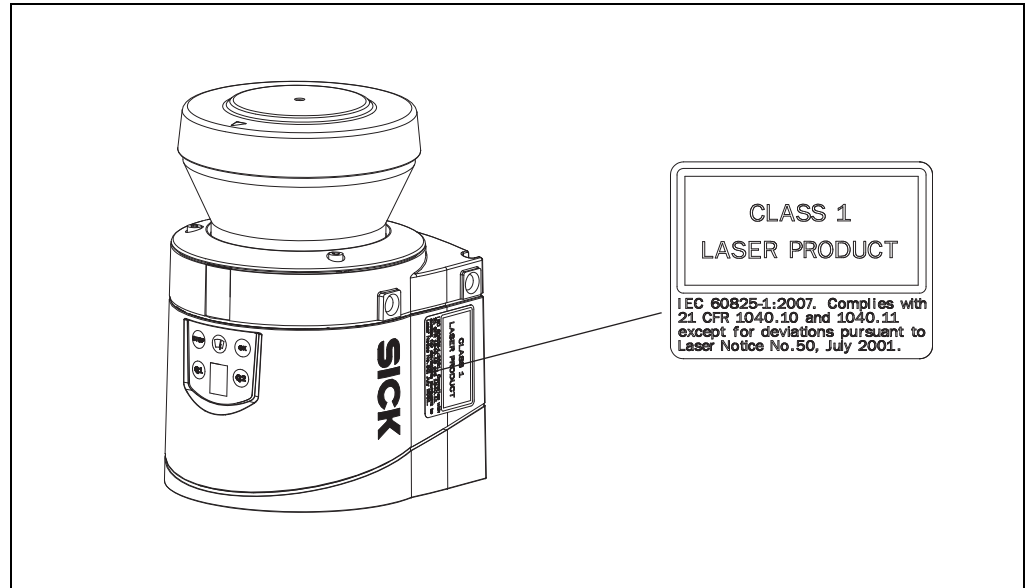


Fig. 2: Laser warning label on the LMS

2.4 Quick stop and Quick restart

2.4.1 Switching off the LMS

- Switch off voltage supply (power supply) for the LMS or disconnect the M12-supply cable on the LMS111/LMS151.

The LMS retains parameters stored in the internal, non-volatile memory. Measured values on the interface are lost.

2.4.2 Switching back on the LMS

- Switch on voltage supply (power supply) for the LMS or re-connect the M12-supply cable on the LMS111/LMS151.

The LMS re-commences operation with the parameters last saved.

2.5 Environmental protection

The LMS 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 LMS100/LMS122/123 consumes a maximum of 20 W in operation.
- In addition, the LMS111/LMS151 draws a maximum of 60 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 LMS laser measurement system. It describes the construction and the operating principle of the device, in particular the different operating modes.

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

3.1 Delivery

The LMS delivery includes the following components:

Quantity	Components	Comment
1	An LMS laser measurement system	LMS100, LMS111, LMS122, LMS123 or LMS151, depending on order
1	Device instructions with electrical circuit diagram for getting started	Is included in the LMS packaging
1	CD-ROM "Manuals & Software Auto Ident"	Contents see 3.1.1

Tab. 3: Delivery

[Section 10.3 "Ordering information" on page 107](#) provides an overview of the systems available and the accessories available.

3.1.1 Contents of the CD-ROM

- SOPAS ET configuration software
- operating instructions "LMS100 ... LMS151 Laser measurement system" in German and English as PDF
- freely available software "Adobe Acrobat® Reader™"

The latest versions of the publications and programs included on the CD-ROM are also available for download at www.sick.com.

3.2 Device variants

Type	Special features	Heating	Enclosure rating
LMS100	Indoor variant	Without	IP 65
LMS111	Outdoor variant	With	IP 67
LMS122	Indoor variant, black, optimised for usage in object protection systems	Without	IP 65
LMS123	Indoor variant, white, optimised for usage in object protection systems	Without	IP 65
LMS151	Outdoor variant with extended functionality	With	IP 67

Tab. 4: Device variants

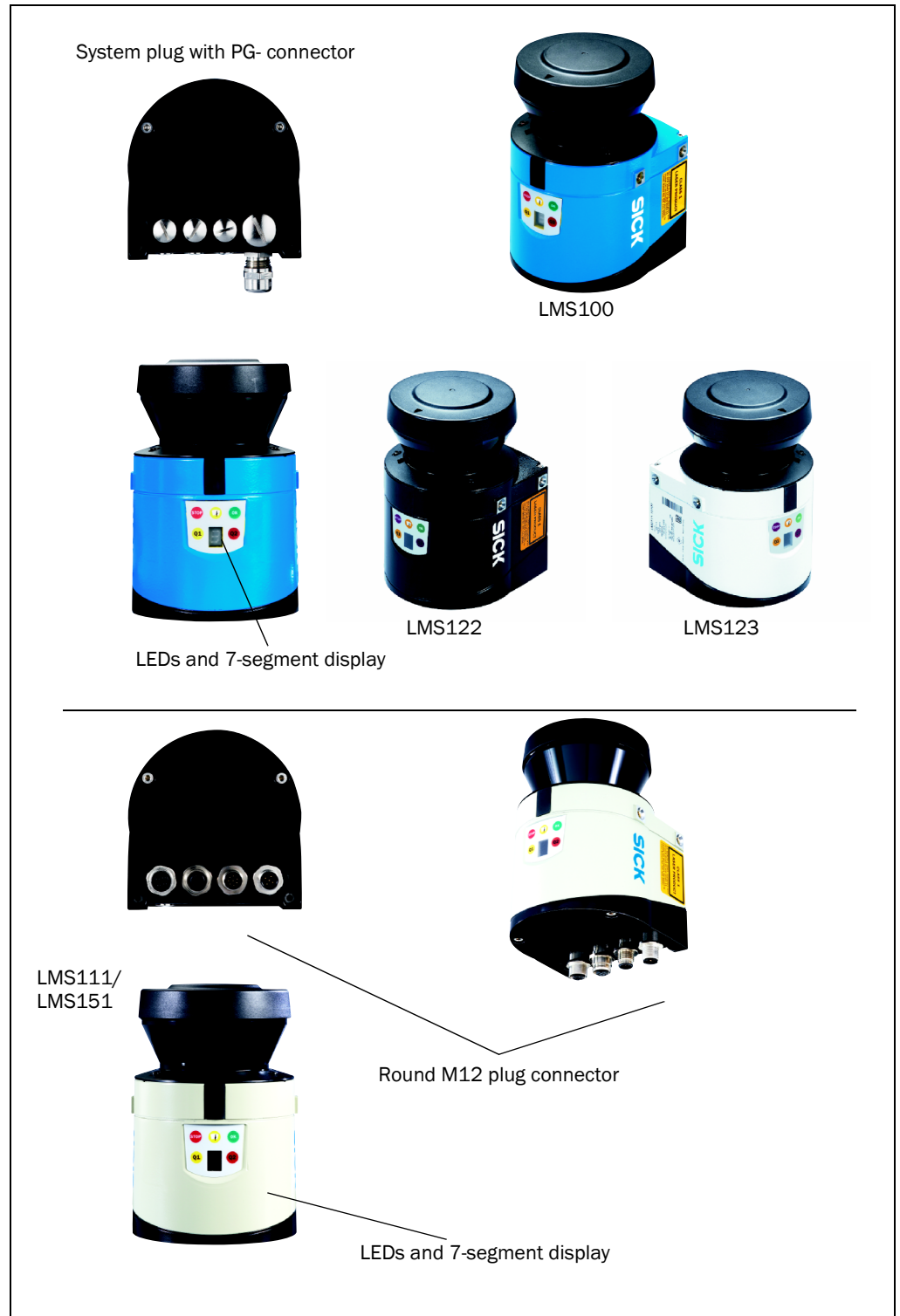


Fig. 3: Device variants

3.3 Special features of the LMS

Variant	Special features
All	<ul style="list-style-type: none"> • field of view maximum 270° • resolution of the angular step width: 0.25/0.50° • rotation frequency 25/50 Hz • flexible system configurations • configuration/measured value request using messages (command strings) • data interfaces Ethernet, RS-232, CAN (for the connection of an I/O module) <p>Measured value output (raw data)</p> <ul style="list-style-type: none"> • electro-sensitive, active measurement technique • measurement of objects with almost any shape • measured value output for a second reflection pulse (e.g. in rain or on measurement through a window) <p>Integrated field application</p> <ul style="list-style-type: none"> • 10 configurable evaluation fields • monitoring of the evaluation field contours • switching of the evaluation fields using digital inputs • encoder inputs • additional output of the evaluation field (unoccupied or infringed) via digital outputs or messages
LMS100	<ul style="list-style-type: none"> • scanning range up to 20 m (65.62 ft) with > 13% object remission (18 m (59.05 ft) with 10% object remission) • housing with protection class IP 65
LMS111	<ul style="list-style-type: none"> • scanning range up to 20 m (65.62 ft) with > 13% object remission (18 m (59.05 ft) with 10% object remission) • outdoor housing with protection class IP 67
LMS120	<ul style="list-style-type: none"> • scanning range up to 20 m (65.62 ft) with > 13% object remission (18 m (59.05 ft) with 10% object remission) • housing with protection class IP 65 • optimised for usage in object protection systems • sabotage contacts
LMS151	<ul style="list-style-type: none"> • scanning range up to 50 m (164.04 ft) with > 75% object remission (18 m (59.05 ft) with 10% object remission) • outdoor housing with protection class IP 67 • CAN data interface, in future support for CANopen 2.0A

Tab. 5: Special features of the LMS variants

3.4 Controls and status indicators

3.4.1 User interface

In normal operation the laser measurement system operates fully automatically 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 that is connected to the LMS 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, note that the field evaluation monitor cannot display the data in real-time and therefore does not display all measured values.

3.4.2 Status indicators

The LEDs and the 7-segment display indicate the operational status of the LMS.



Fig. 4: Status indicators

Important



- On the LMS, along with the standard displays described below, the indication functions of the LEDs and the 7-segment display can be configured in SOPAS ET. PROJECT TREE, LMS..., PARAMETER, NETWORK/INTERFACES/IOs, DISPLAY.
- On the LMS122/123 the status indicators are switched off so that as far as possible it cannot be seen that the device is part of an object protection system. In the practice check mode they are switched on (see [section 3.8.1 "Evaluation cases" on page 35](#)).

LEDs

Display	Possible cause
	LMS in operation, no evaluation field is signalling an event
	LMS in operation, at least one evaluation field is signalling an event
	Optics cover contaminated
	Switching output OUT1 switched (see section 3.8.3 "Operator for the evaluation cases on the output" on page 39)
	Switching output OUT2 switched (see section 3.8.3 "Operator for the evaluation cases on the output" on page 39)

Tab. 6: Meaning of the LEDs

Further information see [section 8.2 "Error displays of the LEDs" on page 74](#).

7-segment display

Used for diagnostics on occurring errors or malfunctions (see [section 8.3 "Indications of the 7-segment display" on page 75](#)).

3.5 Operating principle of the LMS

The LMS is an electro-optical laser measurement system that electro-sensitively scans the perimeter of its surroundings in a plane with the aid of laser beams. The LMS measures its surroundings in two-dimensional polar coordinates. If a laser beam is incident on an object, the position is determined in the form of distance and direction.

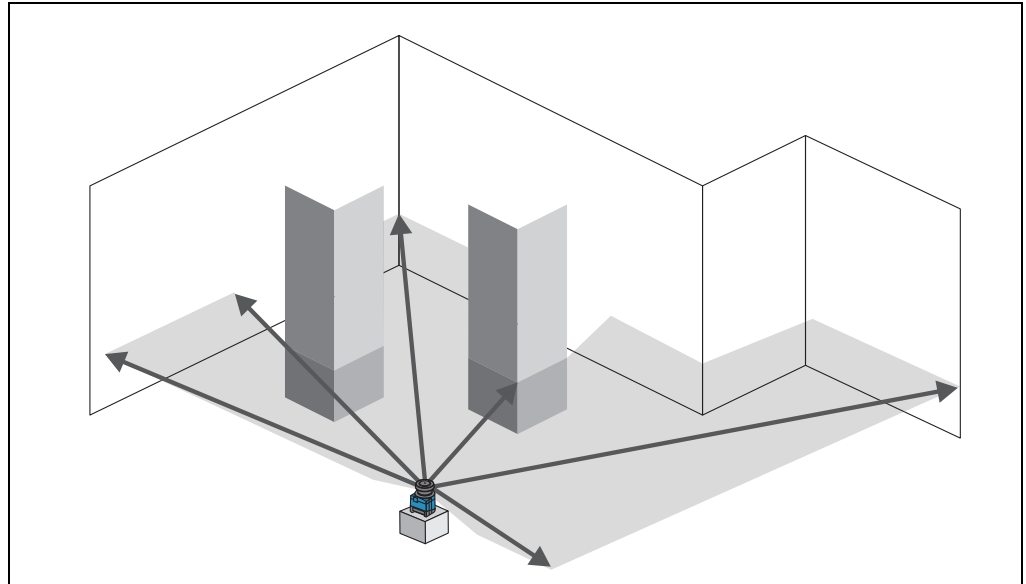


Fig. 5: Measuring principle of the LMS

Scanning takes place in a sector of 270° . The scanning range of the LMS is maximum 20 m (65.62 ft) on light, natural surfaces with an object remission $> 13\%$ (e.g. a white house wall).

Distance measurement

The LMS emits pulsed laser beams using a laser diode. If such a laser pulse is incident on an object or a person, it is reflected at its surface. The reflection is detected in the laser measurement system's receiver using a photodiode.

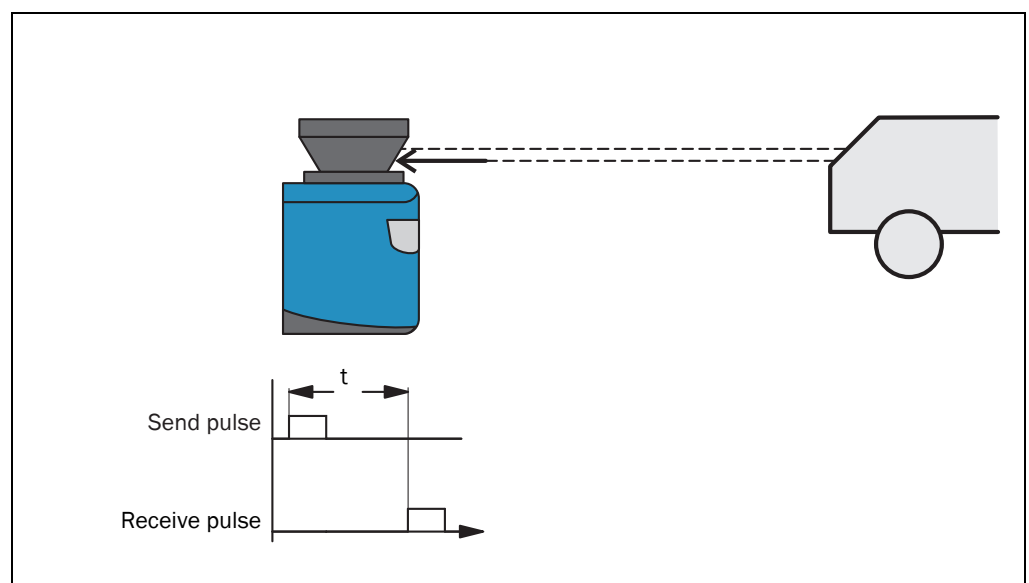


Fig. 6: Principle of operation for pulse propagation time measurement

The distance to the object is calculated from the propagation time that the light requires from emission to reception of the reflection at the sensor. This principle of “pulse propagation time measurement” is used by radar systems in a similar manner (see also [section 3.7.4 “Measured value output for a second reflected pulse” on page 32](#)).

Direction measurement

The emitted laser beams are deflected using a mirror and scan the surroundings in a circular manner. The measurements are triggered at regular angular steps using an angular encoder.

The LMS scans with a scanning frequency of 25 or 50 Hz. During this process, a laser pulse and therefore a measurement is triggered after an angular step of 0.25° or 0.50° .

Influences of object surfaces on the measurement

The signal received from a perfectly diffuse reflecting white surface corresponds to the definition of a remission of 100%. As a result of this definition, the remissions for surfaces that reflect the light bundled (mirrored surfaces, reflectors), are more than 100%.

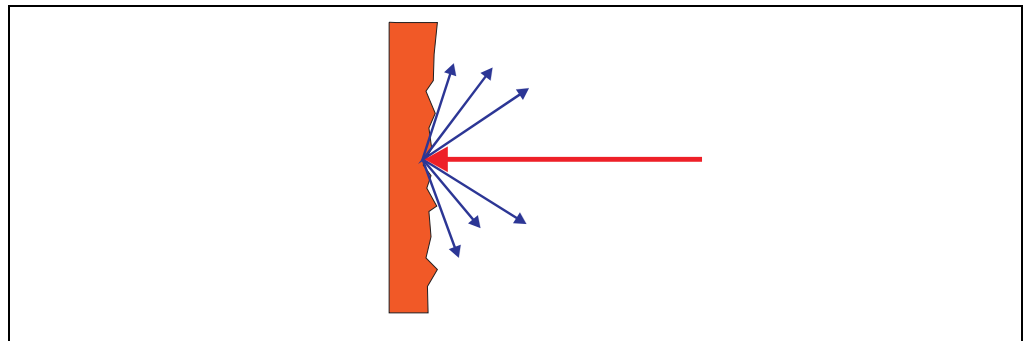


Fig. 7: Reflection of the laser beam at the surface of an object

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 LMS 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 LMS will be reduced as a result.

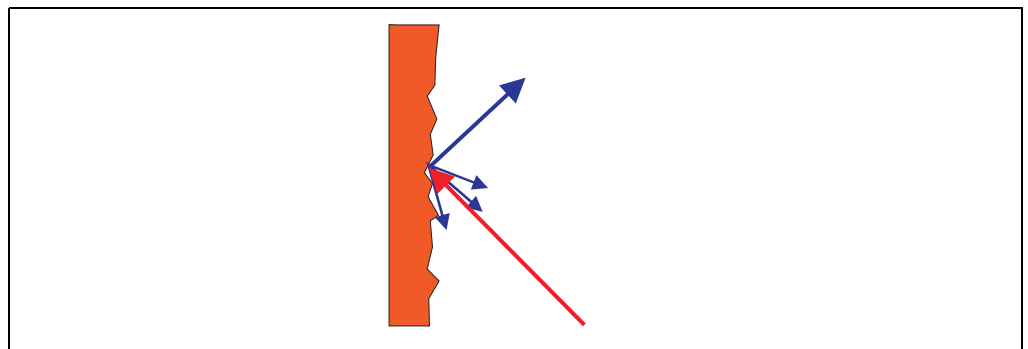


Fig. 8: Reflection angle

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 ([Fig. 7 on page 21](#)). If the beam is incident at an angle, a corresponding energy and scanning range loss is incurred ([Fig. 8 on page 21](#)).

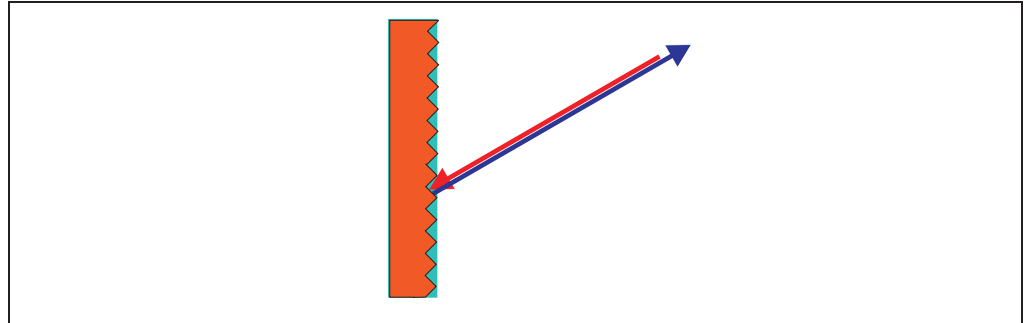


Fig. 9: Degree of reflection

If the reflected energy returned is over 100% (basis: Kodak standard) the incident beam is not reflected diffusely in all directions, but is reflected in a specific direction. As a result a large portion of the energy emitted can be received by the laser distance measurement device. Plastic reflectors (“cats’ eyes”), reflective tape and triple prisms have these properties.

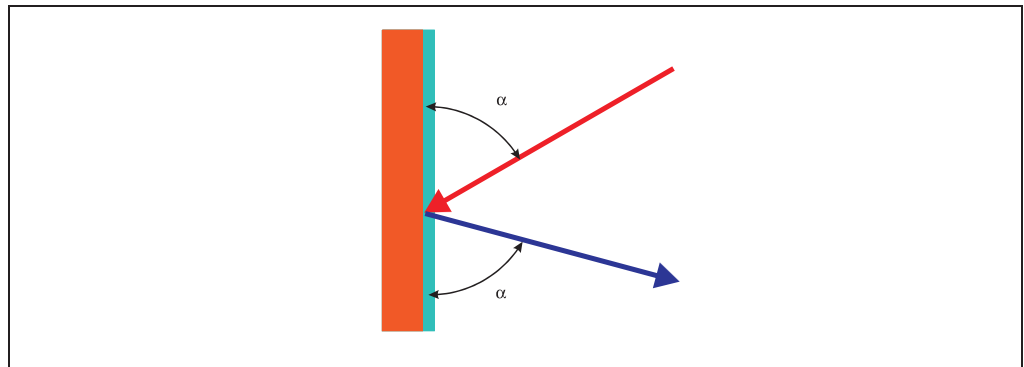


Fig. 10: Mirror surfaces

At mirror surfaces the laser beam is almost entirely deflected ([Fig. 10 on page 22](#)).

Instead of the surface of the mirror, it is possible that the object on which the deflected laser beam is incident may be detected.

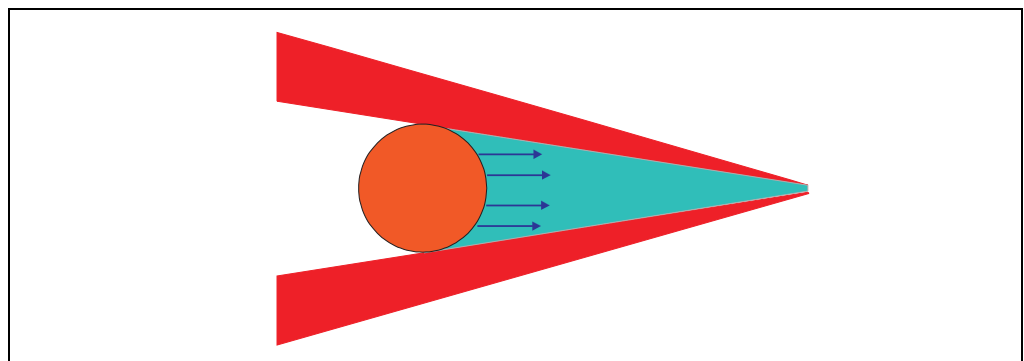


Fig. 11: Object smaller than diameter of the laser beam

Objects that are smaller than the diameter of the laser beam cannot reflect all the energy of the laser light ([Fig. 11 on page 22](#)). 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.

3.5.1 Scanning range of the LMS

The scanning range of the LMS 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 LMS. The diagrams in Fig. 12 and Fig. 13 indicate the relationship between remission and detectability.

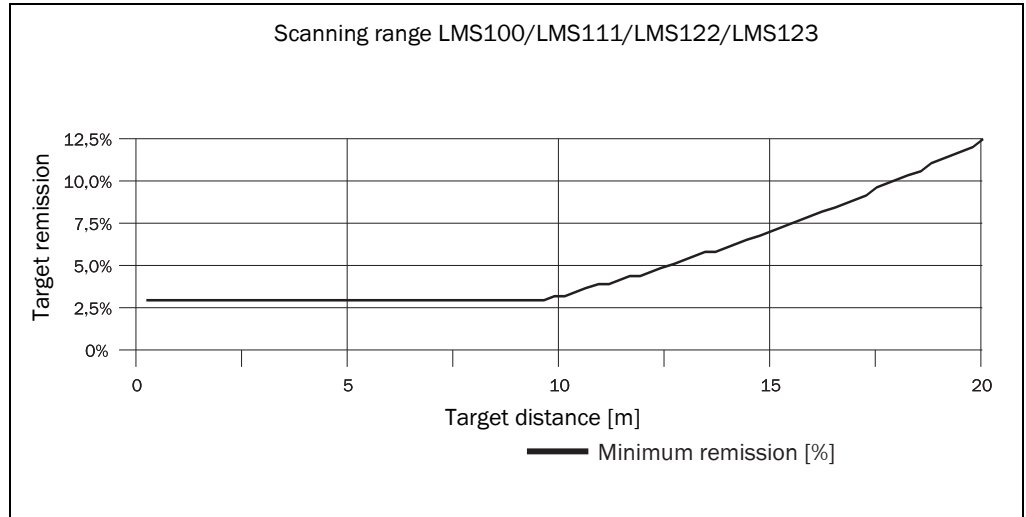


Fig. 12: Scanning range of the LMS100/LMS111/LMS122/LMS123 as a function of the target remission

Up to a distance of 10 m (32.81 ft) the LMS can detect objects from 3% remission. At a distance of 20 m (65.62 ft) objects are only detected if they have a remission > 13%.

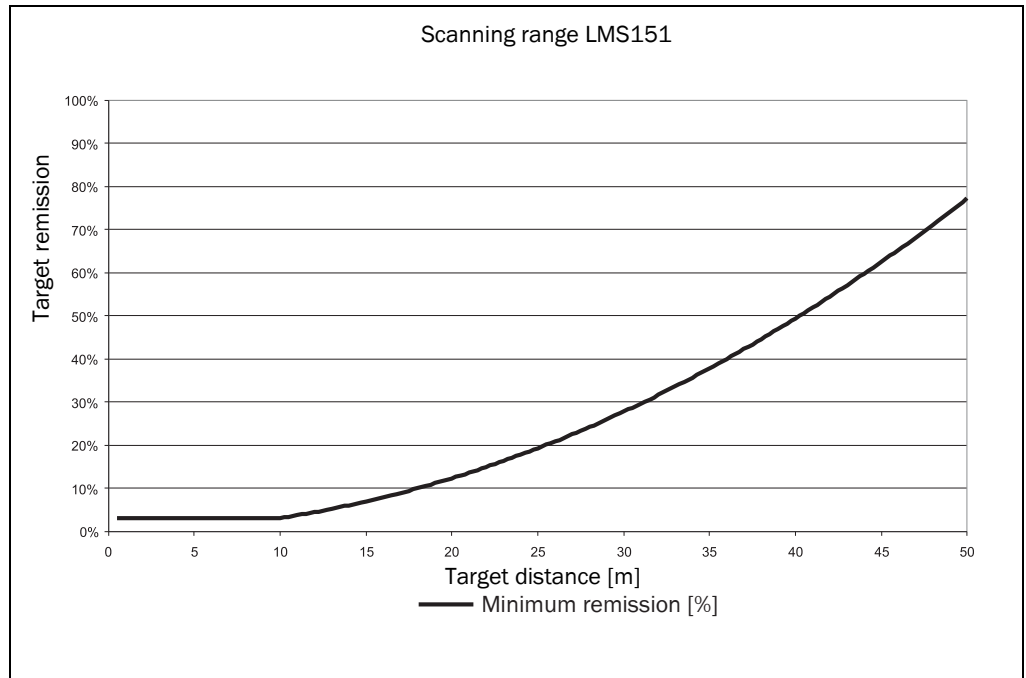


Fig. 13: Scanning range of the LMS151 as a function of the target remission

Important The diagrams in Fig. 12 and Fig. 13 are only applicable if no filters are configured.

3.5.2 Beam diameter and distance between measured points

With increasing distance from the LMS the laser beam of the LMS increases in size. As a result the diameter of the measured point on the surface of the object increases.

The distance-dependent diameter of the measured point is the distance (mm) \times 0.015 rad + 8 mm.

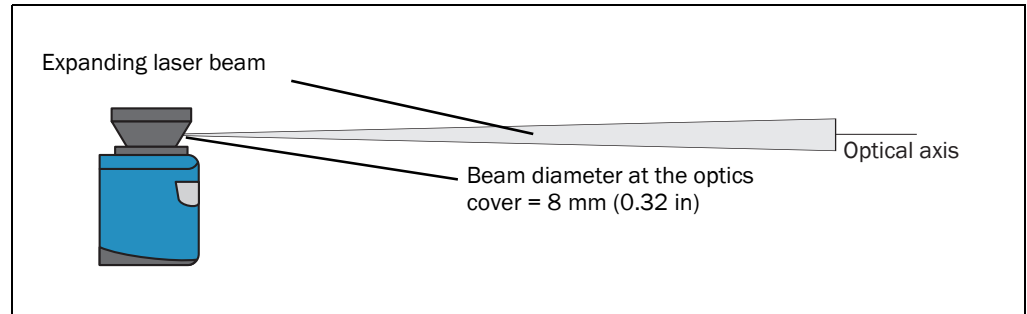


Fig. 14: Beam expansion

With increasing distance from the LMS, the distance 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. The distance-dependent spacing between the measured points is the tangent of the angular resolution \times distance

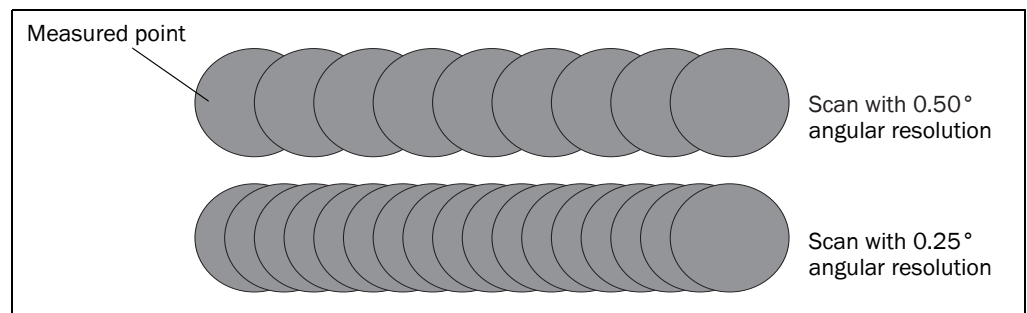


Fig. 15: Schematic layout of the distance between measured points at different angular resolutions

The diagram in [Fig. 16](#) shows the beam diameter and the measured point spacing as a function of the distance from the LMS.

Important The beam diameter is always greater than the measured point spacing. As a result full scanning without gaps is ensured.

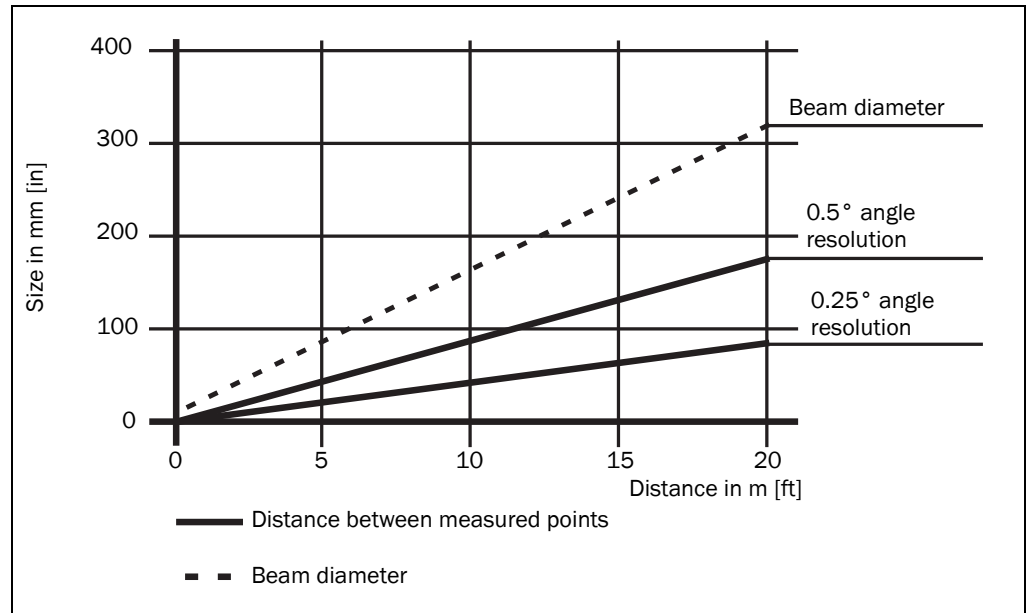


Fig. 16: Beam diameter and distance between measured points at 0 to 20 m (0 to 65.62 ft)

Example for angular resolution 0.25° in Fig. 16

Distance 10 m (32.81 ft)

Distance intersection point 10 m (32.81 ft) gives a distance between the measured points of approx. **40 mm (1.58 in)**

Distance intersection point 10 m (32.81 ft) with the characteristic curve for the beam diameter gives a beam size of approx. **170 mm (6.70 in)**

Example for angular resolution 0.50° in Fig. 16

Distance 20 m (65.62 ft)

Distance intersection point 20 m (65.62 ft) gives a distance between the measured points of approx. **180 mm (7.09 in)**

Distance intersection point 20 m (65.62 ft) with the characteristic curve for beam diameter gives a beam size of approx. **310 mm (12.21 in)**

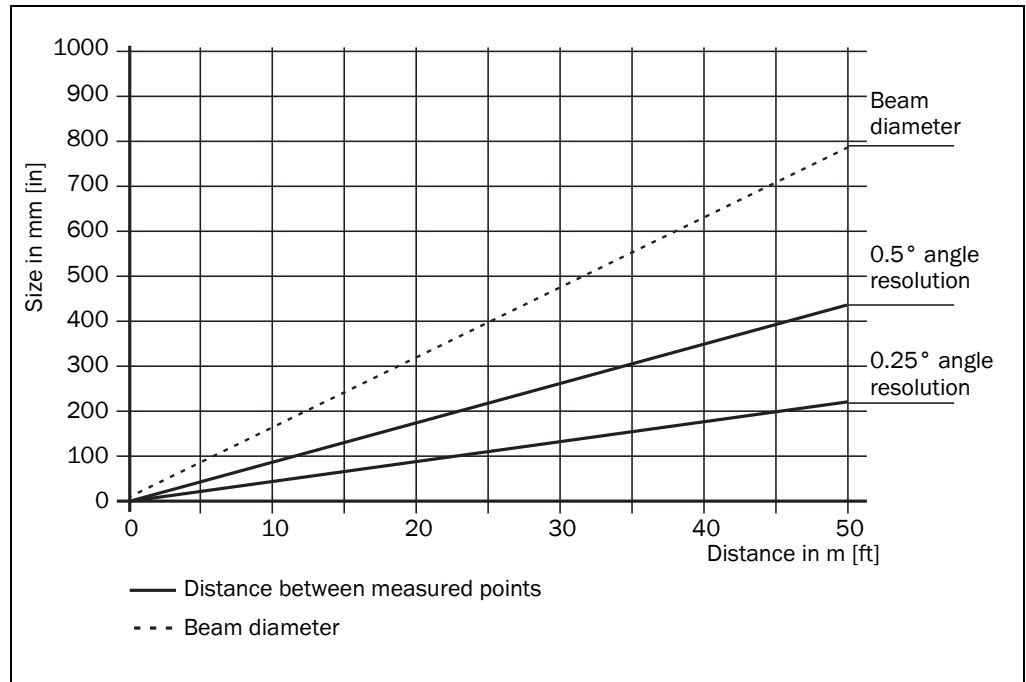


Fig. 17: Beam diameter and distance between measured points of LMS151 at 0 to 50 m (0 to 164.04 ft)

Example for angular resolution 0.50° in Fig. 17

Distance 35 m (114.83 ft)

Distance intersection point 35 m (114.83 ft) gives a distance between the measured points of approx. **305 mm (12.00 in)**

Distance intersection point 35 m (114.83 ft) with the characteristic curve for beam diameter gives a beam size of approx. **560 mm (22.05 in)**

3.5.3 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. 11 on page 22).

An object is only reliably fully seen if it is at least as large as the measured point spacing plus the beam diameter.

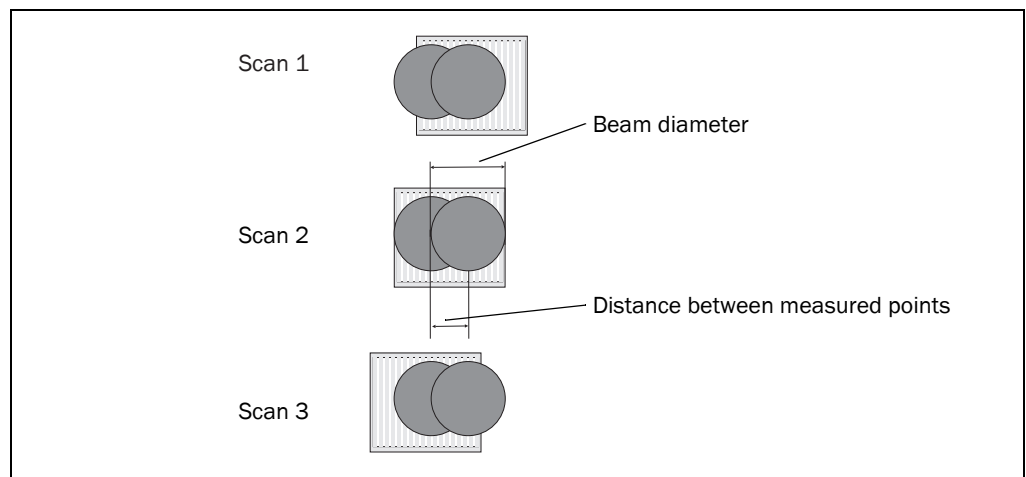


Fig. 18: Minimum object size for detection

In the example in [Fig. 18](#), the beam is fully incident on the object at least once during **each** scan. It will therefore be reliably detected if it has the necessary remission.

How to calculate the minimum object size:

Beam diameter + distance between the measured points = minimum object size

➤ For beam diameter and measured point spacing as a function of the distance from the LMS see the diagram in [Fig. 16](#).

Important

- In particular on the usage of the LMS for measured value output, it is necessary for a reliable measurement that the beam is incident on the object several times. The example shows the minimum size of an object. For a reliable measurement it is important that the beam is incident on the object several times. Therefore an object should be either larger than the minimum object size or the LMS as well as the object should not move.

3.5.4 Contamination measurement

The LMS has an optics cover for protection. This optics cover can become contaminated. The laser beam radiation emitted and received is reduced by the contamination. As a result scanned objects are perceived with a lower remission than they actually have, or no longer measured at all from a certain level of contamination.

For this reason the contamination is measured continuously while the device is in operation. For a certain level of contamination, first a contamination warning is output; if the contamination becomes worse, a contamination error is output and the LMS stops taking measurements.

Depending on the application in which the LMS is used, you can choose between various strategies for the contamination measurement.



PROJECT TREE, LMS..., PARAMETER, CONTAMINATION MEASUREMENT.

- inactive
No contamination measurement
- highly available
Contamination warning and contamination error are only output on even contamination of the optics cover.
- available
Contamination warning and contamination error are only output on partial contamination of the optics cover.
- sensitive
Contamination warning and contamination error are output even with isolated contamination.

Recommendation

The cleaner the application environment, the lower you can set the sensitivity for the contamination measurement. The more exact the measured result must be, the higher you should set the sensitivity of the contamination measurement.

Contamination warning and contamination error are indicated on the LEDs on the LMS (see [section 8.2 “Error displays of the LEDs” on page 74](#)). You can also read these states using messages (see [section 10.2.6 “Read contamination level” on page 96](#) and [section 10.2.4 “Read scan data” on page 90](#)).

A contamination error is also signalled on a digital or external output if this output is configured for the status “Device Ready” (see [section 3.9.3 “Digital switching outputs” on page 39](#)).

Important If you use the “Contour monitoring with blanking” strategy (see [section “Evaluation strategy” on page 36](#)) in the field evaluation application, the contamination measurement should be configured as inactive. If the contamination measurement is active, erroneous detections of contour infringements may occur.

3.6 Applications

In principle the LMS can be used for two purposes:

- for the measurement of objects (see [section 3.7 “Measurement of objects” on page 28](#))
- for the detection of objects with evaluation fields (see [section 3.8 “Field application” on page 34](#))

Therefore, the possible applications are very wide-ranging. In particular the following can be stated:

- container loading/handling
- traffic/transport
- robots
- object protection (low false alarm rate)

3.7 Measurement of objects

3.7.1 Basic parameters

The LMS scans with a scanning frequency of 25 or 50 Hz or with an angular resolution of 0.25° or 0.50°. At a higher scanning frequency or a finer angular resolution the LMS supplies more measured values.



PROJECT TREE, LMS..., PARAMETER, BASIC PARAMETERS, areas CURRENT CONFIGURATION and NEW CONFIGURATION.

Important

- The LMS outputs the data after the start of the measurement using the same interface over which the measured values were requested.
- It is only possible to output all measured values of a scan in real-time using the Ethernet interface.

In case of an error, the measured value output is stopped immediately and an error code output that can be evaluated by the application connected. The error code can also be queried via SOPAS ET from the LMS (see [section 8.4 “Detailed error analysis” on page 75](#)).

3.7.2 Filter

The LMS has digital filters for the pre-processing and optimisation of the measured distance values.

You can configure either a fog filter, a hardware blanking window, an n-pulse-to-1-pulse filter or a filter for interference suppression.



PROJECT TREE, LMS..., PARAMETER, FILTER.

Fog filter

The fog filter suppresses possible glare due to fog. The LMS becomes less sensitive in the near range (up to approx. 4 m (13.12 ft)) with the fog filter.

Hardware blanking window

Using the blanking window an area in front of the LMS is completely blanked. As a result the LMS only supplies measured values from a configured distance. You can configure a blanking window from 1 to 15 m (3.28 to 49.21 ft).

N-pulse-to-1-pulse filter

If two pulses are reflected by two objects during a measurement (incident on drops of rain or edges etc.), the filter initially filters out the first reflected pulse (see [section 3.7.4 “Measured value output for a second reflected pulse” on page 32](#)).

Particle filter

The particle filter can be used in dusty surroundings or in case of rain or snow to filter out interference due to particles of dust, rain drops, snow flakes etc.

- Important**
- The particle filter is an application filter. It acts on the field application, not on the measured value output.
 - Due to the particle filter, the reaction to an object in the evaluation field or an infringement of the contour is delayed by the time for a scan. The response time set for the pixel evaluation, blanking and contour evaluation strategies is not changed as a result.

Mean filter

The mean filter acts on the measured value output, not on the field application. If the mean filter is active, the mean is formed from the configured number of scans and then output.

The mean filter reduces the scan data output (not a smoothing mean).

3.7.3 Measured value output

For the measured value output, the LMS supplies measured values to one of the interfaces. It is prerequisite for this data output that the LMS is in the measurement mode. There are two ways you can start the measurement mode:

- start via SOPAS ET
PROJECT TREE, LMS..., PARAMETER, BASIC PARAMETERS, area MEASUREMENT.
- start via message (see [section 10.2.1 “Start measurement” on page 87](#))



Recommendation

After the measurement mode is started the LMS needs a little time to reach the status “Ready for measurement”. You should therefore query the status of the LMS using the sRN STImS message (see [section 10.2.3 “Query status” on page 89](#)).

Then request measured data by using a message on the interface from which you want to receive measured data. There are two possible ways of doing this:

- Exactly one measured value message can be requested using the sRN LMDscandata message – the last scan measured is transferred (see [section 10.2.4 “Read scan data” on page 90](#)).
- Measured data can be continuously requested using the sEN LMDscandata message – measured data are then transferred until the measured value output is stopped using the sEN LMDscandata message (see [section 10.2.4 “Read scan data” on page 90](#)).

Example of single measured value output

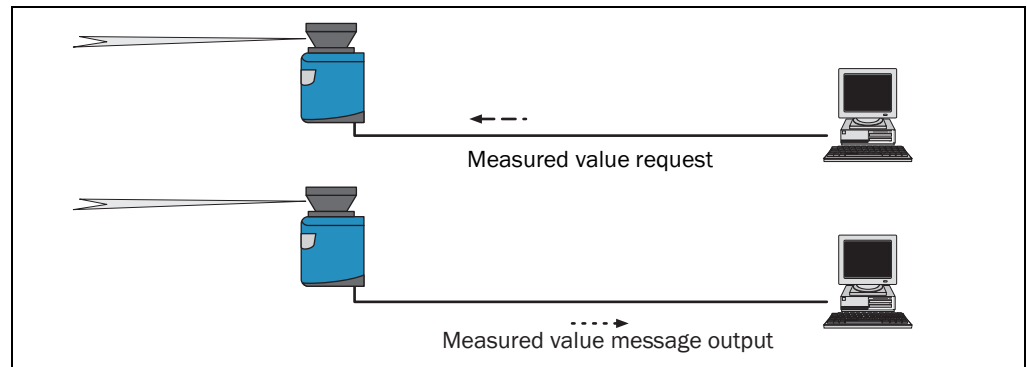


Fig. 19: Measured value message request

1. Start measurement

Request

`<STX>sMN LMCstartmeas<ETX>`

LMS answer

`<STX>sAN LMCstartmeas 0<ETX>`

2. Query measuring status

You must query the status until status 7 (that is ready to measure) is achieved in the reply.

Request

`<STX>sRN STlms<ETX>`

LMS answer

`<STX>sRA STlms 7 0 8 00:00:00 8 01.0 1.06 0 0 0<ETX>`**Important**

If the status is less than 7, you must send the request again.

Start the output of measured values for a single scan

Request

`<STX>sRN LMDscandata<ETX>`

LMS answer

`<STX>sRA LMDscandata [contents see section 10.2.4 "Read scan data" on page 90]<ETX>`

Example of continuous measured value output

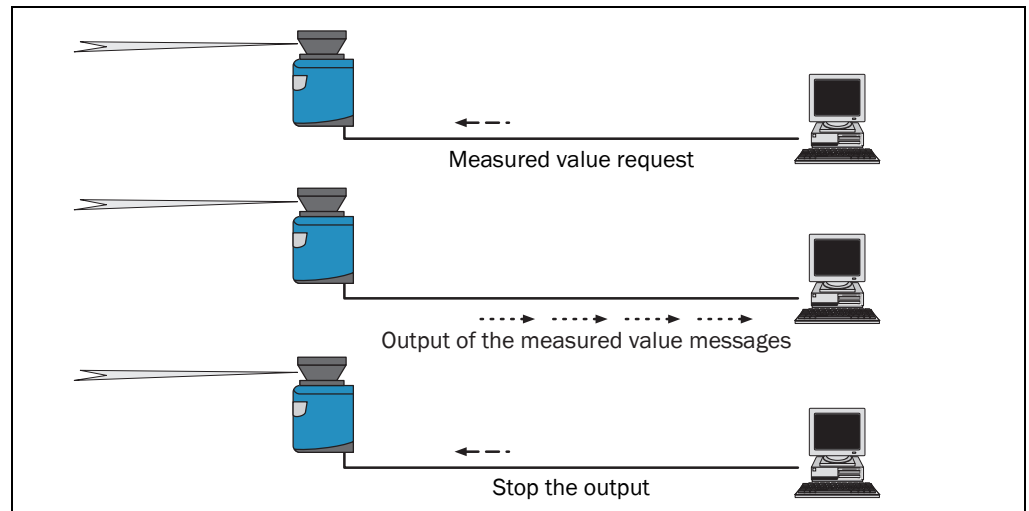


Fig. 20: Continuous measured value output

Recommendation If you are not certain that the scan data can be processed at the speed at which they are output by the LMS, you should only request the scan data for a single scan. The scan counter in the measured value output can be used as an indication that processing is too slow (see [section 10.2.4 “Read scan data” on page 90](#)).

1. Start measurement

Request

<STX>sMN LMCstartmeas<ETX>

LMS answer

<STX>sAN LMCstartmeas 0<ETX>

2. Query measuring status

You must query the status until status 7 (that is ready to measure) is achieved in the reply.

Request

<STX>sRN STlms<ETX>

LMS answer

<STX>sRA STlms 7 0 8 00:00:00 8 01.0 1.06 0 0 0<ETX>

If the status is less than 7, you must send the request again.

3. Start continuous measured value output

The scan data are output until measured value output is ended.

Request

<STX>sEN LMDscandata 1<ETX>

LMS confirmation

<STX>sEA LMDscandata 1<ETX>

LMS answer

<STX>sSN LMDscandata [contents see [section 10.2.4 “Read scan data” on page 90](#)]<ETX>

4. Stop continuous measured value output

Request

<STX>sEN LMDscandata 0<ETX>

LMS confirmation

<STX>sEA LMDscandata 0<ETX>

3.7.4 Measured value output for a second reflected pulse

The LMS also measures a second reflected pulse, if it is produced, and outputs its measured value in the measured value message (see [section 10.2.4 “Read scan data” on page 90](#)). A second reflected pulse can be produced, e.g., if the LMS hits a rain drop first. This will reflect part of the energy (1st reflected pulse). The other part of the beam continues to propagate and is reflected by the actual object (2nd reflected pulse).

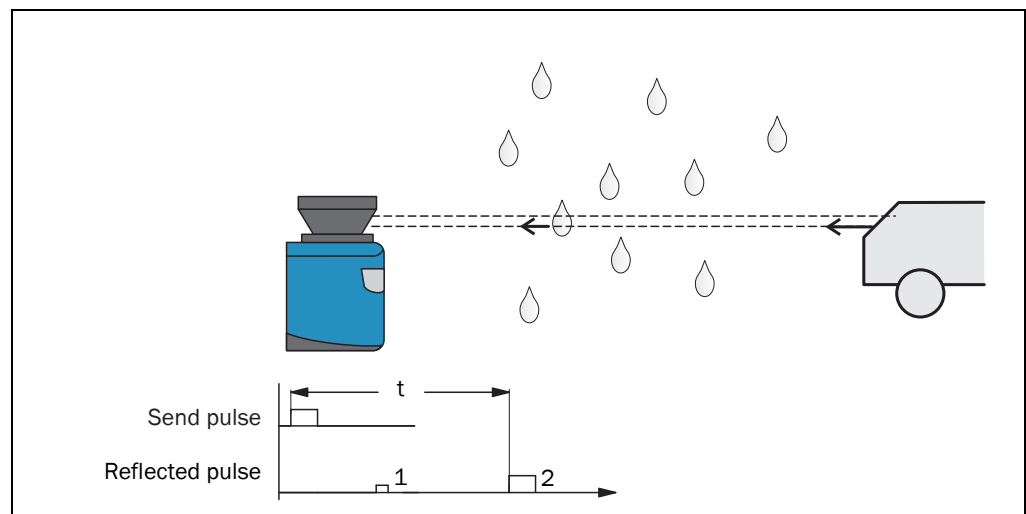


Fig. 21: Principle of operation of the measurement of the second reflected pulse

- Important**
- The function can only be used in measurement applications, not in the field application.
 - The time after the first reflected pulse from which on measurement can be performed again with full accuracy depends on the target that reflected the first reflected pulse.

An application in the host connected can then, for instance, take into account the 2nd reflected pulse for the measurement and ignore the first reflected pulse. In bad weather (rain/snow), this procedure can produce better results or actually make possible special applications such as measurement through a window (e.g. in an ATEX environment).

Measurement through a window

In the case of measurement through a window, various different light reflections may occur. On the one hand due to direct incidence on the window (e.g. due to contamination or scratches), on the other hand due to reflections at the window (that is due to objects behind or beside the LMS). Reflections of objects on the window must be shaded.

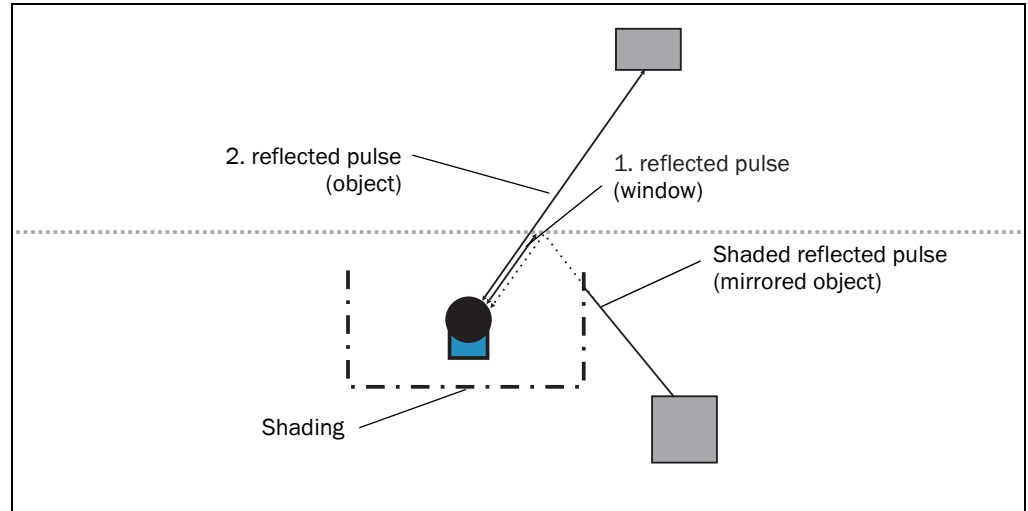


Fig. 22: Shading of reflections

3.8 Field application

With the aid of the integrated field application, the LMS evaluates up to 10 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.

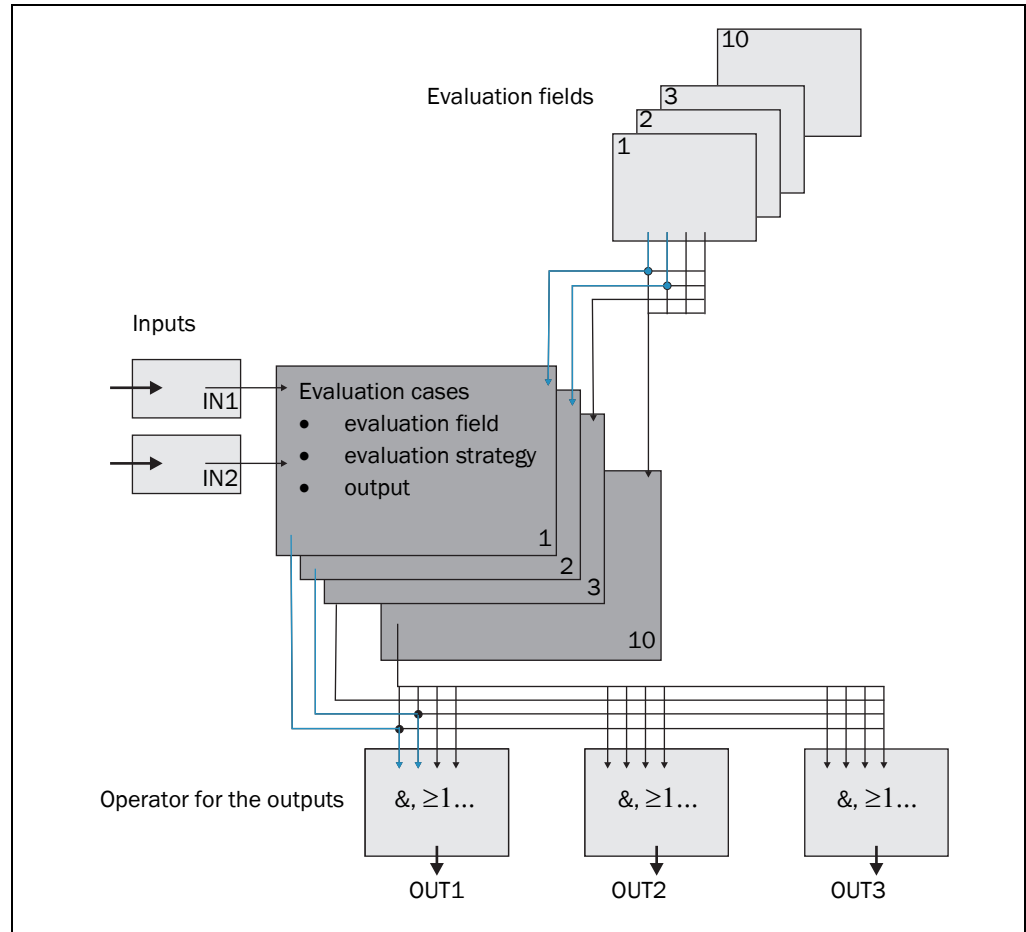


Fig. 23: Principle of the field application

The LMS is adapted to the evaluation situation with the aid of up to ten evaluation cases. In the evaluation case, one of ten configurable evaluation fields, an evaluation strategy, an output and in some circumstances a combination of inputs that activate the evaluation case, are selected. An operator is selected for each output; this operator determines the result on the output if more than one evaluation case acts on the output.

In the example in [Fig. 23](#), in evaluation case 1 evaluation field 1 is used, in evaluation case 2 evaluation field 2 is used. Both evaluation cases act on the output OUT1. If an AND operator is used for the results of the evaluation cases, then the output will only switch if both evaluation cases are signalling an event.

LMS122/123

As supplied nine evaluation fields with pre-configured parameters are available. You can change and adapt the size and shape of all nine evaluation fields to suit your needs. These evaluation fields are already configured with evaluation cases for the pixel evaluation with blanking and linked to the alarm output.

You can also configure a 10th field. This field is used for tamper protection.

Important The tamper protection function is only possible with the 10th field. The 10th field cannot be used as a monitoring field.

3.8.1 Evaluation cases

An evaluation case defines which output field is evaluated in which way and on which output it acts. You can configure up to ten evaluation cases, all configured evaluation cases are active simultaneously.

For each evaluation case you configure in SOPAS ET:

- inputs that activate an evaluation case, if necessary
- the evaluation strategy
- the evaluation field
- the output on which the evaluation case acts
- the response time of the output



PROJECT TREE, LMS..., PARAMETER, EVALUATION CASES.

Inputs

If the evaluation case is not to be permanently active, then you can configure an input combination to activate the evaluation case.

Input 1	Input 2	Evaluation case
Active high	Active high	Evaluation case 1
Active high	Active low	Evaluation case 2
Active low	Active high	Evaluation case 3
Active low	Active low	Evaluation case 4

Tab. 7: Input combination examples LMS100/111/151

Important

An input combination can also be defined for several evaluation cases, e.g. two evaluation cases will then be active simultaneously.

The following input assignments are defined for the LMS122/123:

Input	Evaluation case
Input 1 active high	LMS disarmed
Input 1 active low	LMS armed
Input 2 active high	LMS inactive (practice check mode)
Input 2 active low	LMS active
Input 3 active high	Night configuration
Input 3 active low	Day configuration

Tab. 8: Input combination examples LMS122/123

Evaluation strategy

In SOPAS ET choose one of four possible evaluation strategies:

- pixel evaluation
The LMS evaluates the entire area of the field, every single beam is considered in the evaluation. If an object enters the field, this result is sent to the related output.
- blanking
The LMS evaluates the entire area of the field. However, using blanking objects of a specific size can be blanked. An object is only detected if it is larger than the blanking configured.
- contour
The LMS evaluates the presence of a contour that must be permanently and completely in the evaluation field. As a result the LMS can detect, e.g., that a door is opening outwards or that the position of the LMS 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.
- I/O operator
Using the I/O operator evaluation strategy you can link the inputs of the LMS with its outputs (see [section 3.9.6 “Logical operators for inputs and outputs” on page 40](#)).

Response time

For the Pixel evaluation, Blanking and Contour evaluation strategies you must define a response time. For the LMS to detect an object using the Pixel evaluation or Blanking evaluation strategy, the object must be detected in one place for at least the duration of the response time. For the Contour evaluation strategy the contour infringement must be detected in one place for at least the duration of the response time.

Manipulation prevention

If pixel evaluation is configured, glare may result in it no longer being possible for the LMS to monitor a field. If blanking is configured, small objects in the near range of the LMS can cause large shadows.

If you use evaluation fields at a distance from the LMS, then the object or the object erroneously measured due to glare is outside the evaluation field and will not be detected.

To prevent this situation arising, you can configure the TAMPER PROTECTION option.

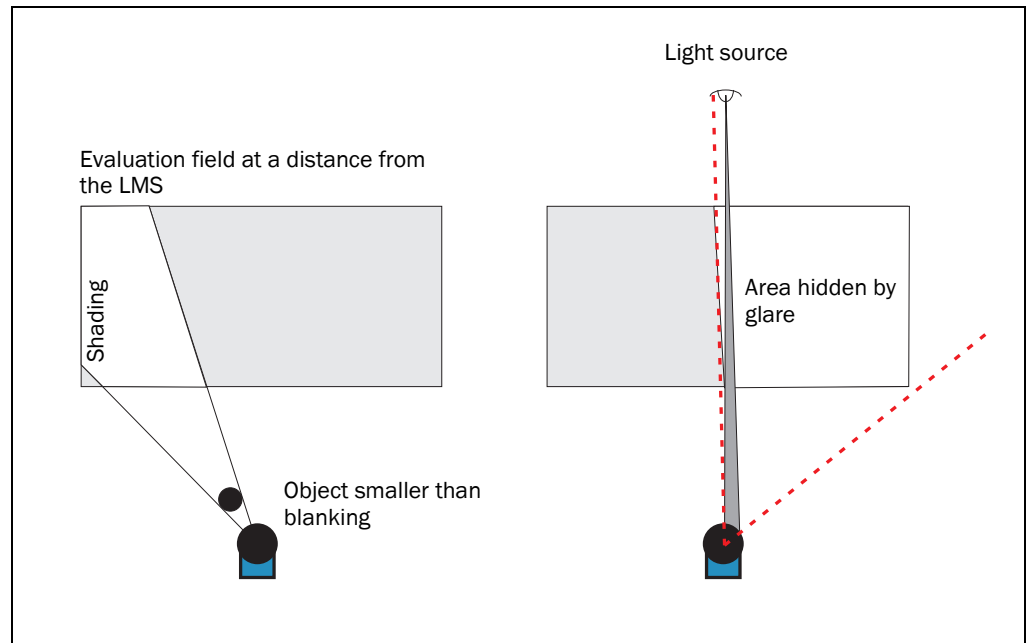


Fig. 24: Protection against tampering due to shading and glare

The Manipulation prevention option switches the evaluation field if ...

- an object that is smaller than or equal to the blanked object size is in front of the laser output aperture on the LMS for the configured response time for Manipulation prevention.
- the LMS is dazzled for longer than the configured response time for Manipulation prevention.

Evaluation field

Choose one of the evaluation fields already configured for the evaluation case. Its shape must match the evaluation strategy (see [section 3.8.2 "Evaluation fields" on page 38](#)).

Output

Choose one of the outputs for the evaluation case. If several evaluation cases act on an output, you must define how the results of the evaluation cases are linked (see [section 3.8.3 "Operator for the evaluation cases on the output" on page 39](#)).

Negating the result

By negating the result the field evaluation is signalled in reverse on the output. The output used is, e.g., then switched if the evaluation field is clear or if the contour is not infringed.

Important Do not confuse the negation of the result with the setting active high/active low for the outputs (see [section 3.8.3 "Operator for the evaluation cases on the output" on page 39](#)).

3.8.2 Evaluation fields

With the aid of the integrated field application, you can configure up to ten evaluation fields. The size and shape of these ten evaluation fields can be configured almost entirely as required.

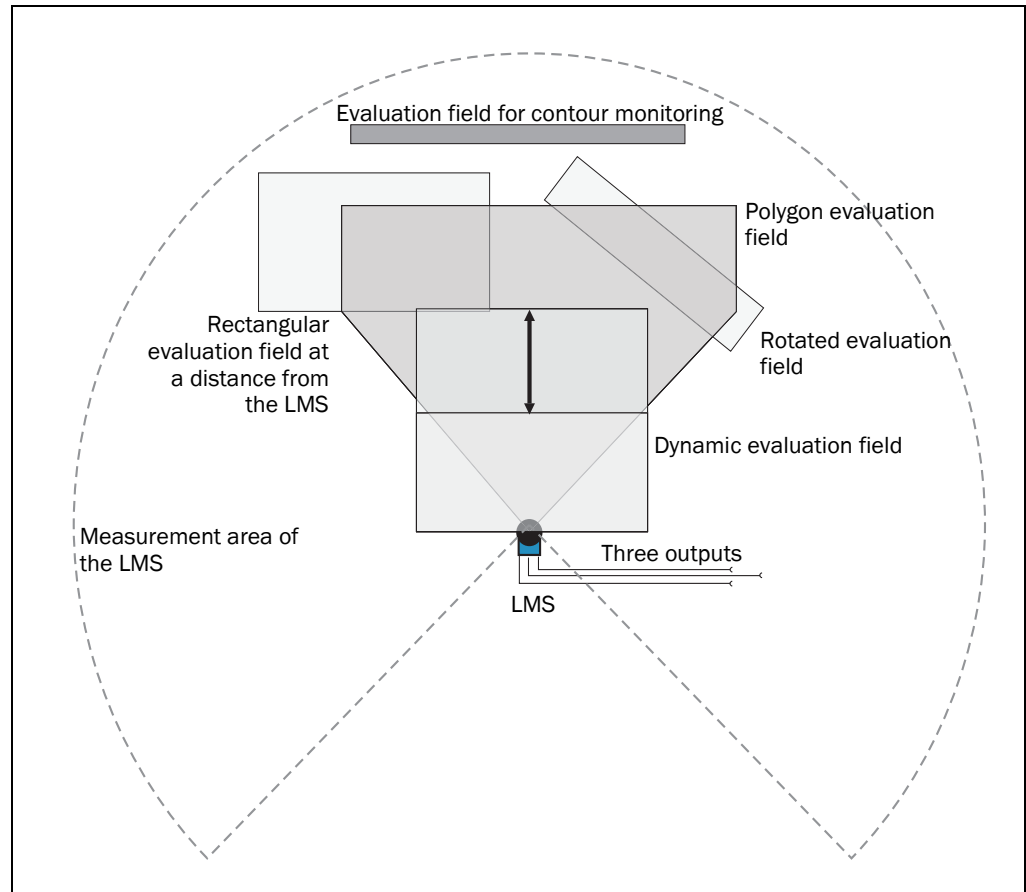


Fig. 25: Examples of different evaluation field shapes

The evaluation fields can be drawn using SOPAS ET to suit the needs of your application. Evaluation fields can have the following shapes:

- polygon
- rectangular
- reaching the LMS
- at a distance from the LMS
- dynamic (the length changes with speed measured using the encoder, see [section 3.9.2 "Encoder inputs" on page 39](#))



You can configure the evaluation fields in SOPAS ET:

PROJECT TREE, LMS..., PARAMETER, EVALUATION FIELDS.

If the area to be monitored changes, then you can re-configure the LMS via software without additional mounting effort.

3.8.3 Operator for the evaluation cases on the output

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



PROJECT TREE, LMS..., PARAMETER, NETWORK/INTERFACES/IOs, DIGITAL OUTPUTS.

The outputs are configured as active high in the pre-setting. You can configure the outputs also as active low.

Resetting an output

By default the outputs are reset 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).

An alternative you can also reset the output using an input. The output is then only reset when the allocated input has the configured status.

3.9 Inputs and outputs

3.9.1 Digital switching inputs

The LMS has 2 digital switching inputs. These inputs can switch on and off evaluation cases (see [section 3.8.1 "Evaluation cases" on page 35](#)). With the aid of the inputs, the outputs on the LMS can also be reset (see [section "Resetting an output" on page 39](#)).

3.9.2 Encoder inputs

The LMS has 2 digital inputs for an encoder.

With the aid of the encoder pulses, the size of so-called dynamic fields can be changed, e.g., for speed-dependent vehicle monitoring. The length of a dynamic field changes with the speed measured, e.g. using an encoder.



PROJECT TREE, LMS..., PARAMETER, INCREMENT CONFIGURATION.

When stationary ($V = 0$ m/s) the evaluation field is the same size as the basic field configured. The size increases continuously with increasing speed up to the largest physical size for the field at the maximum speed.

3.9.3 Digital switching outputs

The LMS100/111/151 has three digital switching outputs.

The outputs can be used as digital switching outputs to ground, as floating outputs or as resistance monitored outputs (see [section 5.4.5 "Wiring of inputs and outputs on the LMS" on page 62](#)).

For each output you configure whether it is switched by the field evaluation application or via SOPAS ET messages, or whether it is used to signal the device is ready.



PROJECT TREE, LMS..., PARAMETER, NETWORK/INTERFACES/IOs, DIGITAL OUTPUTS.

If an output is switched by the field evaluation application, the LMS can signal evaluation field infringements or contour infringements. For this purpose, configure in SOPAS ET which evaluation case is to act on which output.

Sabotage output

The LMS122/123 has a digital output signal switching device that is configured as a sabotage output.

An attempt to open the housing or to remove the system plug is signalled on the sabotage output (active low). An object protection system connected to the device can then trigger an alarm if sabotage is attempted.

3.9.4 External switching outputs

A CAN module can be supplied to expand the switching outputs. With this module additional external switching outputs are made available.

The external switching outputs have the same functionality as the digital switching outputs on the LMS.



PROJECT TREE, LMS..., PARAMETER, NETWORK/INTERFACES/IOs, EXTERNAL OUTPUTS.

3.9.5 Relay outputs

The LMS122/123 has two relay outputs. These are configured as an alarm output and error output.

The outputs can be used as volt-free outputs or as resistance monitored outputs (see [section "Connection of the LMS122/123 to an object protection system, not resistance monitored" on page 65](#) and [section "Connection of the LMS122/123 to an object protection system, resistance monitored" on page 66](#)).

3.9.6 Logical operators for inputs and outputs

With the aid of an evaluation case the inputs and outputs on several LMS can be linked together (see [section 3.8.1 "Evaluation cases" on page 35](#)).

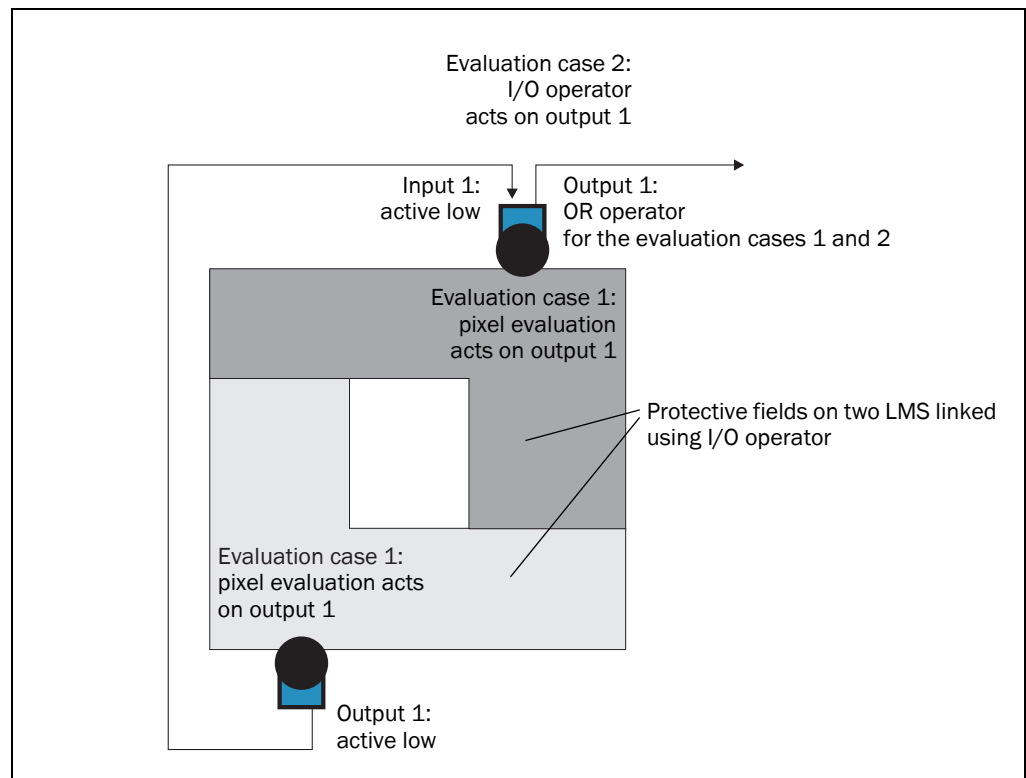


Fig. 26: Logical operators for inputs and outputs

In the example output 1 on the LMS at the bottom is connected to input 1 on the LMS at the top. An evaluation field infringement is therefore signalled at the input on the LMS at the top. This LMS links the input to output 1 in its evaluation case 2. At the same time, evaluation case 1 also acts on the LMS at the top and its output 1. Using the OR operator for the two results, evaluation field infringements on both LMS are signalled on output 1 on the LMS at the top.

3.10 Data interfaces

The LMS has different data interfaces for the configuration and the transmission of measured values.

- Important**
- It is only possible to output all measured values of a scan in real-time using the Ethernet interface.
 - The data transmission rate of the RS-232 interfaces is limited. Therefore these interfaces are not suitable for transmitting scan data in real time.

3.10.1 Ethernet interface

The Ethernet interface has a data transmission rate of 10/100 MBit. The interface is a TCP/IP interface. Full duplex and half duplex are supported.

The Ethernet interface allows the configuration of the LMS as well as the output of measured values.

The factory setting for the Ethernet interface is as follows:

- IP address: 192.168.0.1
- subnet mask: 255.255.255.0
- TCP port: 2111



If necessary, adjust the TCP/IP configuration for the Ethernet interface to enable a connected PC (client) to communicate with the LMS via Ethernet: PROJECT TREE, LMS..., NETWORK/INTERFACES/IOS, ETHERNET.

- Important**
- If you change the parameters for the Ethernet interface over the Ethernet interface, you must first save the data in non-volatile memory in the LMS and then restart the LMS. For this purpose there is the RESTART button in SOPAS_ET.

You will find a description of the electrical interface in [section 5.2 "Connections of the LMS" on page 54](#).

3.10.2 CAN

- Important**
- The LMS151 will in future support the CANopen standard 2.0A.

The CAN interface supports data transmissions between 10 Bit/s and 1 Mbit/s.

For data communication via CAN you must configure the LMS so that it can communicate with the host:



PROJECT TREE, LMS..., NETWORK/INTERFACES/IOS, CAN.

The following interface parameters can be configured

- baud rate of the CAN bus
- ID of the LMS in CAN

3.10.3 Serial host interface

The serial host interface is an RS-232 interface. The host interface permits the configuration of the LMS and only limited measured value output.



The interface parameters are freely configurable:

PROJECT TREE, LMS..., NETWORK/INTERFACES/IOS, SERIAL, area SERIAL HOST INTERFACE.

The factory setting for the host interface is as follows:

- 57,600 Baud
- 8 data bits
- 1 stop bit
- no parity

Important If you change the parameters for the host interface over the host interface, the connection to the device will be lost. You must then scan for the LMS again in SOPAS ET (see [section 6.3.5 “Performing scan” on page 69](#)).

You will find a description of the electrical interface in [section 5.2 “Connections of the LMS” on page 54](#).

3.10.4 Serial auxiliary interface

The serial auxiliary interface is an RS-232 interface. The auxiliary interface permits the configuration of the LMS.



The interface parameters are freely configurable:

PROJECT TREE, LMS..., NETWORK/INTERFACES/IOS, SERIAL, area SERIAL AUXILIARY INTERFACE.

The factory setting for the auxiliary interface is as follows:

- 57,600 Baud
- 8 data bits
- 1 stop bit
- no parity

Important If you change the parameters for the auxiliary interface over the auxiliary interface, the connection to the device will be lost. You must then scan for the LMS again in SOPAS ET (see [section 6.3.5 “Performing scan” on page 69](#)).

You will find a description of the electrical interface in [section 5.2 “Connections of the LMS” on page 54](#).

3.11 Data communication using messages

The LMS sends messages over the interfaces described above to communicate with a connected host. The following functions can be run using messages:

- request for measured values by the host and subsequent output of the measured values by the LMS
- parameter setting by the host for the configuration of the LMS
- parameters and status log querying by the host

The messages each comprise a frame (see [section 3.11.1 “Frame and coding for the messages” on page 43](#)) and the data.

A detailed description of the different messages can be found in the annex (see [section 10.2 “Messages” on page 86](#)).

3.11.1 Frame and coding for the messages

The data frame varies depending on the coding.

Messages with ASCII coding

	Frame	Message	Frame
Code	STX	Data (see section 10.2 "Messages" on page 86)	ETX
Length (byte)	1	≤ 30 kB	1
Description	Start of text character	ASCII coded. The length is dependent on the previous send message.	End of text character

Tab. 9: Frame for the messages with ASCII coding



The frame for the serial host interface can be configured in SOPAS ET: PROJECT TREE, LMS..., INTERFACES, SERIAL, area SERIAL HOST INTERFACE.

In this way, for example, you can use two stop bytes (e.g. to end messages with CR/LF).

Messages with binary coding

	Frame				Message	Frame	
Code	STX	STX	STX	STX	Data (see section 10.2 "Messages" on page 86)	Checksum	
Length (byte)	1	1	1	1	4	≤ 2,495	1
Description	Start of text character				Length of the data without CS	Binary encoded. The length is dependent on the previous send message.	See "Calculation of the checksum" further below

Tab. 10: Frame for the messages with binary coding

Calculation of the checksum

The checksum is calculated using an XOR operator for every byte of the data, that is without the frame.

3.12 Planning

3.12.1 LMS system requirements

For commissioning and operating the LMS, the following are required:

- LMS100, LMS111 and LMS151: Supply voltage DC 10.8 ... 30 V, generated as per IEC 60364-4-41 (VDE 0100, part 410), output power minimum 20 W
- LMS122 and LMS123: Supply voltage DC 9 ... 30 V, generated as per IEC 60364-4-41 (VDE 0100, part 410), output power minimum 20 W
- LMS111 and LMS151: Supply voltage for the heating DC 24 V, output power minimum 40 W (cyclic)
- Data interface RS-232, Ethernet and CAN (optional, in case several LMS are connected together in a network) (see also [section 5.3.3 "General conditions for the data interfaces" on page 59](#))
- PC with operating system Windows 2000™, Windows XP™ or Windows Vista™ (see also [section 6.2.1 "System requirements for SOPAS ET" on page 67](#))

3.12.2 Mounting requirements

The LMS must be mounted as follows:

- robust
- as far as possible without shocks
- as far as possible without vibration

Mounting kits

The following mounting kits are available:

- mounting kit 1a: mounting bracket for mounting at the rear on wall or machine (see [Fig. 63 on page 83](#))
- mounting kit 1b: mounting bracket for mounting at the rear on wall or machine, with protection for the optics cover (see [Fig. 64 on page 83](#))
- mounting kit 2: mounting bracket, only in conjunction with mounting bracket 1a or 1b, cross-wise adjustment possible (see [Fig. 65 on page 84](#))
- mounting kit 3: mounting plate, only in conjunction with mounting bracket 2, length-wise adjustment possible (see [Fig. 66 on page 84](#))

As an alternative you can use a strong stable mounting bracket that provides adjustable alignment of the LMS in the X and Y axis. The LMS weighs approx. 1.1 kg (2.43 lb).

NOTICE

Mount the LMS such that it is not exposed to direct sunlight (if necessary fit canopy). In this way an inadmissible increase in the temperature inside the system is avoided.

3.12.3 Distance between LMS and the object/surface to be monitored

The laser beam diverges with increasing distance from the LMS. In the scan area the floor or a wall may then be continuously detected, as the laser beam is incident on it.

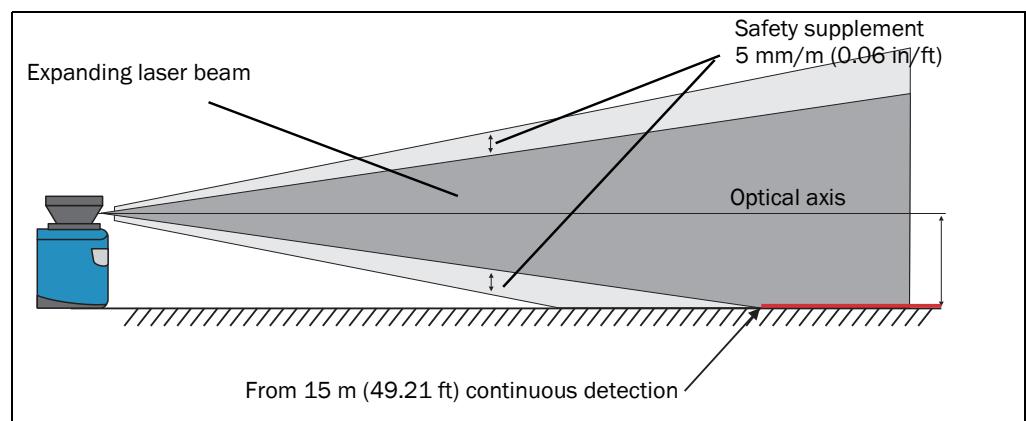


Fig. 27: Increase in the size of the beam and safety supplement

The optical axis is used as the reference plane for the distance to be maintained from the floor or the wall; on a vertically mounted LMS this axis is approx. 116 mm (4.57 in) above the bottom edge of the housing.

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

$$\text{Beam diameter} = (\text{Distance (mm)} \times 0.015 \text{ rad}) + 8 \text{ mm}$$

The following table shows a few values as examples:

Distance	5 m (16.40 ft)	10 m (32.81 ft)	15 m (49.21 ft)	20 m (65.62 ft)	50 m (164.05 ft)
Beam diameter	83 mm (3.27 in)	158 mm (6.23 in)	233 mm (9.18 in)	308 mm (12.14 in)	758 mm (29.84 in)

Tab. 11: Beam diameter at different distances from the LMS

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

Recommendation Take into account a safety supplement of approx. 5 mm per meter (0.06 in/ft).

4 Mounting

NOTICE

Do not open the housing of the LMS. If the housing is opened, any warranty claims against SICK AG will be rendered void.

4.1 Overview of the mounting steps

- select a mounting location for the LMS
- mounting and adjusting the LMS

4.2 Preparations for mounting

4.2.1 Components to be mounted

- an LMS (weight approx. 1.1 kg (2.43 lb))

4.2.2 Material and accessories necessary

- mounting kit or mounting kits with mounting material (not in the delivery)
or
- weather protection hood with mounting kit (not in the delivery)
or
- as an alternative if a fixing bracket is provided by the user
 - stable mounting bracket that provides adjustable alignment of the LMS in the X and Y axis
 - 2 M6 screws for the LMS, screw length dependent on the wall thickness of the mounting bracket used

4.2.3 Necessary tools

- 2 or 3 M6 screws for mounting the SICK fixing bracket on the support, screw length as a function of the wall thickness of the support
- tool set

4.2.4 Select mounting location

NOTICE

Mount the LMS such that it is not exposed to direct sunlight (if necessary fit canopy). In this way an inadmissible increase in the temperature inside the system is avoided.

Avoid installing with view of glass or stainless steel surfaces.

4.3 Mounting steps

NOTICE

Special features to note during mounting:

- Mount the LMS such that it is protected from moisture, dirt and damage.

- Ensure that the entire field of view of the LMS is not restricted.
- Mount the laser measurement system such that the indicators are easy to see.
- Always mount the LMS so that there is still enough space for mounting and removing the system plug.
- Avoid excessive shock and vibration loading on the laser measurement system.
- On applications that suffer from heavy vibration, prevent the fixing screws from coming loose using screw locking devices (see [section 9.1 “Data sheet LMS laser measurement system” on page 76](#)).
- Regularly check the tightness of the fixing screws.
- Pay attention to the maximum torque of the M5 fixing screws on the LMS of max. 5.9 Nm.

The LMS can be fastened in the following ways:

- direct mounting without mounting kit
- mounting with mounting kit 1a or 1b
- mounting with mounting kit 2 (only in conjunction with mounting kit 1a or 1b)
- mounting with weather protection hood 190° and the related mounting kit
- mounting with weather protection hood 190° and the quick-action mounting kit
- mounting with weather protection hood 270° and the related mounting kit
- mounting with weather protection hood 270° and the quick-action mounting kit

4.3.1 Direct mounting

The LMS has two M5×8 threaded holes on the rear. Using them you can mount the LMS directly on the intended mounting surface. To avoid a possible tendency to vibrate, the reference surface on the rear can be used as the third mounting point (1).

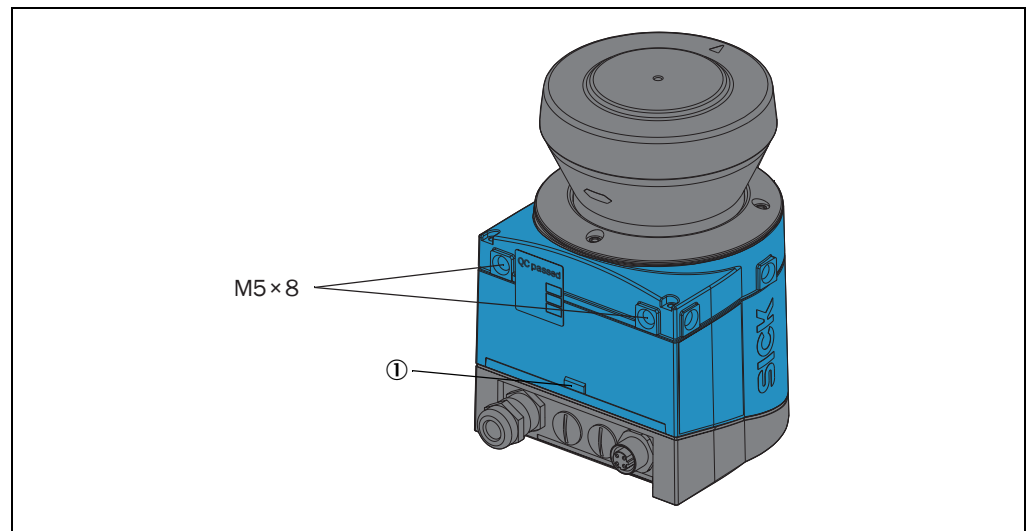


Fig. 28: Direct mounting

Important During mounting, please observe the dimensional drawings (see [section 9.2.1 “Dimensional drawing LMS100/LMS122/LMS123” on page 81](#)).

4.3.2 Mounting with mounting kit 1a or 1b

With the aid of mounting kit 1 you can mount the LMS on a mounting surface (wall, machine). The mounting kit is available as mounting kit 1a without protection device for the optics cover and as mounting kit 1b with protection device for the optics cover.

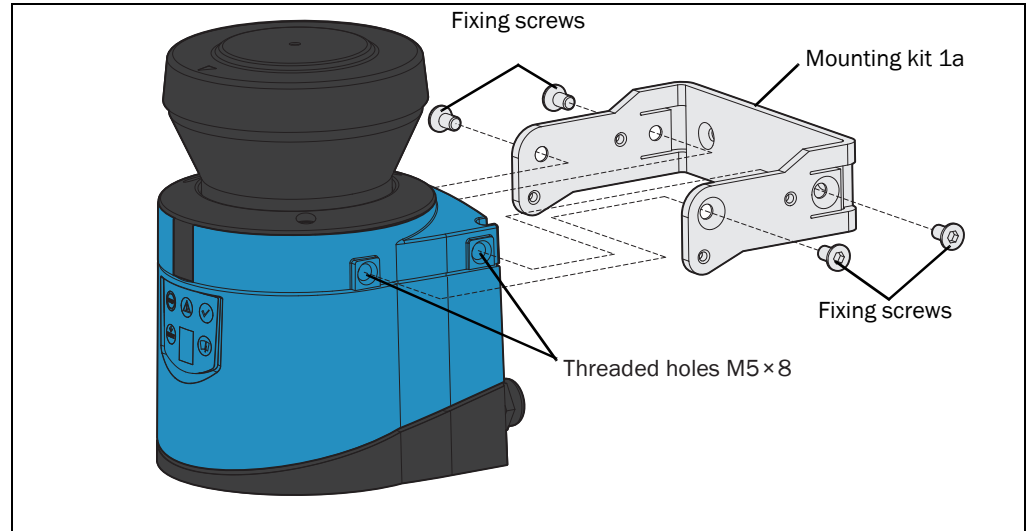


Fig. 29: Mounting with mounting kit 1a

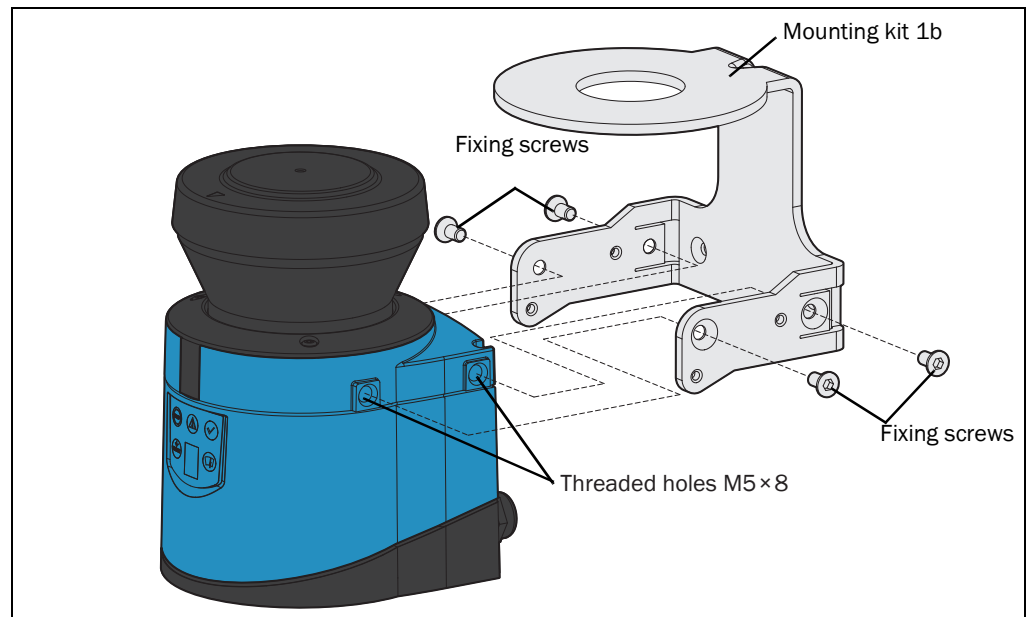


Fig. 30: Mounting with mounting kit 1b

1. Mount mounting kit 1a or 1b on the mounting surface.
2. Then mount the LMS on the mounting kit 1a or 1b.

Important During mounting, please observe the dimensional drawings (see [section 9.2.3 "Dimensional drawings, mounting kits" on page 83](#)).

4.3.3 Mounting with mounting kit 2 and 3

With the aid of mounting kits 2 and 3 (only in conjunction with mounting kit 1a or 1b) you can align the LMS in two planes. The maximum adjustment angle is $\pm 11^\circ$ in both planes.

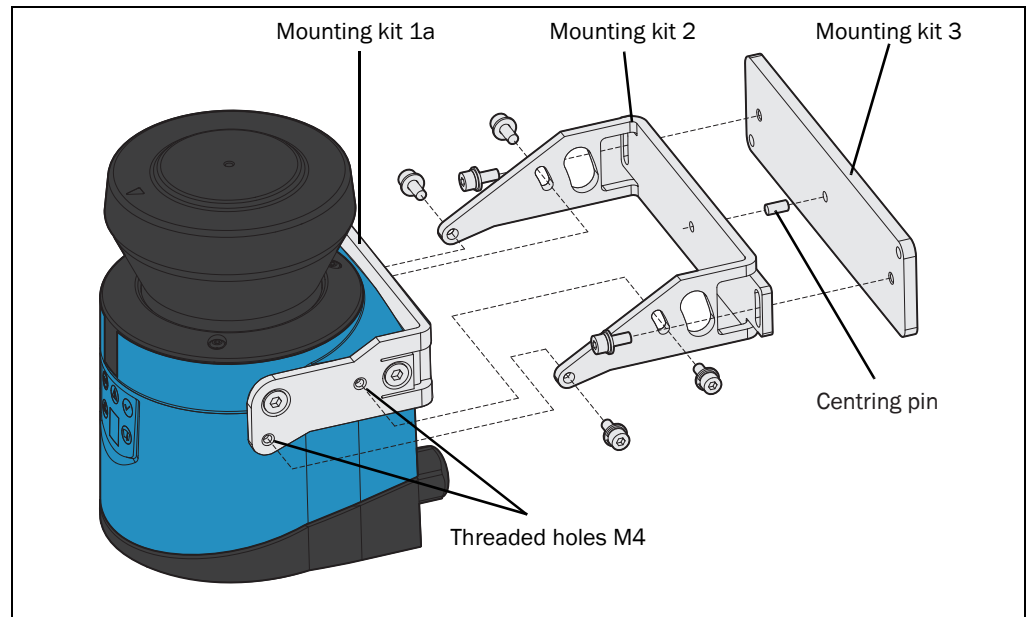


Fig. 31: Mounting with mounting kit 2 and 3

1. Mount mounting kit 1a or 1b to the LMS.
2. Mount the mounting kit 3 on the mounting surface.
3. Fit the centring pin (4 mm (0.16 in)) in the central hole on mounting bracket 3.
4. Fit mounting kit 2 to mounting kit 3 and mount it using two fixing screws M4 × 10.
5. Then mount the LMS on mounting kit 2 with the aid of the threaded holes in mounting kit 1a.
6. Adjust the LMS longitudinally and transversely and then tighten the six fixing screws on the mounting kits.

Important During mounting, please observe the dimensional drawings (see [section 9.2.3 "Dimensional drawings, mounting kits" on page 83](#)).

4.3.4 Mounting the LMS111/LMS151 with weather protection hood

To protect the LMS111/LMS151 from glare and precipitation when used outside, two weather protection hoods are available.

- The weather protection hood 190° provides a field of view of 190° and practically flat mounting on the application.
- The weather protection hood 270° provides a larger field of view of 270°, but not flat mounting on the application.

You will find detailed dimensions in [section 9.2.4 “Dimensional drawings, weather protection hoods” on page 85](#).

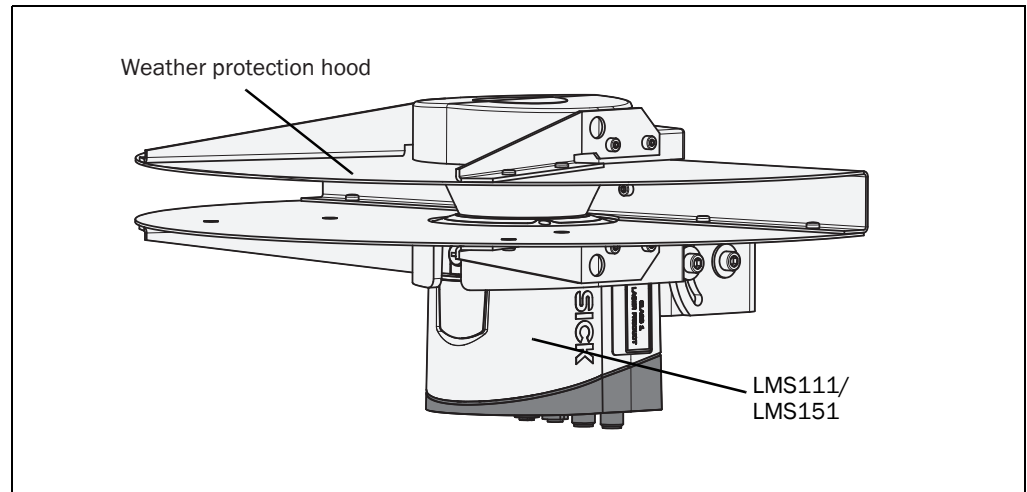


Fig. 32: Weather protection hood 190°

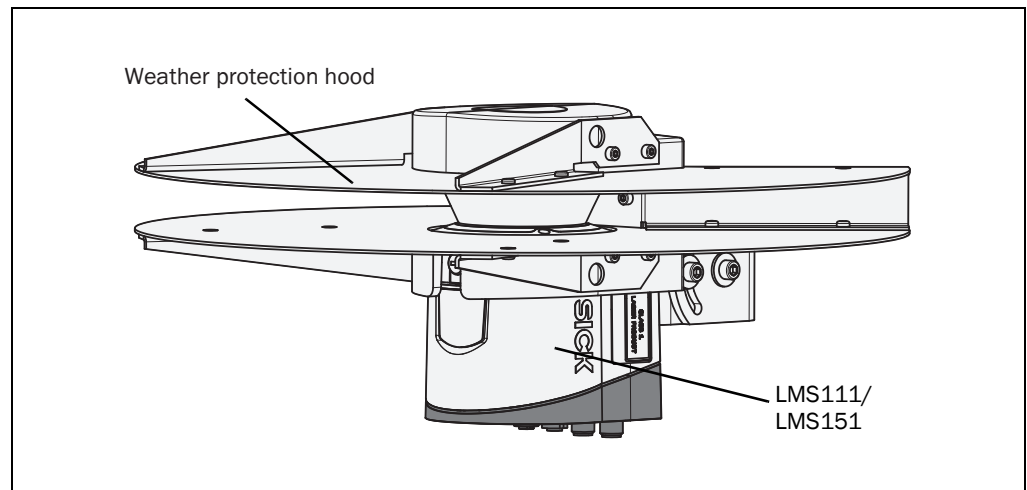


Fig. 33: Weather protection hood 270°

How to mount the weather protection hood on the LMS111/LMS151:

1. Put the weather protection hood 190° or 270° over the LMS111/LMS151.
2. Mount the weather protection hood on the LMS111/LMS151 using three M5 × 15 countersunk head screws (included with the delivery of the weather protection hood).

For this purpose you will find on the weather protection hood two holes with 90° countersink on the rear and one hole with 90° countersink on the right.

Mounting kits for the weather protection hood

Using the mounting kits for the weather protection hood you can align the LMS111/LMS151 in two planes. The maximum adjustment angle is $\pm 22.5^\circ$ in both planes.

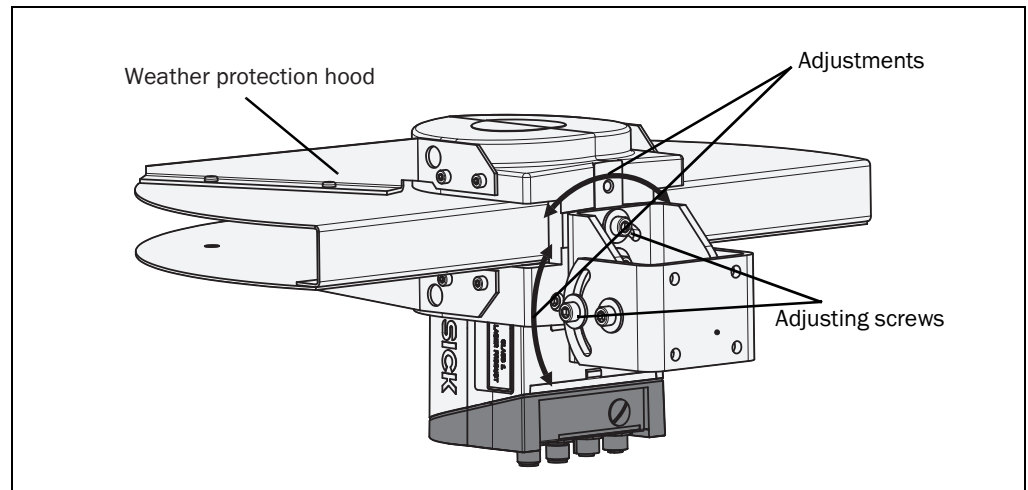


Fig. 34: Mounting kit for the weather protection hood

The quick-action mounting kit for the weather protection hood permits the quick replacement of the LMS111/LMS151, without the need to adjust the new device.

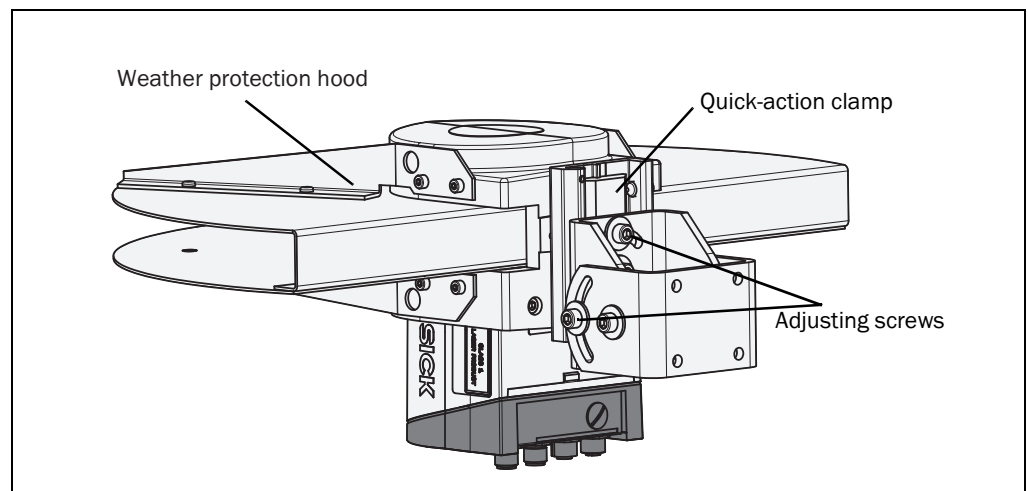


Fig. 35: Quick-action mounting kit for the weather protection hood

4.3.5 Using multiple LMS laser measurement systems

NOTICE

Risk of interference on the LMS!

Sources with a wavelength of 905 nm may cause interference if they act directly on the LMS.

The LMS is so designed that mutual interference between several laser measurement systems is unlikely. To completely exclude erroneous switching, we recommend mounting the laser measurement systems as shown in the following examples.

Use mounting kits 1 to 3 to adjust the laser measurement systems to different angles.

Correct placement of several LMS

Arrange or shield several LMS such that the laser beam cannot be received by a different LMS.

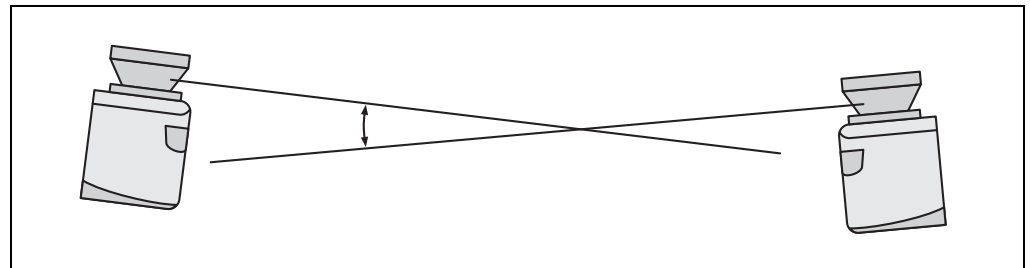


Fig. 36: Placement of two LMS opposed to each other

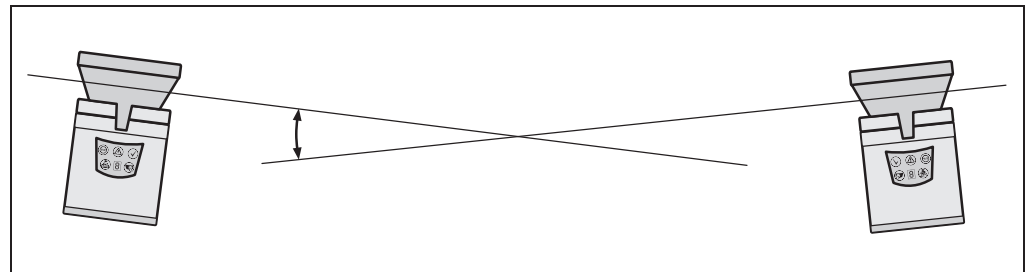


Fig. 37: Crosswise placement of two LMS

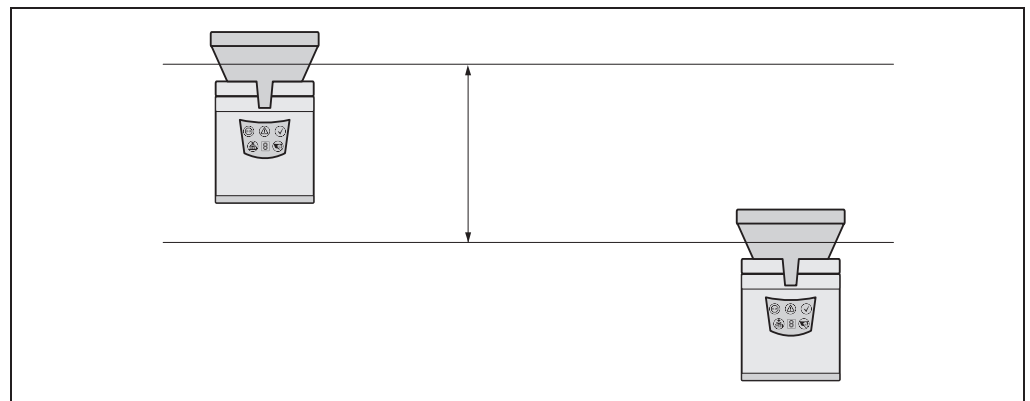


Fig. 38: Placement of two LMS with parallel offset

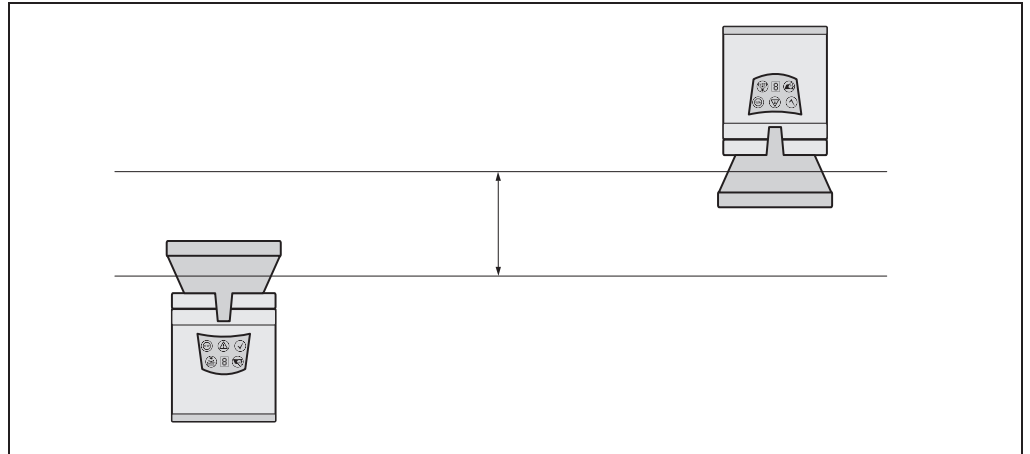


Fig. 39: Placement of two LMS with parallel offset, one of these upside down

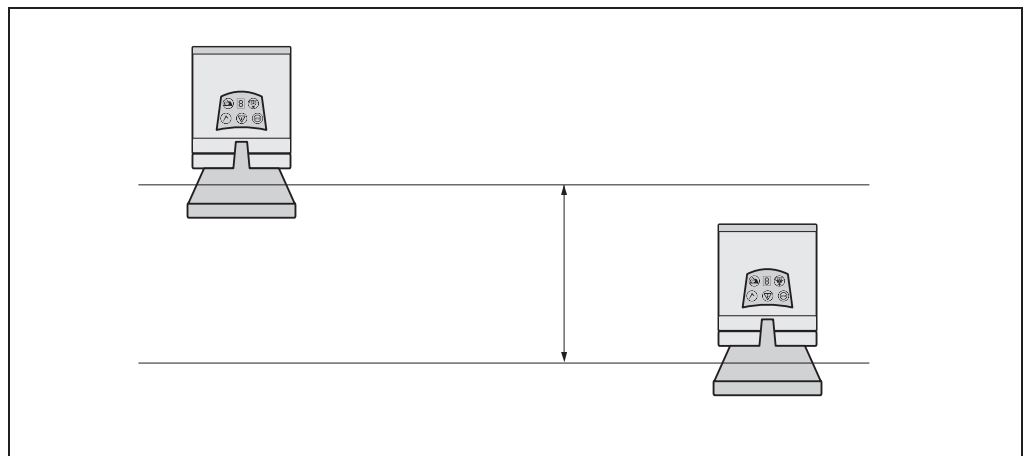


Fig. 40: Placement of two LMS upside down, parallel offset

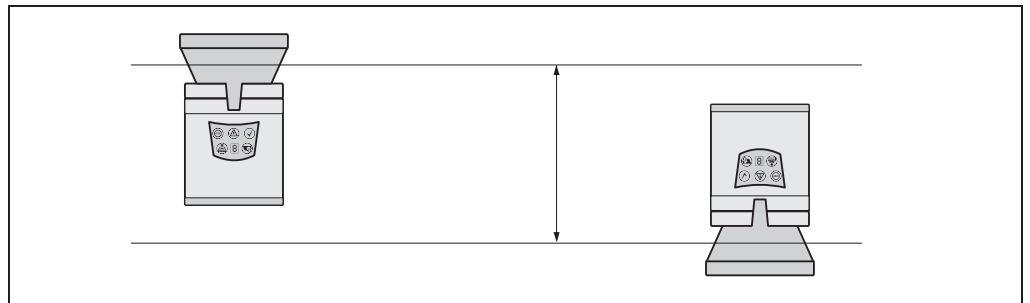


Fig. 41: Placement of two LMS with parallel offset, one of these upside down

4.4 Dismantling the system

1. Switch off the supply voltage.
2. Remove the connection cables.
3. Undo the mounting screws for the LMS to the mounting bracket and remove the device.

Important On final decommissioning, please observe the disposal requirements in [section 2.5.2](#) “*Disposal after final de-commissioning*” on [page 15](#) for environmentally correct disposal.

5 Electrical 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

- Connect the supply voltage to the LMS.
- Wire switching outputs (application-dependent).
- Temporarily connect PC (configuration).
- Wire data interface for operation.

5.2 Connections of the LMS

Depending on the variant, the LMS has different connections:

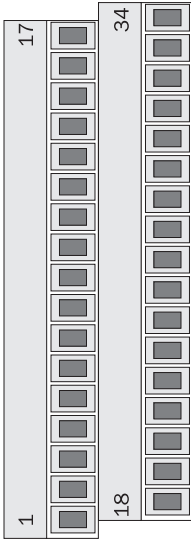
- The LMS100, LMS122 and the LMS123 have a removable system plug. This has a PG7 cable entry on the rear. The connections are made to the screw type terminal in the system plug. In addition these variants have a round M12 plug connector for the connection to Ethernet.
You can move the PG7 cable entry and the round plug connector from the rear to the underside of the system plug (see [section 9.2.1 “Dimensional drawing LMS100/LMS122/LMS123” on page 81](#)).
- The LMS111/LMS151 have four multipin round M12 plug connectors. The connections are made to the related plug or sockets.
- All variants have a round M8 plug connector on the front of the unit for the connection to the RS-232 interface on a PC.

Important

This interface is only used for configuration and is not allowed to be permanently connected.

5.2.1 Connections of the LMS100

Terminal	Signal	Function
1	Reserved	Do not use
2	Reserved	Do not use
3	RxD RS-232	Serial RS-232 host interface (receiver)
4	Reserved	Do not use
5	Reserved	Do not use
6	IN1	Digital input 1
7	IN1 GND	Ground digital input 1
8	IN2	Digital input 2
9	IN2 GND	Ground digital input 2
10	A1_INCA_0	Encoder input 1
11	A1_INCA_90	Encoder input 2
12	GNDINC_A	Ground digital inputs
13	OUT1_A	Digital output 1
14	OUT1_B (or _GND)	Digital output 1
15	OUT1_R	Resistance monitor output 1
16	OUT2_A	Digital output 2
17	OUT2_B (or _GND)	Digital output 2
18	GND	Ground LMS
19	V _S 10.8 V ... 30 V	LMS supply voltage
20	TxD RS-232	Serial RS-232 host interface (sender)
21	Reserved	Do not use
22	GND RS-232/GND CAN	Ground serial host interface or CAN
23	CAN_H	CAN-BUS High
24	CAN_L	CAN-BUS Low
25	CAN Vs 24 V	CAN supply voltage
26	GND RS-232/GND CAN	Ground serial host interface or CAN
27	CAN_H	CAN-BUS Low
28	CAN_L	CAN-BUS High
29	CAN Vs 24 V	CAN supply voltage
30	OUT3_R	Resistance monitor digital output 3
31	OUT3_B (or _GND)	Digital output 3
32	OUT3_A	Digital output 3
33	OUT2_R	Resistance monitor digital output 2
34	Case	Housing



Tab. 12: Terminal assignment of the LMS100

“Ethernet” connection M12 × 4, socket

Pin	Signal	Function
1	Ethernet_TX+	Ethernet interface
2	Ethernet_RX+	Ethernet interface
3	Ethernet_TX-	Ethernet interface
4	Ethernet_RX-	Ethernet interface



Tab. 13: Pin assignment of the “Ethernet” connection on the LMS100

“Auxiliary interface” connection M8 × 4, socket

Pin	Signal	Function
1	-	Not assigned
2	RxD	Serial RS-232 auxiliary interface
3	0 VDC	Ground
4	TxD	Serial RS-232 auxiliary interface

Tab. 14: Pin assignment of the “Auxiliary interface” connection on the LMS100


5.2.2 Connections of the LMS122/123

Terminal	Signal	Function
1	Alarm	Relay contact 1 of the alarm output
2	Alarm R	Resistance monitored relay contact 1 for the alarm output
3	Alarm	Relay contact 2 of the alarm output
4	Sabotage ¹⁾	Digital sabotage output
5	Sabotage ¹⁾	Digital sabotage output
6	IN1	Digital input 1
7	IN1 GND	Ground digital input 1
8	IN2	Digital input 2
9	IN2 GND	Ground digital input 2
10	INC1/IN4	Encoder input 1/Digital input 4
11	INC2/IN3	Encoder input 2/Digital input 3
12	GNDINC/IN34	Ground encoder inputs/digital inputs 3/4
13	Error R	Resistance monitored relay contact 1 for the error output
14	Error	Relay contact 1 of the error output
15	GND	Ground LMS
16	V _S	LMS supply voltage
17	Without function	Do not use
18	Sabotage R ¹⁾	Resistance monitored digital sabotage output
19	GND CAN	Ground CAN-BUS
20	CAN_H	CAN-BUS High
21	CAN_L	CAN-BUS Low
22	CAN 24 V	CAN supply voltage
23	GND CAN	Ground CAN-BUS
24	CAN_H	CAN-BUS High
25	CAN_L	CAN-BUS Low
26	CAN 24 V	CAN supply voltage
27	Error	Relay contact 2 of the error output
28	Case	Housing

Tab. 15: Terminal assignments on the LMS122/123

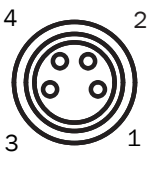
1) Series configuration of cover contact and semiconductor switch. Fixed assignment.

“Ethernet” connection M12 × 4, socket

	Pin	Signal	Function
	1	Ethernet_TX+	Ethernet interface
	2	Ethernet_RX+	Ethernet interface
	3	Ethernet_TX-	Ethernet interface
	4	Ethernet_RX-	Ethernet interface

Tab. 16: Pin assignment of the “Ethernet” connection on the LMS122/123

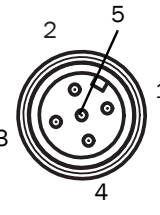
“Auxiliary interface” connection M8 × 4, socket

	Pin	Signal	Function
	1	-	Not assigned
	2	RxD	Serial RS-232 auxiliary interface
	3	DC 0 V	Ground
	4	TxD	Serial RS-232 auxiliary interface

Tab. 17: Pin assignment of the “Auxiliary interface” connection on the LMS122/123


5.2.3 Connections of the LMS111/LMS151

“Power” connection M12 × 5, plug

	Pin	Signal	Function
	1	V _S	LMS supply voltage
	2	V _S heat.	Supply voltage for the heating
	3	GND	Ground
	4	-	Not assigned
	5	GND heat.	Ground heating

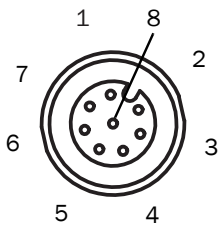
Tab. 18: Pin assignment of the “Power” connection on the LMS111/LMS151

“RS-232” connection M12 × 8, plug

	Pin	Signal	Function
	1	RxD	Serial RS-232 host interface (receiver)
	2	TxD	Serial RS-232 host interface (sender)
	3	CAN_H	CAN-BUS High
	4	CAN_L	CAN-BUS Low
	5	GND CAN	Ground CAN
	6	IN1	Digital input 1
	7	IN2	Digital input 2
	8	IN GND	Ground digital inputs

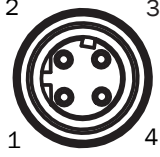
Tab. 19: Pin assignment of the “RS-232” connection on the LMS111/LMS151

“I/O” connection M12×8, socket

	Pin	Signal	Function
	1	A1_INCA_0	Encoder input 1
	2	A1_INCA_90	Encoder input 2
	3	GNDINC_A	Ground encoder inputs
	4	OUT1_A	Digital output 1
	5	OUT2_A	Digital output 2
	6	OUT3_A	Digital output 3
	7	OUTx_B	Second connection of the digital outputs 1 to 3
8	OUTx_R	Resistance monitored connection of the digital outputs 1 to 3	

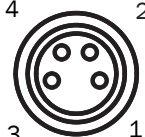
Tab. 20: Pin assignment of the “I/O” connection on the LMS111/LMS151

“Ethernet” connection M12×4, socket

	Pin	Signal	Function
	1	Ethernet_TX+	Ethernet interface
	2	Ethernet_RX+	Ethernet interface
	3	Ethernet_TX-	Ethernet interface
4	Ethernet_RX-	Ethernet interface	

Tab. 21: Pin assignment of the “Ethernet” connection on the LMS111/LMS151

“Auxiliary interface” connection M8×4, socket

	Pin	Signal	Function
	1	-	Not assigned
	2	RxD	Serial RS-232 auxiliary interface
	3	0 VDC	Ground
4	TxD	Serial RS-232 auxiliary interface	

Tab. 22: Pin assignment of the “Auxiliary interface” connection on the LMS111/LMS151

5.3 Preparing the electrical installation

5.3.1 Supply voltage

For commissioning and operating the LMS, the following are required:

- LMS100/LMS111/LMS151: 10.8 ... 30 V DC as per IEC 60364-4-41

The LMS draws the following power:

- power consumption of the LMS100/LMS120 with maximum output load 20 W
- power consumption of the LMS111/LMS151 with maximum heating performance 60 W



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).

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 (approx. 24 AWG), if local power supply in the immediate vicinity
 - supply voltage at least 1.0 mm² (approx. 18 AWG) at maximum length of 20 m (65.62 ft), if the connection is made to an existing 24 V DC supply
 - switching outputs minimum 0.25 mm² (approx. 24 AWG), maximum cable length 50 m (164.04 ft) with 0.5 mm² (approx. 22 AWG)
 - data interface minimum 0.25mm² (approx. 24 AWG)
 - For the LMS the outside diameter of the common cable must be a maximum of 9 mm (0.35 in) due to the cable entry.

Important If you use flexible connecting cables with stranded wire for the connection to the terminals on the LMS100/LMS122/123, you must **not** use wire end ferrules.

5.3.3 General conditions for the data interfaces

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-232	115,200 Bd	10 m (32.81 ft)
CAN bus ¹⁾	1 MBit/s	40 m (131.23 ft)

Tab. 23: Maximum cable lengths for the data interfaces

1) With appropriate cable termination, termination in accordance with related specification.

- Important**
- Use screened cable (twisted-pair) with at least 0.25 mm² (approx. 24 AWG).
 - 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 Perform electrical installation on the LMS



CAUTION

- Lay all cables such that there is no risk of tripping and all cables are protected against damage.

5.4.1 Equipment

- tool set
- digital multimeter (current/voltage measurement)

5.4.2 Connection on the auxiliary interface and the Ethernet interface of the LMS100 ... LMS151

Pre-assembled cables are available to configure the LMS via the serial auxiliary interface and via the Ethernet interface.

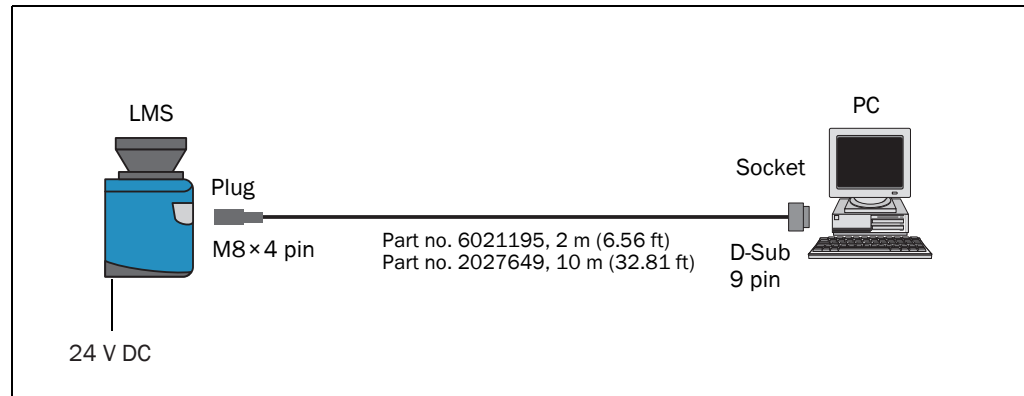


Fig. 42: LMS100 ... LMS151: RS-232 connection at the auxiliary interface

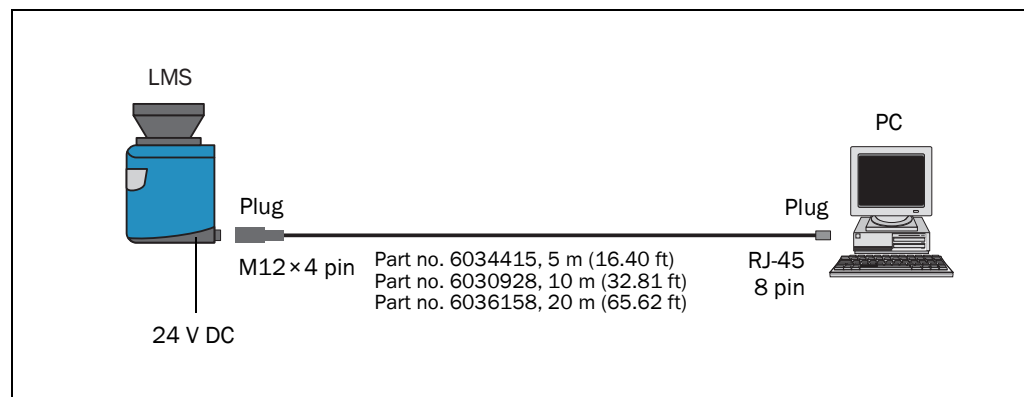


Fig. 43: LMS100 ... LMS151: Ethernet connection using the Ethernet cable

5.4.3 Connecting the system plug on the LMS100/LMS122/LMS123

NOTICE

Reduced enclosure rating!

- If the system plug is removed, the LMS100/LMS122/LMS123 are no longer compliant with the enclosure rating IP 65. To prevent damage due to the entry of moisture and dirt, only open the system plug in dry, clean surroundings.
- If necessary, pre-wire and fit the adapter in suitable surroundings.

1. Ensure the power supply to which the LMS is connected is switched off.
2. Remove interface adapter on the underside of the device. For this purpose undo the four fixing screws ([Fig. 9.2.1 on page 81](#)) and pull the adapter carefully off the device perpendicular to the base.
3. The PG7 cable entry (metal) has an earth connection to the device. If a screened connecting cable is used, as necessary connect the screen braid on the cable to the cable entry. For this purpose, shorten the screen braid as appropriate before assembling the cable entry and fit over the plastic insert for the cable entry.
4. Undo fitting for the PG7 cable entry.

5. Pull the cable for supply voltage and switching outputs with maximum outside diameter \varnothing 5.6 mm (0.22 in) through the plastic insert for the PG7 cable entry.
6. Connect electrically isolated wires to the terminal block.
7. If necessary, connect screen braid on the cable to the cable entry.
8. Fit PG7 cable entry fitting and tighten.
9. Carefully re-fit the system plug to the LMS.
10. Tighten the fixing screws for the system plug.

5.4.4 Connecting the round M12 plug connector on the LMS111/LMS151

NOTICE

Only make connection to the LMS111/LMS151 at the round M12 plug connectors provided for this purpose!

- Only use plug connectors that are compliant with enclosure rating IP 67.

Pre-assembled cables are available as accessories for the connection to the round M12 plug connectors. These comprise the round plug connector and 5, 10 or 20 m (16.40, 32.81 or 65.62 ft) of cable with flying leads.

Connection of the voltage supply on the LMS111/LMS151

Pre-assembled cables with flying leads are available for the supply to the LMS111/LMS151.

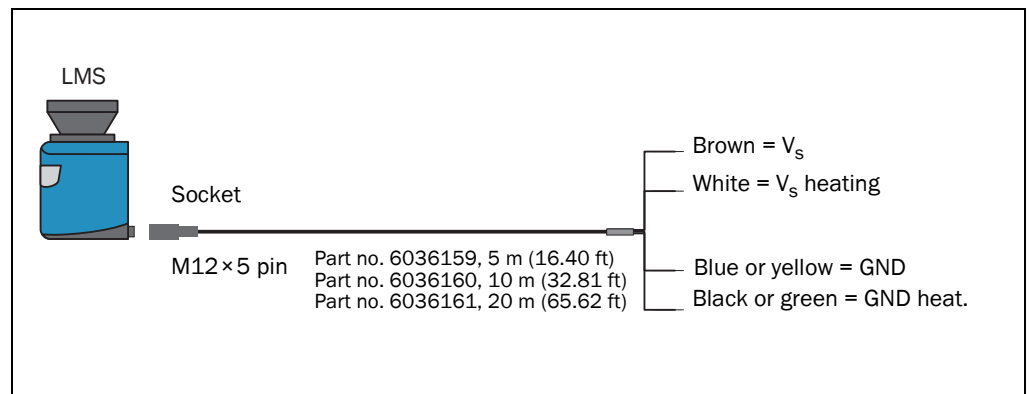


Fig. 44: LMS111/LMS151: connection of the voltage supply

Important On the connecting cables part no. 6036159, part no. 6036160 and part no. 6036161 the cables for GND and GND heat. are either blue and black or yellow and green.

“RS-232” connection on the LMS111/LMS151

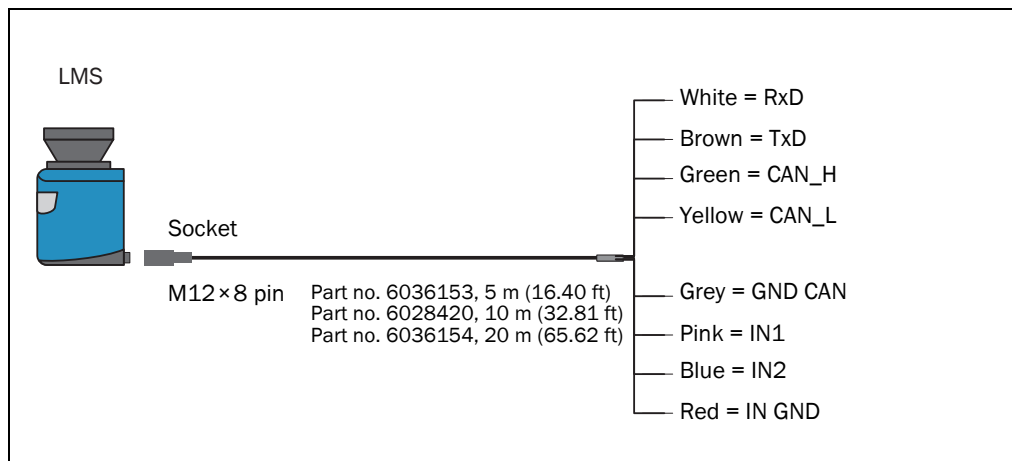


Fig. 45: LMS111/LMS151: “RS-232” connection

“I/O” connection on the LMS111/LMS151

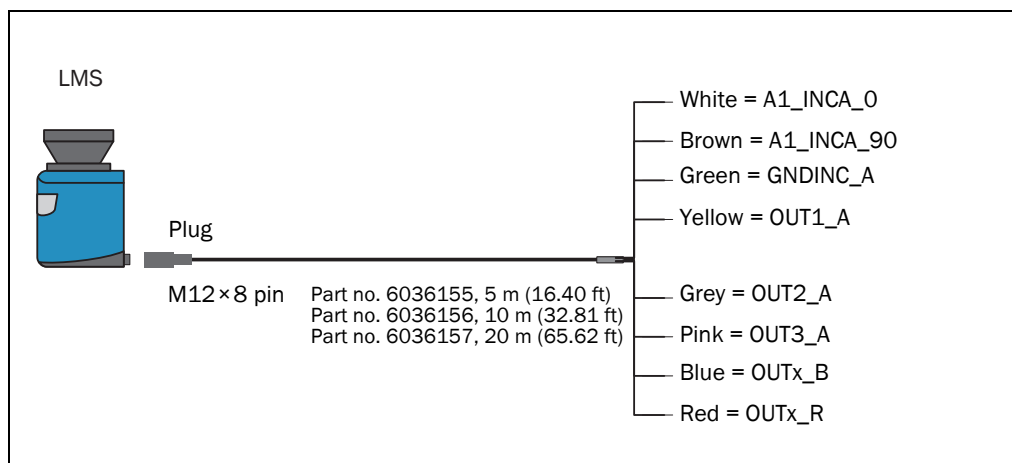


Fig. 46: LMS111/LMS151: “I/O” connection

5.4.5 Wiring of inputs and outputs on the LMS

Connecting digital inputs as non-floating

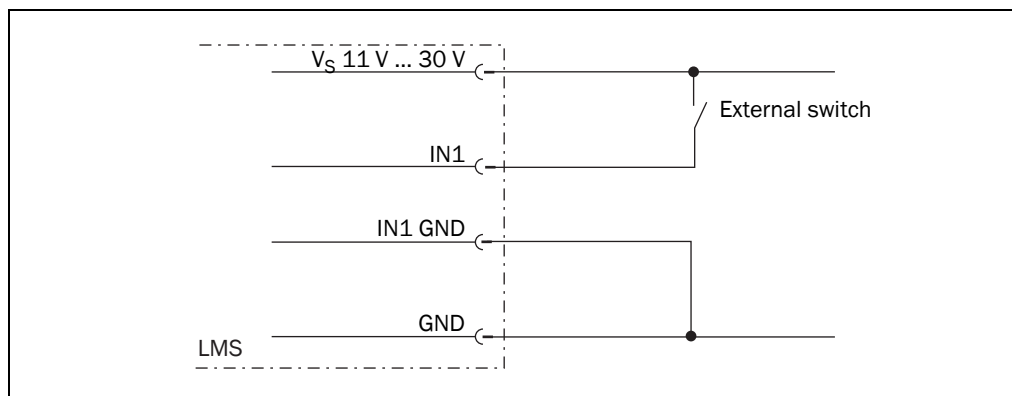


Fig. 47: Connecting digital inputs as non-floating

Important The inputs require a switching voltage of at least 11 V. For this reason the supply voltage must be at least 11 V.

Connecting digital inputs as floating

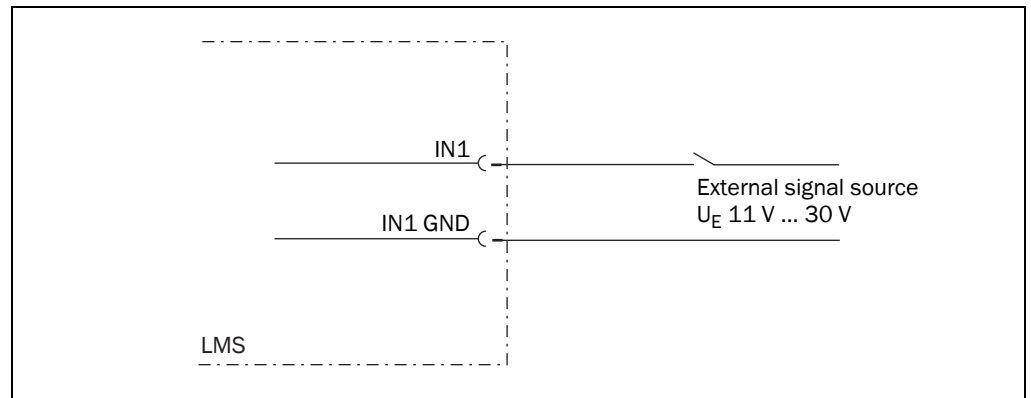


Fig. 48: Connecting digital inputs as floating

Wiring encoder inputs

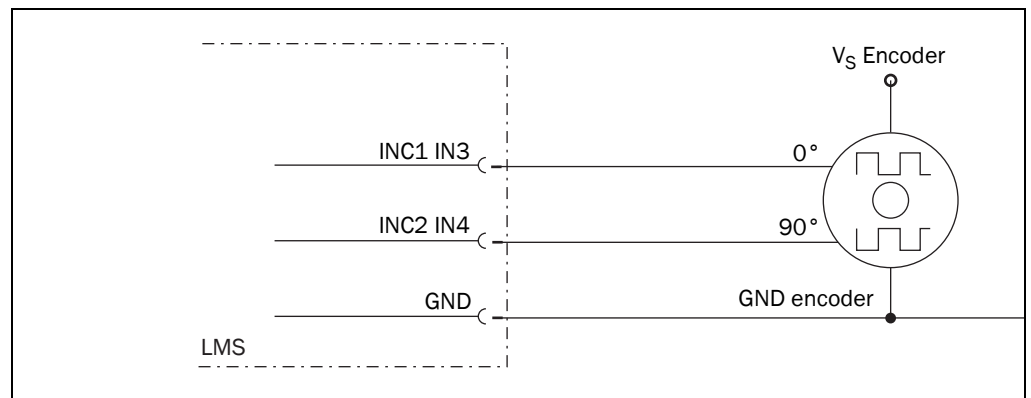


Fig. 49: Wiring encoder inputs

Connection of the outputs of the LMS100/111/151 to a PLC, non-floating

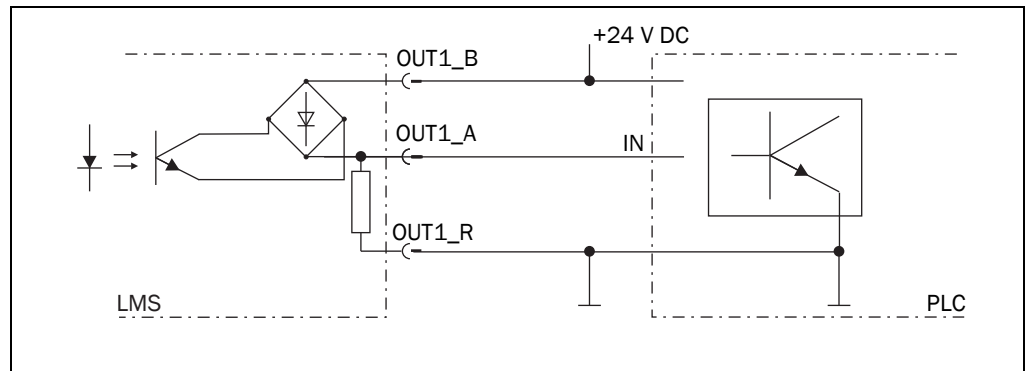


Fig. 50: Connection of the outputs to a PLC, non-floating (active high)

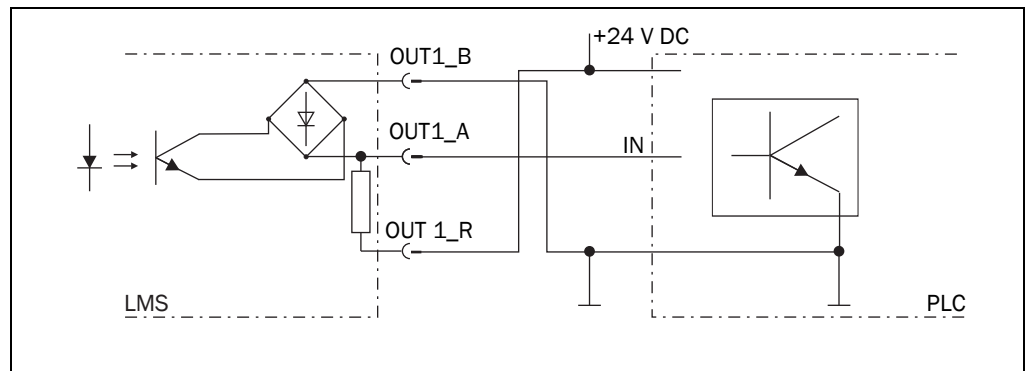


Fig. 51: Connection of the outputs to a PLC, non-floating (active low)

Connection of the outputs of the LMS100/111/151 to a PLC, floating

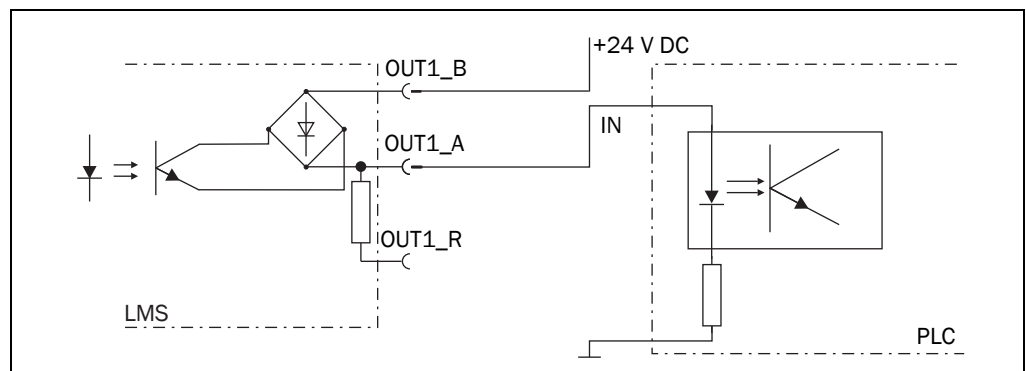


Fig. 52: Connection of the outputs to a PLC, floating (active high)

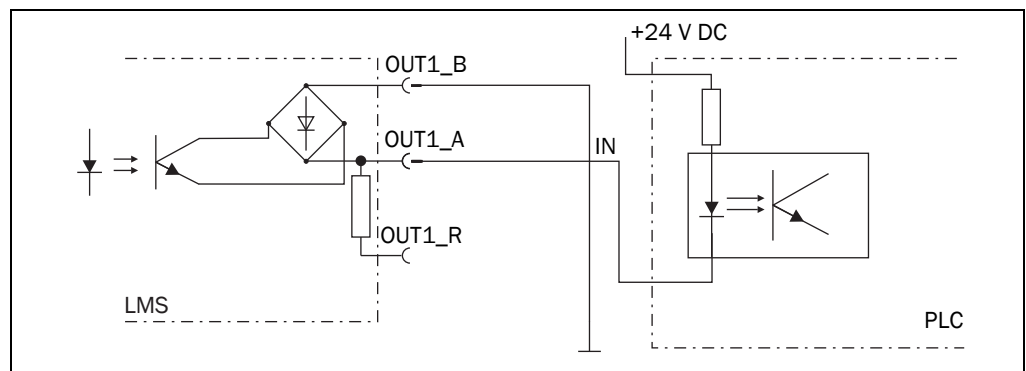


Fig. 53: Connection of the outputs to a PLC, floating (active low)

Connection of the LMS100/111/151 to an object protection system

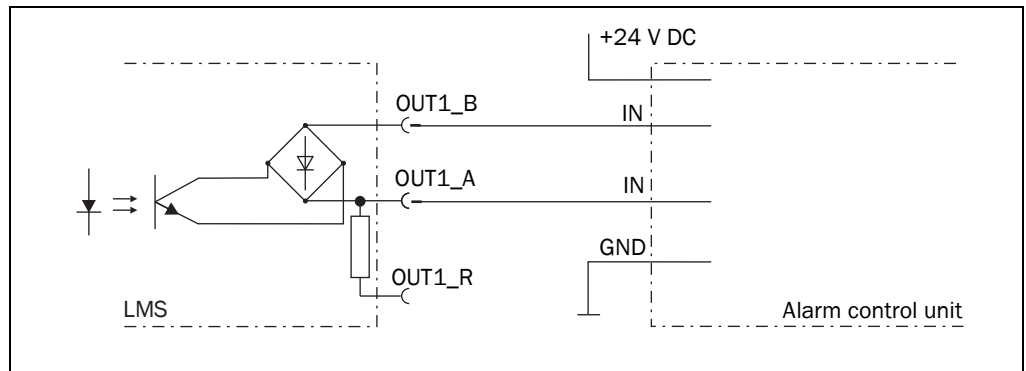


Fig. 54: Connection to an object protection system

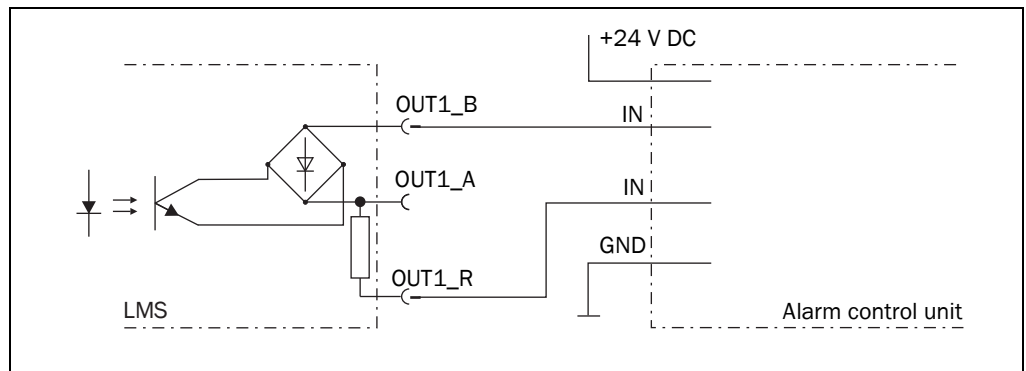


Fig. 55: Connection to an object protection system, resistance monitored

Important Between OUT_x_R and OUT_x_A a resistor of 10 kΩ is fitted. You can modify this to suit the external connection layout, if necessary.

Connection of the LMS122/123 to an object protection system, not resistance monitored

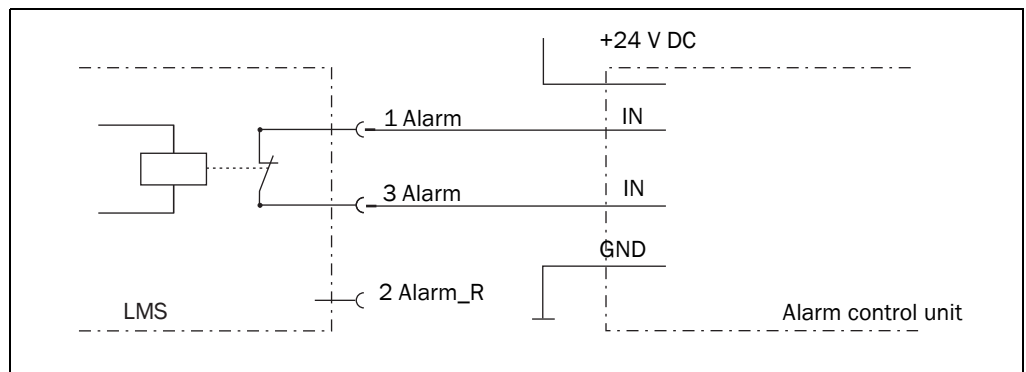


Fig. 56: Connection of the LMS122/123 to an object protection system

Connection of the LMS122/123 to an object protection system, resistance monitored

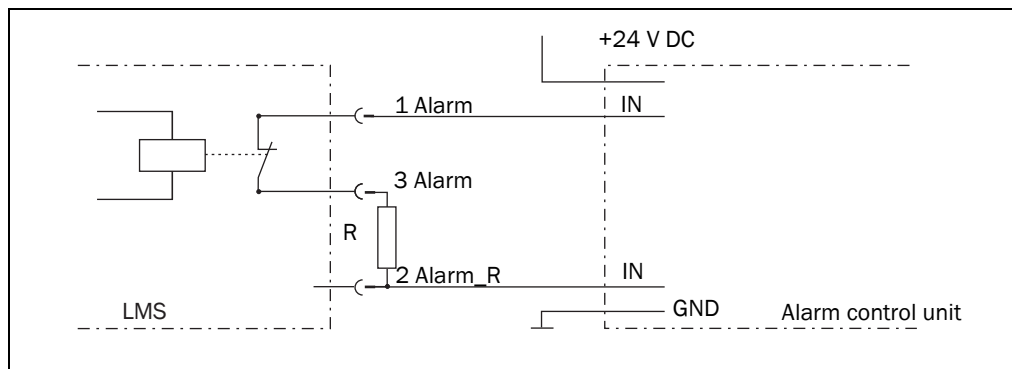


Fig. 57: Connection of the LMS122/123 to an object protection system, resistance monitored

Important The resistance R must be adapted to the related security centre and the number of sensors that are connected to an input

Wiring CAN- interface

To wire the CAN interface a screened “twisted-pair” cable is required. The terminator of 120 Ω must be connected.

- Pay attention to max. cable length as per [section 5.3.3 “General conditions for the data interfaces” on page 59](#).

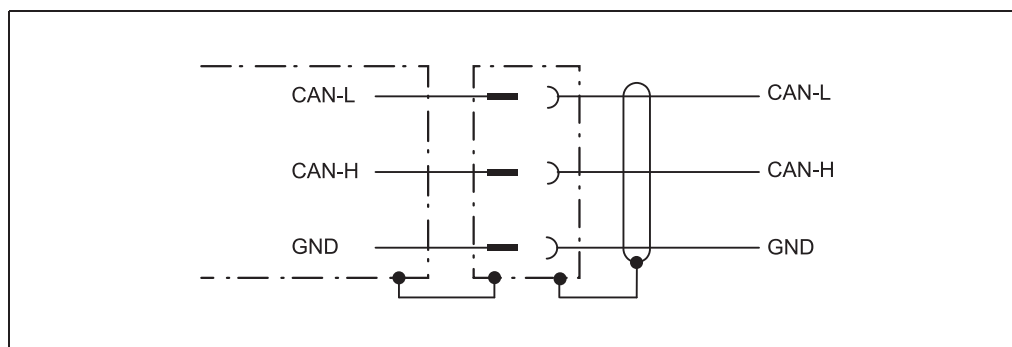


Fig. 58: Wiring of the CAN interface

Wiring the RS-232 interface

A screened cable is required for the wiring of the RS-232 interface.

- Pay attention to max. cable length as per [section 5.3.3 “General conditions for the data interfaces” on page 59](#).

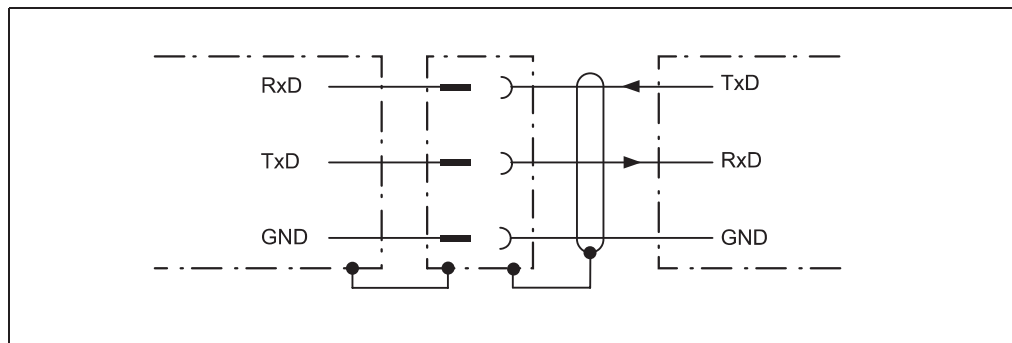


Fig. 59: Wiring the RS-232 interface

6 Commissioning and configuration



WARNING

Commissioning requires a thorough check by qualified personnel!

Before you operate a system equipped with the LMS 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

- install SOPAS ET configuration software
- establish communication with the LMS
- create a custom parameter set using SOPAS ET and save in non-volatile memory in the LMS
- test LMS 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 system 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 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 LMS
- password-protected configuration with different operating levels
- system diagnostics

6.2.1 System requirements for SOPAS ET

- standard Intel Pentium PC or compatible, at least Pentium III, 500 MHz
- minimum 256 MB RAM, 512 MB RAM recommended
- data interface RS-232, Ethernet or CAN (see also [section 5.3.3 “General conditions for the data interfaces” on page 59](#))
- operating system: MS Windows 2000, XP or VISTA
- monitor with 256 colours minimum, 65.536 colours recommended (16 Bit High Color)

- screen resolution at least 800 × 600
- hard disc: minimum 170 MB free memory
- CD-ROM drive
- HTML browser on PC, e.g. Internet Explorer™, for the online help system for SOPAS ET

6.2.2 Installation of SOPAS ET

1. Start PC and insert installation CD.
2. If the installation does not start automatically, run the file setup.exe on the CD-ROM.
3. To complete the installation, follow the instructions.

6.2.3 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 of the parameters to the LMS	Immediate on change, temporary in the LMS RAM
Upload of the parameters from the LMS	After switching online, automatic
Window layout	3 (project tree, help, working area)
Serial communication	COM1: 9,600 Bd/19,200 Bd, 8 data bits, no parity, 1 stop bit

Tab. 24: SOPAS ET default setting

6.3 Establish communication with the LMS

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 the PC to the LMS using data cable.
3. Switch on the supply voltage for the LMS.
The LMS performs a self-test and initialises itself.

6.3.1 Connect the data interfaces

➤ Connect PC and LMS together as per table.

Data interface	Comment
Ethernet	Connect the PC to the LMS using the Ethernet cable (see Fig. 43 on page 60)

Or:

RS-232	Connect the PC (serial interface) to the LMS (see Fig. 42 on page 60)
--------	----------------------------------------------------------------------------------------

Tab. 25: Connect the data interfaces

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/DEUTSCH.
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 BINARY 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

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

1. In the SCAN ASSISTANT dialog, under INTERNET PROTOCOL, IP COMMUNICATION, select the ACTIVATE IP COMMUNICATION checkbox and the USE AUTOIP checkbox.
2. Confirm the settings in the SCAN ASSISTANT dialog box with OK.
The SCAN ASSISTANT dialog box is closed.

6.3.5 Performing scan

1. In the SCAN ASSISTANT dialog box, click on the START SCAN button.
2. Choose devices listed and accept using ADD DEVICE.
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 LMS 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 can either be loaded initially from the device (upload) or it can be prepared independently.

The parameter set is then loaded into the LMS (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 the non-volatile memory in the laser measurement system. In addition, the parameter set can be saved as a project file (spr- file with configuration data) on the PC and archived.

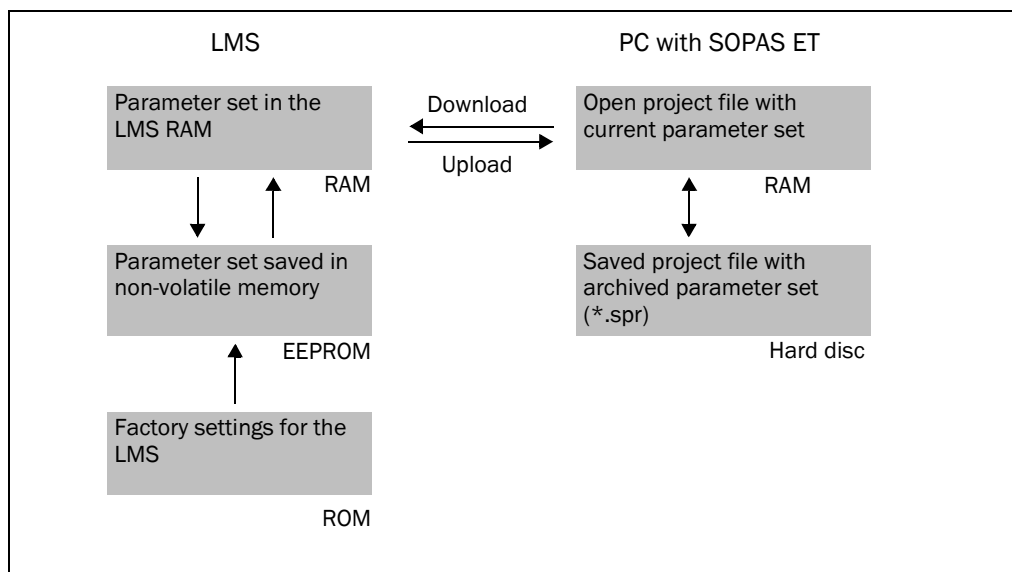


Fig. 60: Principle of data storage

6.4.1 Configuring the LMS

You can configure the LMS in two ways:

- interactively using SOPAS ET
This section describes the interactive configuration.
- using configuration messages
On this subject please read [section 3.11 “Data communication using messages” on page 42.](#)

Interactive configuration using SOPAS ET

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

The function of each parameter is explained in a context-sensitive online help (**F1** key). 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 LMS is password protected. Following completion of the configuration, you should change the password so that it can perform its protective function.

User level	Password
Maintenance personnel	main
Authorised client	client

Tab. 26: Passwords LMS100/111/151

User level	Password
Operator	-
Operator	main
Integrator	client

Tab. 27: Passwords LMS122/123

A password is not defined for the Operator user level as supplied.

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 LMS 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.

Expert mode or Quickstart

For the LMS122/123 a Quickstart configuration mode is available with the aid of which the parameters for the LMS122/123 can be easily configured for the needs of object protection.

For the LMS100/111/151 only the Expert mode is available. The Expert mode can also be used for the LMS122/123.

Resetting configuration

Recommendation To reset the LMS to the default delivery status, you should first export the device data to a file from a device that is in the default delivery status. You can then subsequently load these device data into an already configured device to reset its configuration to the default delivery status.

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. In the project tree, choose LMS..., MONITOR, SCAN VIEW.
2. In order to start the measurement, click on PLAY.
3. Compare the measurement line with the desired 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 **unfiltered**, i.e. the action of filters can **not** be checked with the aid of the monitor.
4. After completing the test measurement successfully, save the configuration permanently to the LMS: menu LMS..., PARAMETER, SAVE PERMANENT.

7 Maintenance

NOTICE

Claims under the warranty rendered void!

The housing screws of the LMS 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

7.1.1 Cleaning the optics cover

The LMS laser measurement system is largely maintenance-free. The optics cover on the laser measurement system should however be cleaned regularly and if it is contaminated.

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

Important Static charges cause dust particles to be attracted to the optics cover. You reduce this effect by using the antistatic plastic cleaner (SICK part no. 5600006) and the SICK lens cloth (part no. 4003353) (see [section 10.3.1 “Consumables” on page 107](#)).

How to clean the optics cover:

- Use a clean and soft brush to remove dust from the optics cover.
- Then wipe the view window of the optics cover with a clean and damp cloth.

7.2 Exchanging an LMS

As all external cable connections end in the system plug or 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 LMS is to be replaced, proceed as follows:

1. Switch off the voltage supply for the LMS.
2. Remove the connection cable/s from the LMS.
3. Mount the replacement device (see [chapter 4 “Mounting” on page 46](#)).
4. Configuring a replacement device (see [chapter 6 “Commissioning and configuration” on page 67](#)).

8 Troubleshooting

NOTICE

Claims under the warranty rendered void!

The housing screws of the LMS 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 of the LMS.

8.1 In the event of faults or errors








WARNING

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

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





8.2 Error displays of the LEDs

Important On the LMS122/123 the status indicators are switched off so that as far as possible it cannot be seen that the device is part of an object protection system. In the practice check mode they are switched on.

Display	Possible cause	Rectification of the error
 and  off	No operating voltage, or voltage too low	➤ Check the voltage supply and activate, if necessary.
 illuminated	Optics cover contaminated, still in operation	➤ Clean the optics cover.
 flashes with 1 Hz	Optics cover contaminated, no operation	➤ Clean the optics cover.
 flashes with 4 Hz	System error	➤ Pay attention to the error display of the 7-segment display or carry out a diagnostics with the aid of SOPAS ET. ➤ Switch the device off and back on again.

Tab. 28: Error displays of the LEDs

8.3 Indications of the 7-segment display

Display	Possible cause	Rectification of the error
 , ...	No error	Device in measurement mode
	IDLE mode, the outputs are in the OFF state, the laser is switched off.	No error. If the criteria for the IDLE mode are withdrawn, readiness for operation is re-established.
	Motor starts	No error.
	LMS faulty	➤ Send the LMS to the manufacturer for repair.

Tab. 29: Indications of the 7-segment display

8.4 Detailed error analysis

The LMS outputs occurring errors in various ways. Errors are output in stages and always permit detailed analysis:

- Communication errors can occur on the transfer of messages to the LMS. The LMS then returns an error code.
- In case of status errors occurring during a scan, error codes are written to a status log.

8.4.1 Field evaluation monitor

Using the field evaluation monitor, you can analyse whether and how evaluation fields are infringed and how the outputs on the LMS behave.

PROJECT TREE, LMS..., MONITOR, FIELD EVALUATION MONITOR.



8.4.2 Field evaluation logging

Using the field evaluation logging you can log, save and subsequently play back the operation of LMS. It is used for diagnostics over extended periods and for the analysis of malfunctions or for the optimisation of processes.

PROJECT TREE, LMS..., MONITOR, FIELD EVALUATION LOGGING.



9 Technical specifications

9.1 Data sheet LMS laser measurement system

	Minimum	Typical	Maximum
Functional data			
Scan angle			270°
Scanning frequency	25 Hz		50 Hz
Remission	10%		Several 1,000% ¹⁾ (reflectors)
Angular resolution			
With 25 Hz	0.25°		0.5°
With 50 Hz		0.5°	
Measurement error 1st reflected pulse ²⁾			
Systematic error		± 30 mm (± 1.18 in)	± 40 mm (± 1.58 in)
Temperature drift	0 mm/°C (0 in/°F)		0.32 mm/°C (0.007 in/ °F)
Statistical error (1σ)		12 mm (0.47 in)	20 mm (0.79 in)
Immunity to external light		40 klx	
Evenness of the scan field (25 Hz)			
Cone		±0.5°	±1°
Inclination		±1°	±-2°
Distance from mirror axis of rotation (zero point on the X and Y axis) to the rear of the device		55 mm (2.17 in)	
Distance between centre of the scan plane and the bottom edge of the housing		116 mm (4.57 in)	
Distance measuring range			
LMS100/LMS111/LMS122/LMS123	0.5 m (1.64 ft)		20 m (65.62 ft)
LMS151	0.5 m (1.64 ft)		50 m (164,04 ft)
Hardware blanking window	0 m (0 ft)		15 m (49.21 ft)
Step width		1 m (3.28 ft)	
Power-up delay			60 s
Of a configured device		15 s	
Configurable restart after	2 s		60 s
General data			
Laser protection class	Laser class 1 according IEC 60825-1 (2007-3) (complies with 21 CFR 1040.10 with the exception of the deviations as per Laser Notice No. 50, July 26, 2001)		
Enclosure rating	As per EN 60529 (1991-10); A1 (2002-02)		
LMS100/LMS122/LMS123	IP 65		
LMS111/LMS151	IP 67		

Tab. 30: Data sheet LMS100 ... LMS151

	Minimum	Typical	Maximum
Protection class	III as per EN 50178 (1997-10)		
EMC test	As per EN 61000-6-2 (2005-08), EN 61000-6-3 (2007-03)		
Electrical safety	As per EN 50178 (1997-10)		
Operating temperature range			
LMS100/LMS122/LMS123	0 °C (32 °F)		+50 °C (122 °F)
LMS111/LMS151	-30 °C (86 °F)		+50 °C (122 °F)
Storage temperature range	-30 °C (86 °F)		+70 °C (158 °F) max. 24 h
Humidity (taking into account the operating temperature range)	DIN EN 60068-2-61, method 1		
Vibration resistance	As per EN 60068-2-6 (1995-04)		
Frequency range	10 Hz		150 Hz
Amplitude	5 g RMS		
Shock resistance	As per EN 60068-2-27 (1993-03), EN 60068-2-29 (1993-04)		
Single shock	15 g (0.53 oz), 11 ms		
Continuous shock	10 g (0.35 oz), 16 ms		
Sender	Pulsed laser diode		
Wave length	895 nm	905 nm	915 nm
Divergence of the collimated beam (solid angle)		15 mrad	
Light spot size at the optics cover		8 mm (0.32 in)	
Light spot size at 18 m (59.05 ft) scanning range		300 mm (11.82 in)	
Housing			
Material	GD-ALSI12 3.2582.05		
Colour LMS100	RAL 5012 (blue)		
Colour LMS122	RAL 9005 (black)		
Colour LMS123	RAL 9003 (white)		
Colour LMS111/LMS151	RAL 7032 (grey)		
Alloy	Excellent weather resistance as per DIN EN 106:1988, plate 3		
Optics cover			
Material	Polycarbonate		
Surface finish	Outside with scratch-resistant coating		
System plug (LMS100/LMS122/LMS123)			
Material	GD-ALSI12 3.2582.05		
Colour LMS100/LMS122	RAL 9005 (black)		
Colour LMS123	RAL 9003 (white)		
Cable entries (LMS111/LMS151)			
Material	Stainless steel/plastic		

Tab. 30: Data sheet LMS100 ... LMS151 (cont.)

	Minimum	Typical	Maximum
Dimensions ³⁾			
Height LMS100/LMS122/LMS123			152 mm (5.99 in)
Height LMS111/LMS151			162 mm (6.38 in)
Width			102 mm (4.02 in)
Depth			106 mm (4.18 in)
Total weight (without connecting cables)		1.1 kg (2.43 lb)	

Electrical data

Supply voltage LMS100/LMS111/LMS151 SELV or PELV as per IEC 60364-4-41 (2005-12)	10.8 V	24 V	30 V
Supply voltage LMS122/LMS123 SELV or PELV as per IEC 60364-4-41 (2005-12)	9 V	24 V	30 V
Permissible residual ripple			±5%
Supply voltage for the LMS111/LMS151 heating	19.2 V	24 V	28.8 V
Switch on current			2 A
Operating current at 24 V without output load		0.35 A	0.5 A
Operating current with max. output load		0.65 A	0.8 A
Operating current with maximum heating performance		2.3 A	2.5 A
Power consumption without output load		8.4 W	12 W
Power consumption with maximum output load		16 W	20 W
Power consumption with maximum heating performance		55 W	60 W
Electrical connection LMS111/LMS151	Round M12 plug connector		
Electrical connection LMS100/LMS122/LMS123	System plug with screw terminal block		
Technical specifications, screw terminals			
Cross-section of rigid cores (American Wire Gauge – AWG)	0.14 mm ² (approx. 26 AWG)		1.5 mm ² (approx. 16 AWG)
Cross-section of flexible cores (American Wire Gauge – AWG)	0.14 mm ² (approx. 26 AWG)		1.0 mm ² (approx. 18 AWG)
Insulation stripping length for the cores		5 mm (0.2 in)	
Screw tightening torque	0.22 Nm		0.3 Nm
Cable length for device power supply at 24 V			
With 1 mm ² wire cross-section (approx. 18 AWG)			220 m (721.78 ft)
With 0.5 mm ² wire cross-section (approx. 22 AWG)			110 m (360.89 ft)
With 0.25 mm ² wire cross-section (approx. 24 AWG)			50 m (164.04 ft)
Cable length for heating at 24 V			
With 1 mm ² wire cross-section (approx. 18 AWG)			45 m (147.64 ft)
With 0.5 mm ² wire cross-section (approx. 22 AWG)			20 m (65.62 ft)

Tab. 30: Data sheet LMS100 ... LMS151 (cont.)

	Minimum	Typical	Maximum
With 0.25 mm ² wire cross-section (approx. 24 AWG)			10 m (32.81 ft)
Cable length for device power supply at 12 V			
With 1 mm ² wire cross-section (approx. 18 AWG)			20 m (65.62 ft)
With 0.5 mm ² wire cross-section (approx. 22 AWG)			10 m (32.81 ft)
With 0.25 mm ² wire cross-section (approx. 24 AWG)			5 m (16.40 ft)
Switching inputs			
Number	2		
Input resistance on HIGH		2 k Ω	
Voltage for HIGH	11 V	24 V	30 V
Voltage for LOW		0 V	5 V
Input capacity		15 nF	
Static input current	6 mA		15 mA
Dynamic control inputs			
Number	2		
Input resistance on HIGH		2 k Ω	
Voltage for HIGH	11 V	24 V	30 V
Voltage for LOW	-3 V	0 V	5 V
Input capacity		1 nF	
Static input current	6 mA		15 mA
Duty cycle (Ti/T)		0.5	
Input frequency			100 kHz
Current load per incremental encoder		50 mA	100 mA
Velocity range that can be sampled			
Forward	From +100 mm/s to +20,000 mm/s (3.94 in/s to +788 in/s)		
Backward	From -10 mm/s to -20,000 mm/s (-0.39 in/s to -788 in/s)		
Incremental encoders that can be evaluated			
Type	Two-channel rotary encoder with 90° phase offset		
Enclosure rating	IP 54		
Supply voltage	U _V - 3 V		U _V
Outputs required on the incremental encoders	Push/pull		
Pulse frequency			100 kHz
Number of pulses per cm	50		
Cable length (screened)			10 m (32.81 ft)
Digital switching outputs LMS100/111/151			
Number	3		
Voltage drop load		2 V	
Maximum switching current			140 mA
Current limiting (after 5 ms at 25 °C (77 °F))	100 mA		200 mA
Power-up delay	Negligible		
Switch off time		0.8 ms	2 ms

Tab. 30: Data sheet LMS100 ... LMS151 (cont.)

	Minimum	Typical	Maximum
Relay switching outputs LMS122/123			
Number	2		
Switching capacity			DC 30 W/ AC 37,5 VA
Switching voltage			DC 110 V/ AC 125 V
Switching current			0.5 A at DC 30 V
Switching capacity			10µA DC 10 mV
Switching cycles	10 ⁵		
Power-up delay		2 ms	4 ms
Switch off time		2 ms	4 ms
Serial auxiliary interface			
Communication protocol	RS-232 (proprietary)		
Transmission speed	9,600 Baud	57.6 kBd	115.2 kBd
Serial host interface			
Communication protocol	RS-232 (proprietary)		
Transmission speed (selectable)	9,600 Baud	57.6 kBd	115.2 kBd
Cable length at 38.400 kBd and wire cross-section 0.25 mm ² (approx. 24 AWG)			15 m (49.21 ft)
Galvanic de-coupling	Yes		
Wire cross-section of the connecting cable			0.25 mm ² (approx. 24 AWG)
Ethernet	10/100 MBit/s		
CAN	20 kBit/s, 500 kBit/s, 1 Mbit/s		

Tab. 30: Data sheet LMS100 ... LMS151 (cont.)

- 1) Corresponds to Diamond Grade 3000X™ (approx. 1,250 cd/lx × m²).
- 2) The time after the first reflected pulse from which measurement can be performed with full accuracy is dependent on the target that reflected the first reflected pulse.
- 3) Without fixing screws and projection of cable glands with system plug mounted.

9.2 Dimensional drawings

9.2.1 Dimensional drawing LMS100/LMS122/LMS123

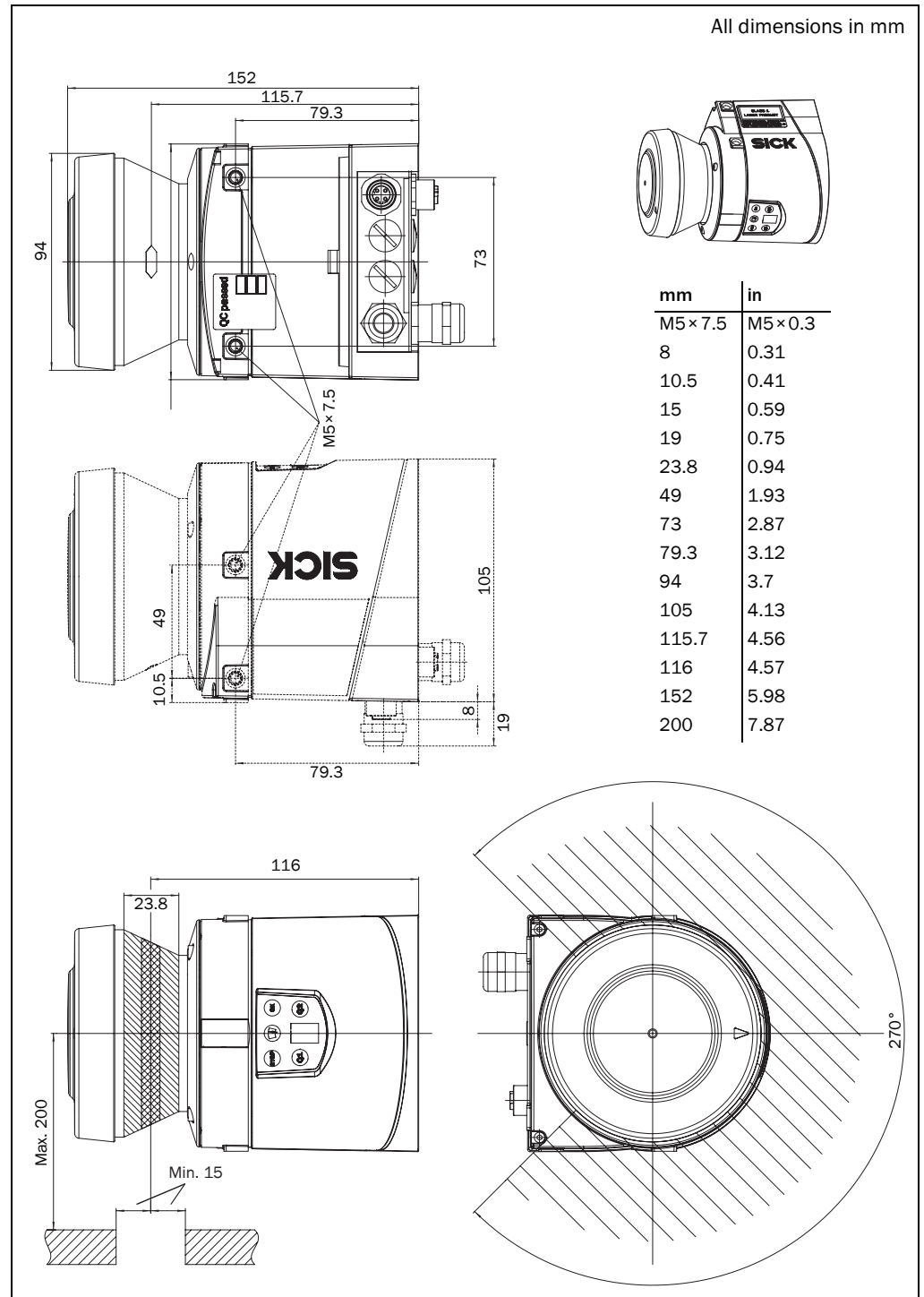


Fig. 61: Dimensional drawing LMS100/LMS122/LMS123

9.2.2 Dimensional drawing LMS111/LMS151

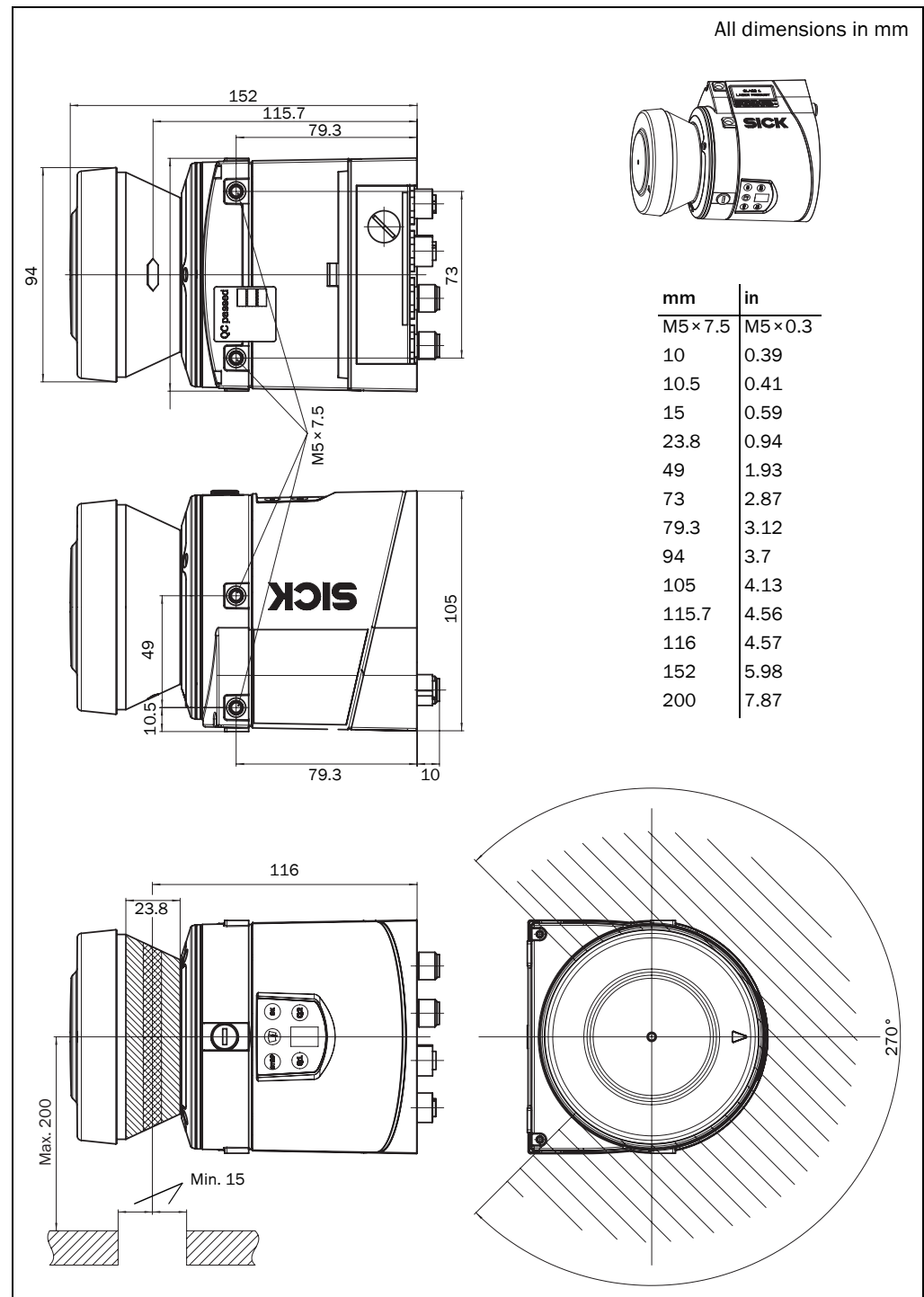


Fig. 62: Dimensional drawing LMS111/LMS151

9.2.3 Dimensional drawings, mounting kits

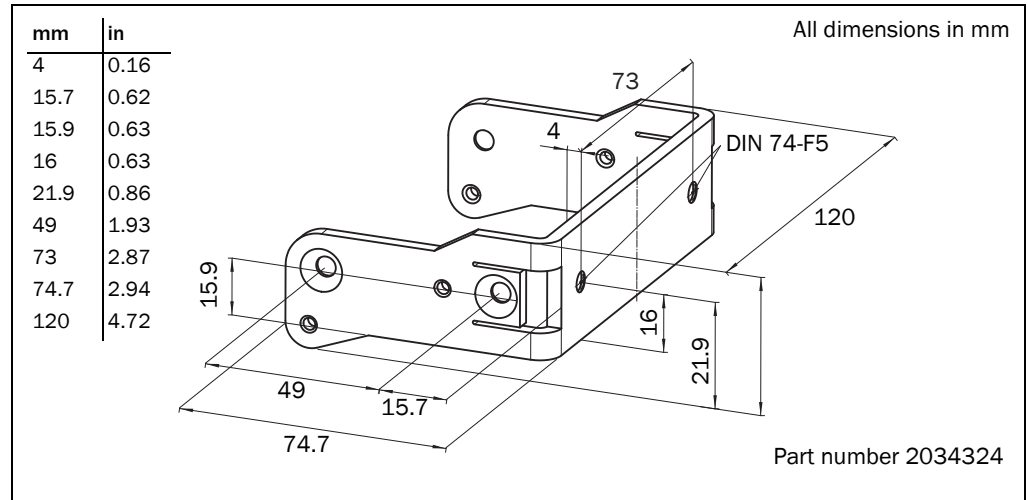


Fig. 63: Dimensional drawing, mounting kit 1a

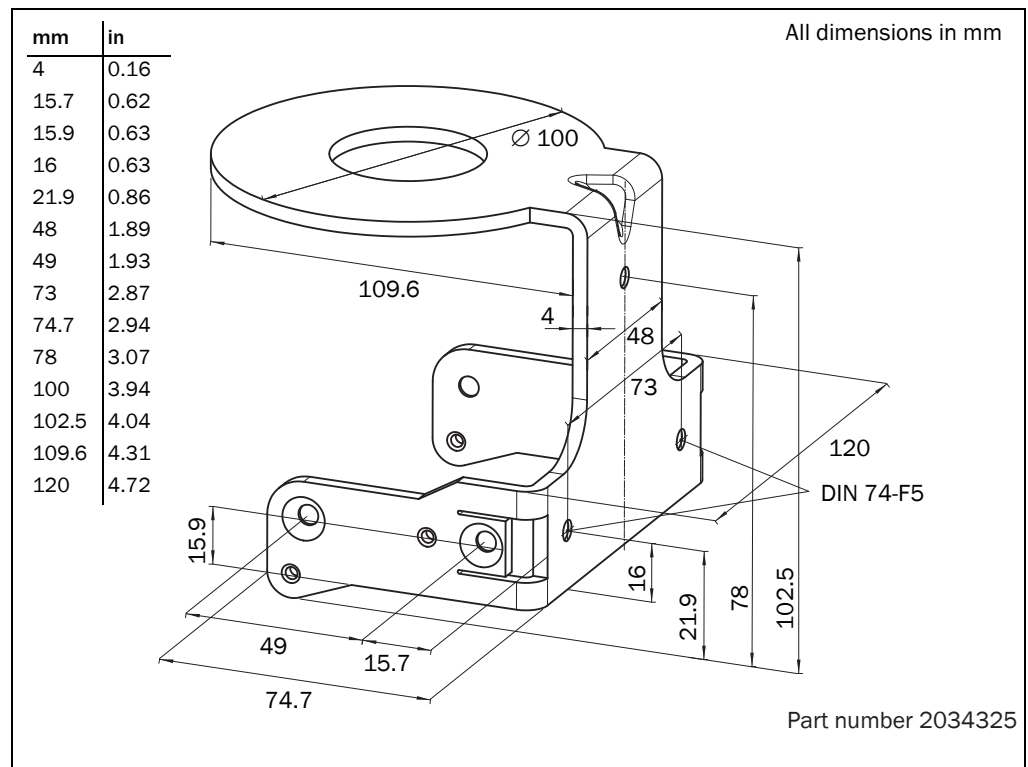


Fig. 64: Dimensional drawing, mounting kit 1b

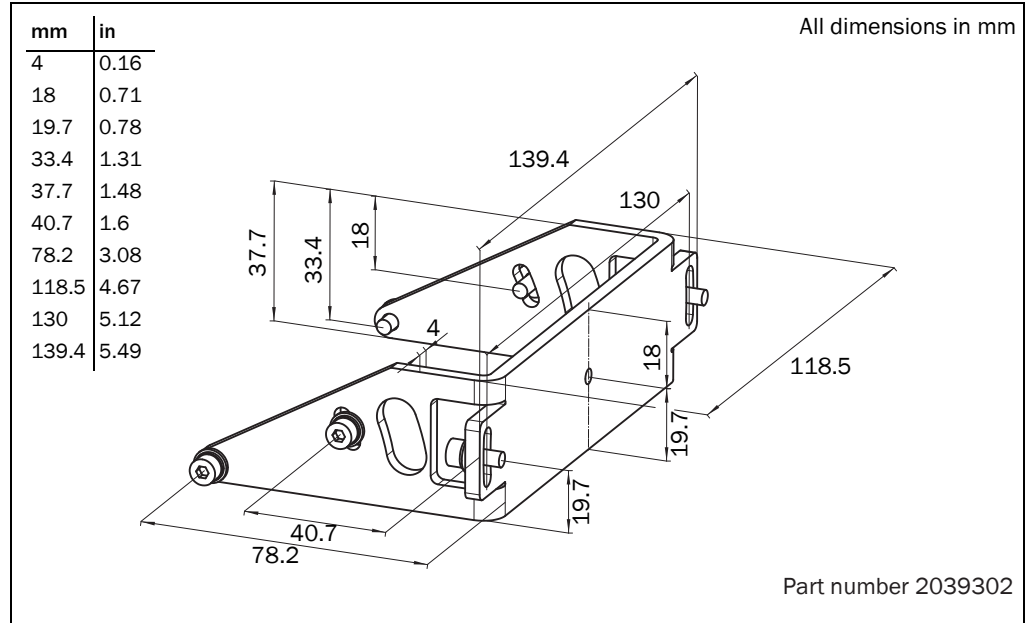


Fig. 65: Dimensional drawing, mounting kit 2

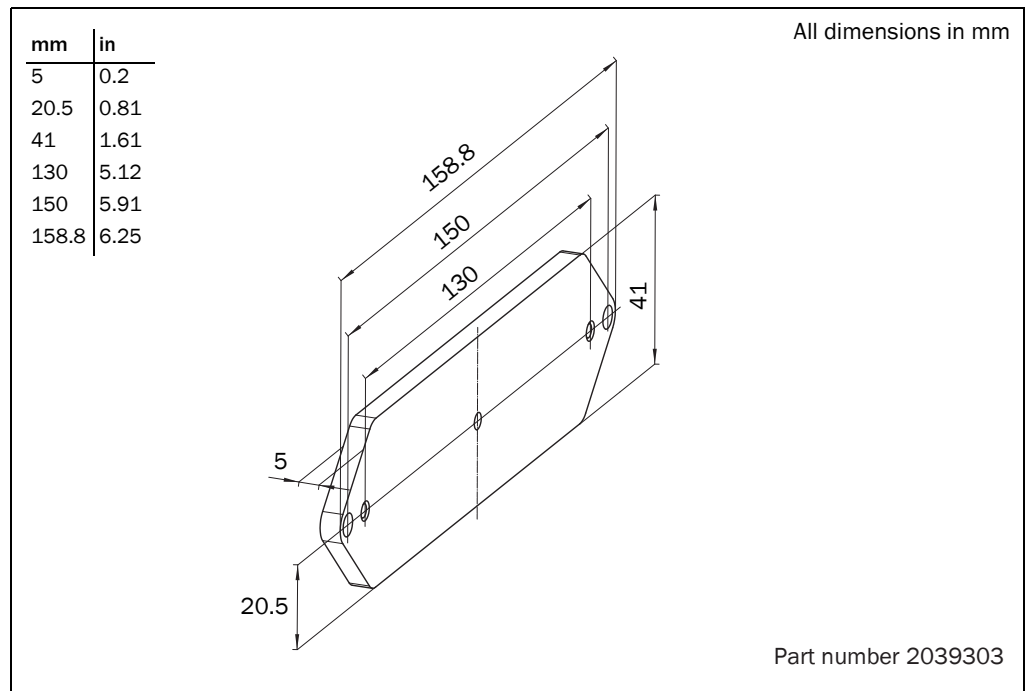


Fig. 66: Dimensional drawing, mounting kit 3

9.2.4 Dimensional drawings, weather protection hoods

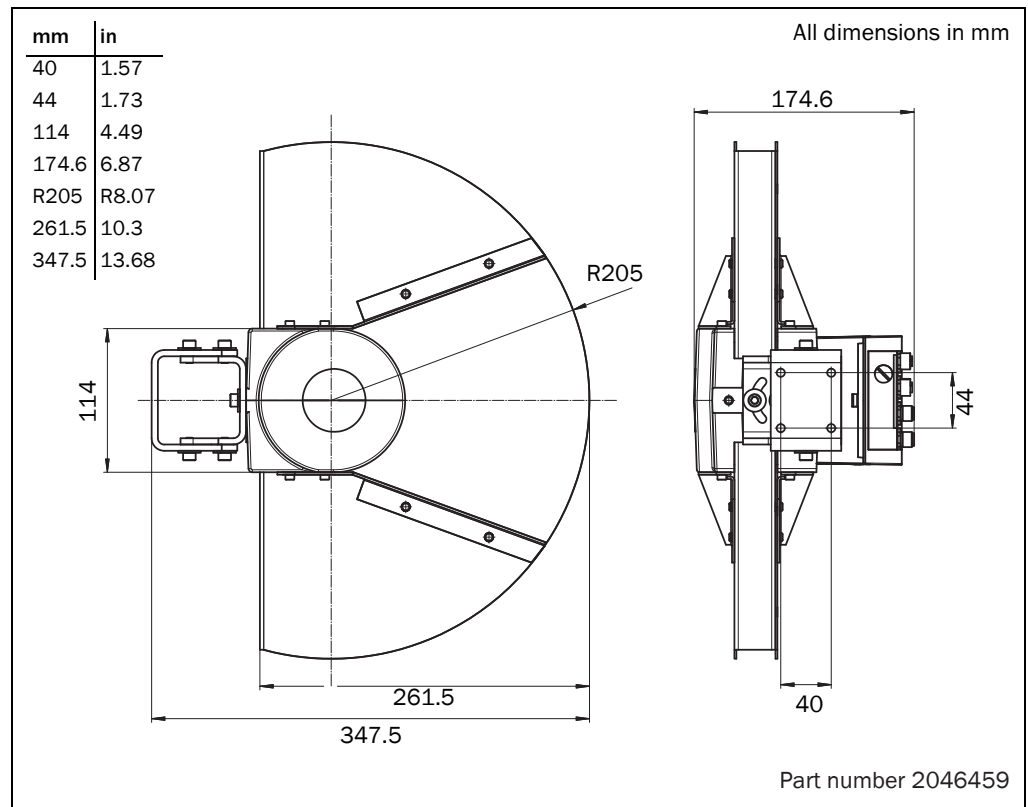


Fig. 67: Dimensional drawing weather protection hood 190°

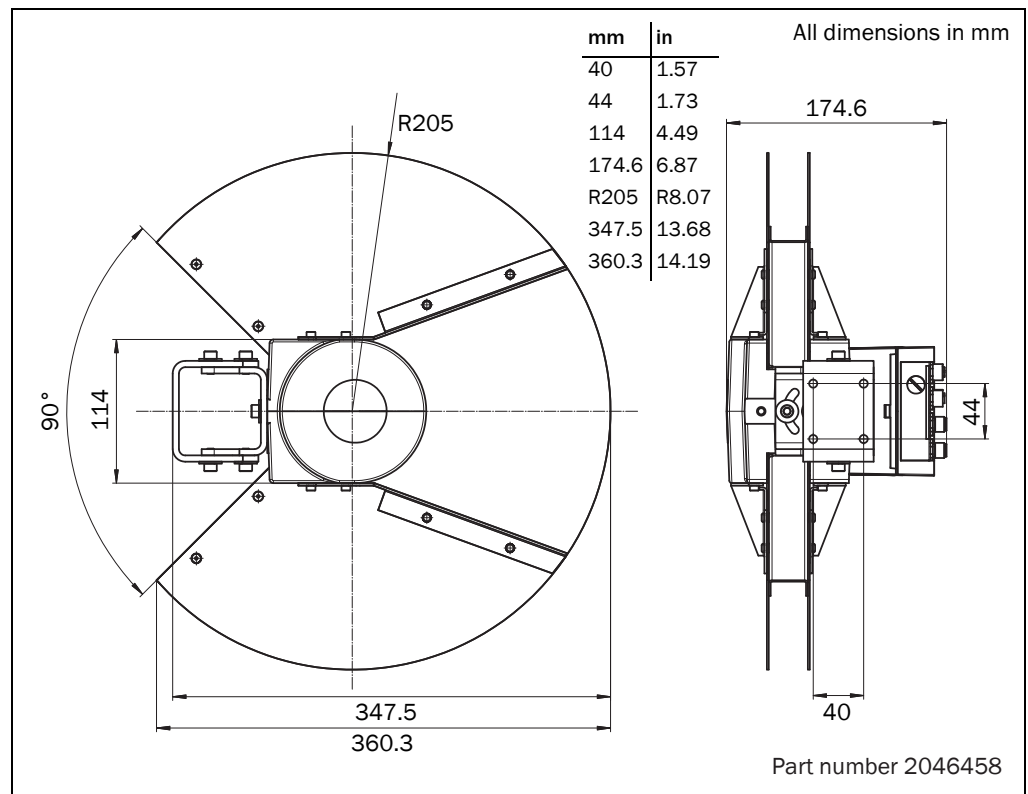


Fig. 68: Dimensional drawing weather protection hood 270°

10 Annex

10.1 Overview of the annexes

The annex contains the following supplementary information:

- message descriptions
- ordering information
- glossary
- illustration containing the EU Declaration of Conformity

10.2 Messages

Notation

The individual message sections are each to be separated by a space (ASCII code 32, 20h). The LMS interprets the parameters transferred as follows:

- Parameters with a leading “+” or “-” are interpreted as a decimal value (ASCII notation).
- Parameters without a leading “+” or “-” are interpreted as a hexadecimal value (ASCII notation).
- The LMS interprets each parameter individually, i.e. the different notations can be mixed within a message.
- All examples used in the following message lists refer to the CoLa-A protocol.

Variable types

The variable types are given in the message syntax. The following variable types are possible:

Variable type	Length (byte)	Value range	Sign
bool_1	1	0 or 1	No
uint_8	1	0 ... 255	No
int_8	1	-128 ... +127	Yes
uint_16	2	0 ... 65,535	No
int_16	2	-32,768 ... +32,767	Yes
uint_32	4	0 ... 4,294,967,295	No
int_32	4	-2,147,483,648 ... +2,147,483,647	Yes
float_32	4	$\pm \sim 10^{-44.85} \dots +10^{38.53}$	Yes
string	Context-dependent	Important: strings are not terminated in zeroes	

Tab. 31: Variable types

- Important**
- The information in the “Length” column of the table refers to the binary transfer of the numeric parameters.
 - The information in the “Value range” column in the table refers to the value range mathematically possible for the variable type. The actual value ranges for the parameters may be different. You will find these in the message syntax that follows.

10.2.1 Start measurement

The LMS starts measuring.

Request

Message structure: **sMN LMCstartmeas**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Start measurement	string	12	LMCstartmeas

Message syntax I: Request "Start measurement"

Answer

Message structure: **sAN LMCstartmeas ErrorCode**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Start measurement	string	12	LMCstartmeas
ErrorCode	The command has been accepted if the error code 0 is returned.	Enum8	1	0 no error 1 error, status change not permitted

Message syntax II: Answer to the "Start measurement" request

Example

Request: <STX>sMN{SPC}LMCstartmeas<ETX>

HEX string: 02 73 4D 4E 20 4C 4D 43 73 74 61 72 74 6D 65 61 73 03

Answer: <STX>sAN{SPC}LMCstartmeas{SPC}0<ETX>

HEX string: 02 73 41 4E 20 4C 4D 43 73 74 61 72 74 6D 65 61 73 20 30 03

10.2.2 Stop measurement

The LMS stops measuring.

Request

Message structure: **sMN LMCstopmeas**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Stop measurement	string	11	LMCstopmeas

Message syntax III: Request "Stop measurement"

Answer

Message structure: **sAN LMCstopmeas ErrorCode**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Acknowledgement of receipt (SOPAS answer)	string	3	sAN
Command	Stop measurement	string	11	LMCstopmeas
ErrorCode	The command has been accepted if the error code 0 is returned.	Enum8	1	0 no error 1 error, status change not permitted

Message syntax IV: Answer to the "Stop measurement" request

Example

Request: <STX>sMN{SPC}LMCstopmeas<ETX>

HEX string: 02 73 4D 4E 20 4C 4D 43 73 74 6F 70 6D 65 61 73 03

Answer: <STX>sAN{SPC}LMCstopmeas{SPC}0<ETX>

HEX string: 02 73 41 4E 20 4C 4D 43 73 74 6F 70 6D 65 61 73 20 30 03

10.2.3 Query status

Returns the status of the LMS.

Important Only when the status 7 = “Ready for measurement” is achieved can measured data be requested from the LMS.

Request

Message structure: **sRN STlms**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS read by name)	string	3	sRN
Command	Query status	string	5	STlms

Message syntax V: Request “Query status”

Answer

Message structure: **sRA STlms Status OperatingTemperatureRange Time Date [LED1 LED2 LED3]**

Message part	Description	Variable type	Length (byte)	Value range	
Type of command	Acknowledgement of receipt (SOPAS read answer)	string	3	sRA	
Command	Query status	string	5	STlms	
Status	Status of the LMS	Enum16	1	0 undefined 1 initialisation 2 configuration 3 IDLE 4 rotated 5 in preparation 6 ready 7 ready for measurement 8 ... 11 reserved	
Operating temperature range	Indicates whether the operating temperature range is met or not	bool_1	1	0 yes 1 no	
Time	Flexible range, the string can contain 0 to 10 characters	string	0 ... 10	
Date	Flexible range, the string can contain 0 to 10 characters	string	0 ... 10	
LEDs	LED1	Currently without function, values always 0	uint_32	4	0 reserved
	LED2		uint_32	4	0 reserved
	LED3		uint_32	4	0 reserved

Message syntax VI: Answer to the “Query status” request

Example

Request: <STX>sRN{SPC}STlms<ETX>
 Answer: <STX>sRA{SPC}STlms{SPC}7{SPC}0{SPC}8{SPC}00:00:00{SPC}8{SPC}01.01.06{SPC}0{SPC}0{SPC}0<ETX>

10.2.4 Read scan data

The measured value output is started using this message. It is a prerequisite for this action that the LMS is in the “Measurement” status. For this purpose the measurement mode must be started, there are two ways you can undertake this action:

- start via SOPAS ET
PROJECT TREE, LMS..., PARAMETER, BASIC PARAMETERS, area MEASUREMENT.
- start via message (see [section 10.2.1 “Start measurement” on page 87](#))



Single or continuous measured value output

There are two ways of requesting measured value output (see [section 3.7.3 “Measured value output” on page 29](#)):

- Exactly one measured value message can be requested using the **sRN LMDscandata** message – the last scan measured is transferred.
- Measured data can be continuously requested using the **sEN LMDscandata** message – measured data are then transferred until the measured value output is stopped using the **sEN LMDscandata** message.

Request method 1: single measured value output

Message structure: **sRN LMDscandata**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS read by name)	string	3	sRN
Command	Data request	string	11	LMDscandata

Message syntax VII: Request “Read scan data”

Request method 2: continuous measured value output

Message structure: **sEN LMDscandata MeasurementStartStop**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS event by name)	string	3	sEN
Command	Data request	string	11	LMDscandata
MeasurementStartStop		Enum8	1	0 stop of the measured value output 1 start of the measured value output

Message syntax VIII: Request “Read scan data”

Message structure: **sRA/sSN LMDscandata** VersionNumber DeviceNumber
SerialNumber DeviceStatus MessageCounter ScanCounter
PowerUpDuration TransmissionDuration InputStatus OutputStatus
ReservedByteA ScanningFrequency MeasurementFrequency
NumberEncoders [EncoderPosition EncoderSpeed]
NumberChannels16Bit [MeasuredDataContent ScalingFactor
ScalingOffset StartingAngle AngularStepWidth NumberData
[Data_1 Data_n]] NumberChannels8Bit [MeasuredDataContent
ScalingFactor ScalingOffset StartingAngle AngularStepWidth
[NumberData Data_1 Data_n] Position [XPosition YPosition
ZPosition XRotation YRotation ZRotation RotationType] Name

[DeviceName] Comment [CommentContent] TimeInfo [Year Month Day Hour Minute Second Microseconds] EventInfo [EventType EncoderPosition EventTime AngularPosition]

Message part		Description	Variable type	Length (byte)	Value range
Type of command		Answer (SOPAS read answer/SOPAS send event)	string	3	sRA/sSN
Command		Data request	string	11	LMDscandata
VersionNumber		Version information for the measured data	uint_16	2	0000h ... FFFFh
Device information	DeviceNumber	Device ID as configured in SOPAS ET	uint_16	2	0000h ... FFFFh
	Serial number	Factory serial number	uint_32	4	00000000h ... FFFFFFFFh
	DeviceStatus	Status of the LMS	uint_x	2 × 2	0000h Devices OK 0001h Device error 0002h Contamination warning 0004h Contamination error
Status information	MessageCounter	Counter, starting at the first measured value message (cyclic data) after confirmation of the measured value message. When the upper limit is reached, the counter starts again at 0 (= 1st message).	uint_16	2	0000h 0 FFFFh 65,535
	ScanCounter	Counter, starting with the first scan after confirmation of the measured value message. When the upper limit is reached, the counter starts again at 0 (= 1. scan).	uint_16	2	0000h 0 FFFFh 65,535
	PowerUpDuration	Time since the LMS was switched on in µs	uint_32	4	00000000h 0 FFFFFFFFh 68,719,476,735
	TransmissionDuration	Time since the transfer of the measured values in µs	uint_32	4	00000000h 0 FFFFFFFFh 68,719,476,735
	InputStatus	The least significant byte reflects the state of the digital inputs by bit. The least significant bit corresponds to input 1.	uint_x	2 × 2	0000h all inputs off 0003h all inputs on
	OutputStatus	The least significant byte reflects the state of the digital outputs by bit. The least significant bit corresponds to output 1.	uint_x	2 × 2	0000h all outputs off 0007h all outputs on
	ReservedByteA	Reserved	uint_16	2	-
Measurement parameters	ScanningFrequency	Information 1/100 Hz	uint_32	4	2,500 25 Hz ... 5,000 50 Hz
	MeasurementFrequency	Frequency between two separate measurements in 100 Hz	uint_32	4	00000000h ... FFFFFFFFh

Message syntax IX: Answer to the "Read scan data" request

Message part		Description	Variable type	Length (byte)	Value range
NumberEncoders		Defines the number of encoders from which data are output	uint_16	2	0 ... 3 1 to 3 encoder
Encoder	EncoderPosition	Information in ticks	uint_32	4	00000000h ... FFFFFFFFh
	EncoderSpeed	Information in ticks/mm	uint_16	2	0000h ... FFFFh
NumberChannels16Bit		Defines the number of 16-bit output channels on which measured data are output. If "0 output channels" are selected, no data are output.	uint_16	2	0 ... 4 0 to 4 output channels
Output channel 1 ... 4 (16 bit)	MeasuredDataContent	The message part defines the contents of the output channel.	string	5	DIST1 Radial distance for the first reflected pulse RSSI1 Remission values for the first reflected pulse DIST2 Radial distance for the second reflected pulse RSSI2 Remission values for the second reflected pulse
	ScalingFactor	Multiplier for the values in the message parts Data_1 to Data_n	Real	4	00000000h ... FFFFFFFFh
	ScalingOffset	For the LMS always 0	Real	4	00000000h ... FFFFFFFFh
	Starting angle	Information 1/10,000 degree	int_32	4	-550,000 ... +1,250,000
	Angular step width	Information 1/10,000 degree	uint_16	2	1,000 ... 10,000
	NumberData	Defines the number of items of measured data output	uint_16	2	0 ... 1,082
	Data_1 Data_n	Output of the measured values 1 to n. The contents and the unit depend on the message part "MeasuredDataContent". DIST in mm, RSSI in digits	uint_16 uint_16	2 2	0000h ... FFFFh 0000h ... FFFFh

Message syntax IX: Answer to the "Read scan data" request

Message part		Description	Variable type	Length (byte)	Value range
NumberChannels8Bit		Defines the number of 8-bit output channels on which measured data are output. If "0 output channels" are selected, no data are output.	uint_16	2	0 ... 4 0 to 4 output channels
Output channel 1 ... 4 measured data (8 bit)	MeasuredDataContent	The message part defines the contents of the message parts that follow.	string	5	RSSI1 Remission values for the first reflected pulse RSSI2 Remission values for the second reflected pulse
	ScalingFactor	Multiplier for the values in the message parts Data_1 to Data_n	Real	4	00000000h ... FFFFFFFFh
	ScalingOffset	For the LMS always 0	Real	4	00000000h ... FFFFFFFFh
	Starting angle	Information 1/10,000 degree	int_32	4	-550,000 ... +1,250,000
	Angular step width	Information 1/10,000 degree	uint_16	2	1,000 ... 10,000
	NumberData	Defines the number of items of measured data output	uint_16	2	0 ... 1,082
	Data_1 Data_n	Output of the measured values 1 to n. The contents and the unit depend on the message part "MeasuredDataContent". RSSI in digits	uint_8 uint_8	1 1	00h ... FFh 00h ... FFh
Position		Defines whether position data are output	uint_16	2	0 no position data 1 Output of position data
Position information	XPosition	X coordinate for the LMS in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	YPosition	Y coordinate for the LMS in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	ZPosition	Z coordinate for the LMS in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	XRotation	X angle of rotation for the LMS in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	YRotation	Y angle of rotation for the LMS in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	ZRotation	Z angle of rotation for the LMS in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	RotationType	Rotation type	Enum8	1	0 none 1 Pitching 2 Rolling 3 free rotation
Name		Determines whether the device name is to be output	uint_16	2	0 no device name 1 Output of the device name
DeviceName	Flexible range from 0 to 16 characters (20h ... FFh)	string	0 ... 16	
Comment		Defines whether a comment is output	uint_16	2	0 no comment 1 Output of the comment
CommentContent	Entered comment	string	0 ... 128	

Message syntax IX: Answer to the "Read scan data" request

Message part		Description	Variable type	Length (byte)	Value range
TimeInfo		Defines whether time information is output	uint_16	2	0 no time output 1 Output of the time information
TimeInformation	Year	Year	uint_16	2	0000h ... 270Fh
	Month	Month from 1 to 12	uint_8	1	00h ... 0Ch
	Day	Day of the month from 1 to 31	uint_8	1	00h ... 1Fh
	Hour	Hour from 0 to 23	uint_8	1	00h ... 17h
	Minute	Minute from 0 to 59	uint_8	1	00h ... 3Bh
	Second	Second from 0 to 59	uint_8	1	00h ... 3Bh
	Micro seconds	Micro seconds from 0 to 999,999	uint_32	4	00000000h ... 000F423Fh
EventInfo		Defines whether event information is output	uint_16	2	0 no event information 1 Output of the event information
Event information	Event type	Fast digital input event	string	4	FDIN
	Encoder position	Encoder position at the time of the event, information in ticks	uint_32	4	00000000h ... FFFFFFFFh
	EventTime	Time since the LMS was switched on in μ s	uint_32	4	00000000h 0 FFFFFFFh 68,719,476,735
	Angular position	Angular position of the LMS at the time of the event, information in 1/10,000 Grad	int_32	4	-450,000 ... +2,250,000

Message syntax IX: Answer to the "Read scan data" request

10.2.5 Read scanning frequency, angular resolution and scan area

Reads the scanning frequency, the angular resolution and the starting/stopping angle from the LMS.

Request

Message structure: **sRN LMPscancfg**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS read by name)	string	3	sRN
Command	Reading of scanning frequency and angular resolution	string	10	LMPscancfg

Message syntax X: Request "Read scanning frequency, angular resolution and scan area"

Answer

Message structure: **sRA LMPscancfg ScanningFrequency NumberSegments AngularResolution StartingAngle StoppingAngle**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS read answer)	string	3	sRA
Command	Configuration of scanning frequency and angular resolution	string	10	LMPscancfg
ScanningFrequency	Information 1/100 Hz	uint_32	4	2,500 25 Hz ... 5,000 50 Hz
NumberSegments	For the LMS100 always 1	uint_16	2	1 1 segment
AngleResolution	Information 1/10,000 degree	uint_32	4	2,500 0.25° ... 5,000 0.5°
Starting angle	Information 1/10,000 degree	int_32	4	-450,000 ... +2,250,000
StoppingAngle	Information 1/10,000 degree	int_32	4	-450,000 ... +2,250,000

Message syntax XI: Answer to the "Read scanning frequency, angular resolution and scan area" request

Example

Request: <STX>sRN {SPC}LMPscancfg<ETX>

HEX string: 02 73 52 4E 20 4C 4D 50 73 63 61 6E 63 66 67 03

Answer: <STX>sRA {SPC}LMPscancfg{SPC}0{SPC}9C4{SPC}1{SPC}9C4{SPC}FFF92230{SPC}225510<ETX>

HEX string: 02 73 52 41 20 4C 4D 50 73 63 61 6E 63 66 67 20 31 33 38 38 20 31 20 31 33 38 38 20 46 46 46 39 32 32 33 30 20 32 32 35 35 31 30 03

10.2.6 Read contamination level

Returns the contamination level of the LMS.

Request

Message structure: **sRN LCMstate**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS read by name)	string	3	sRN
Command	Read contamination level	string	8	LCMstate

Message syntax XII: Request "Read contamination level"

Answer

Message structure: **sRA LCMstate Contamination level**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Acknowledgement of receipt (SOPAS read answer)	string	3	sRA
Command	Read contamination level	string	8	LCMstate
Contamination level	Determines the level of contamination	Enum8	1	0 no contamination 1 contamination warning 2 contamination error 3 serious contamination error

Message syntax XIII: Answer to the "Read contamination level" request

Example

Request: <STX>sRN{SPC}LCMstate<ETX>

HEX string: 02 73 52 4E 20 4C 43 4D 73 74 61 74 65 20 03

Answer: <STX>sRA{SPC}LCMstate{SPC}0<ETX>

HEX string: 02 73 52 41 20 4C 43 4D 73 74 61 74 65 20 30 03

10.2.7 Select user level

By means of the selection of a user level and transfer of the corresponding password, permits configuration of the LMS via messages. The LMS expects the password in the message in coded form (hash value).

User level	Password	Hash value
Maintenance personnel	main	B21ACE26h
Authorised client	client	F4724744h

Tab. 32: Hash values of the passwords

Request

Message structure: **sMN SetAccessMode** User level password

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Select user level	string	12	SetAccessMode
User level	A valid user level must be included in the transmission. Otherwise the LMS declines the command.	int_8	1	02h maintenance personnel 03h authorised client 04h service
Password	E.g. encoded value for "client"	uint_32	4	00000000h ... FFFFFFFFh

Message syntax XIV: Request "Select user level"

Answer

Message structure: **sAN SetAccessMode** ChangeUserLevel

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Select user level	string	12	SetAccessMode
ChangeUserLevel	A new user level is opened.	bool_1	1	00h error 01h user level change successful

Message syntax XV: Answer to the "Select user level" request

Example

Request: <STX>sMN{SPC}SetAccessMode{SPC}03{SPC}F4724744<ETX>

HEX string: 02 73 4D 4E 20 53 65 74 41 63 63 65 73 73 4D 6F 64 65 20 30 33 20 46 34 37 32 34 37 34 34 03

Answer: <STX>sAN{SPC}SetAccessMode{SPC}01<ETX>

HEX string: 02 73 41 4E 20 53 65 74 41 63 63 65 73 73 4D 6F 64 65 20 31 03

10.2.8 Configure scanning frequency, angular resolution and scan area

Configures the LMS by means of the exact definition of scanning frequency, angular resolution and starting/stopping angle. The LMS calculates the technically possible values based on these parameters and supplies the parameters actually used in the response as result.

Important The required user level is “Authorised client” (see [section 10.2.7 “Select user level” on page 97](#)).

Request

Message structure: **sMN mLMPsetscafcfg** ScanningFrequency NumberSegments
AngularResolution StartingAngle StoppingAngle

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Configuration of scanning frequency and angular resolution	string	14	mLMPsetscafcfg
ScanningFrequency	Information in 1/100 Hz, the transmitted value can be 25 Hz or 50 Hz.	uint_32	4	2,500 25 Hz ... 5,000 50 Hz
NumberSegments	For the LMS100 always 1	uint_16	2	1 1 segment
AngleResolution	Information in 1/10.000 degrees, the transmitted value can be 0.25° or 0.5°	uint_32	4	2,500 0.25° ... 5,000 0.5°
Starting angle	Not currently possible, in future information in 1/10,000 degree	int_32	4	-450,000 ... +2,250,000
StoppingAngle	Not currently possible, in future information in 1/10,000 degree	int_32	4	-450,000 ... +2,250,000

Message syntax XVI: Request “Configure scanning frequency, angular resolution and scan area”

Answer

Message structure: **sAN mLMPsetscancfg** ErrorCode ScanFrequency NumberSegments AngularResolution StartingAngle StoppingAngle

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Configuration of scanning frequency and angular resolution	string	14	mLMPsetscancfg
Error code	The command has been accepted if the error code 0 is returned.	Enum8	1	0 no error 1 invalid frequency 2 invalid angular resolution 3 invalid frequency and angular resolution 4 invalid scan area 5 other error
ScanningFrequency	Information 1/100 Hz	uint_32	4	09C4 25 Hz ... 1388 50 Hz
NumberSegments	For the LMS100 always 1	uint_16	2	1 1 segment
AngleResolution	Information 1/10,000 degree	uint_32	4	09C4 25 Hz ... 1388 50 Hz
Starting angle	Information 1/10,000 degree	int_32	4	FFF92,230 ... 225,510
StoppingAngle	Information 1/10,000 degree	int_32	4	FFF92,230 ... 225,510

Message syntax XVII: Answer to the “Configure scanning frequency, angular resolution and scan area” request

Example

Request: <STX>sMN {SPC} mLMPsetscancfg {SPC} +2500 {SPC} +1 {SPC} +2500 {SPC} -450000 {SPC} +2250000 <ETX>

HEX string: 02 73 4D 4E 20 6D 4C 4D 50 73 65 74 73 63 61 6E 63 66 67 20 2B 35 30 30 30 20 2B 31 20 2B 35 30 30 30 20 2D 34 35 30 30 30 20 2B 32 32 35 30 30 30 03

Answer: <STX>sAN {SPC} mLMPsetscancfg {SPC} 0 {SPC} 9C4 {SPC} 1 {SPC} 9C4 {SPC} FFF92230 {SPC} 225510 <ETX>

HEX string: 02 73 41 4E 20 6D 4C 4D 50 73 65 74 73 63 61 6E 63 66 67 20 30 20 31 33 38 38 20 31 20 31 33 38 38 20 46 46 46 39 32 32 33 30 20 32 32 35 35 31 30 03

Important The data are not stored in non-volatile memory after a message has been sent. Therefore you must save the data in non-volatile memory in the EEPROM on the LMS using a message (see [10.2.13 on page 105](#)) or send the message to the LMS again after switch on.

10.2.9 Configure scan data output

Defines which data are output with the message [section 10.2.4 “Read scan data” on page 90](#).

Important The required user level is “Authorised client” (see [section 10.2.7 “Select user level” on page 97](#)).

Request

Message structure: **sWN LMDscandatacfg** OutputChannel Remission Resolution
Unit Encoder Position Devicename Comment Time
OutputInterval

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS write by name)	string	3	sWN
Command	Configure scan data output	string	14	LMDscandatacfg
Output channel	The measured data message has several output channels. The message part defines which output channel is activated. The definition is made using a so-called bit pattern. The least significant bit corresponds to output channel 1.	uint_16	2	01h output channel 1 02h output channel 2 03h output channel 1 + 2 04h output channel 3 ... 08h output channel 4 ... 0Fh output channel 1 + 2 + 3 + 4 10h reserved ... FFh reserved
Remission	Defines whether remission values are output	bool_1	1	00h no 01h yes
Resolution	Defines whether the remission values are output with 8-bit or 16-bit resolution	Enum8	1	0 8 Bit 1 16 Bit
Unit	Defines the unit in which the remission values are output	Enum8	1	0 digits
Encoder	The measured data message has several output channels for encoder data. The message part defines which output channel is activated.	uint_16	2	00h no encoder data 01h encoder channel 1 02h reserved ... FFh reserved

Message syntax XVIII: Request “Configure scan data output”

Message part	Description	Variable type	Length (byte)	Value range
Position	Defines whether position values are output	bool_1	1	00h no 01h yes
DeviceName	Determines whether the device name is to be output	bool_1	1	00h no 01h yes
Comment	Defines whether a comment saved in the configuration is output	bool_1	1	00h no 01h yes
Time	Defines whether time information is output	bool_1	1	00h no 01h yes
Output interval	Defines which scan is output	uint_16	2	01 every scan 02 every 2nd scan ... 50,000 every 50,000th scan

Message syntax XVIII: Request "Configure scan data output"

Answer

Message structure: **sWA LMDscandatacfg**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS write answer)	string	3	sWA
Command	Configure scan data output	string	14	LMDscandatacfg

Message syntax XIX: Answer to the "Configure scan data output" request

Example 1

Output channel 1 active, each measured data message:

Request: <STX>sWN{SPC}LMDscandatacfg{SPC}01{SPC}00{SPC}0{SPC}1{SPC}0{SPC}00{SPC}00{SPC}0{SPC}0{SPC}0{SPC}0{SPC}0{SPC}+1<ETX>
 HEX string: 02 73 57 4E 20 4C 4D 44 73 63 61 6E 64 61 74 61 63 66 67 20 30 31 20 30 31 20 30 20 30 20 30 30 20 30 20 30 20 30 20 30 20 2B 31 03
 Answer: <STX>sWA{SPC}LMDscandatacfg<ETX>
 HEX string: 02 73 57 41 20 4C 4D 44 73 63 61 6E 64 61 74 61 63 66 67 03

Example 2

Output channel 2 active, encoder channel 1 active, each 10th measured data message:

Request: <STX>sWN{SPC}LMDscandatacfg{SPC}02{SPC}00{SPC}0{SPC}1{SPC}0{SPC}01{SPC}00{SPC}0{SPC}0{SPC}0{SPC}0{SPC}0{SPC}0{SPC}+10<ETX>
 HEX string: 02 73 57 4E 20 4C 4D 44 73 63 61 6E 64 61 74 61 63 66 67 20 30 32 20 30 31 20 30 20 31 20 30 20 30 31 20 30 30 20 30 20 30 20 30 20 30 20 2B 31 30 03
 Answer: <STX>sWA{SPC}LMDscandatacfg<ETX>
 HEX string: 02 73 57 41 20 4C 4D 44 73 63 61 6E 64 61 74 61 63 66 67 03

10.2.10 Set LMS output

The message sets the outputs on the LMS, if the output is configured to SOPAS command in SOPAS ET.



PROJECT TREE, LMS..., PARAMETER, NETWORK/INTERFACES/IOs, DIGITAL OUTPUTS.

Important If the status of several outputs is to be set, then the message must be sent separately for each output.

Request

Message structure: **sMN mDOSetOutput** Status output

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Set output	string	12	mDOSetOutput
Output	Output number	uint_8	1	0 output 1 1 output 2 2 output 3
Status	State of the output	uint_8	1	0 inactive 1 active

Message syntax XX: Request "Set LMS output"

Answer

Message structure: **sAN mDOSetOutput** ErrorCode

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Set output	string	12	mDOSetOutput
ErrorCode	The command has been accepted if the error code 1 is returned.	bool_1	1	0 error 1 no error

Message syntax XXI: Answer to the "Set LMS output" request

Example

Request: <STX>sMN{SPC}mDOSetOutput{SPC}0{SPC}1<ETX>

Answer: <STX>sAN{SPC}mDOSetOutput{SPC}1<ETX>

10.2.11 Set LMS LEDs

The message sets the LEDs on the LMS, if the LED is set to SOPAS command in SOPAS ET. PROJECT TREE, LMS..., PARAMETER, NETWORK/INTERFACES/IOs, DISPLAY.



Important

- If the status of several LEDs is to be set, then the message must be sent separately for each LED.
- The “Stop” and “OK” LEDs always have a complementary state. If “Stop” is illuminated, “OK” is off, and vice versa. The last message sent overwrites any message sent previously.

Request

Message structure: **sMN mLMLSetLed** LEDType Status

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Set LED	string	10	mLMLSetLed
LEDType	Type of the LED	uint_8	1	0 stop 1 OK 2 Q1 3 Q2 4 contamination
Status	Status of the LED	Enum8	1	0 off 1 on

Message syntax XXII: Request “Set LMS LEDs”

Answer

Message structure: **sAN mLMLSetLed** ErrorCode

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Set LED	string	10	mLMLSetLed
ErrorCode	The command has been accepted if the error code 1 is returned.	bool_1	1	0 error 1 no error

Message syntax XXIII: Answer to the “Set LMS LEDs” request

Example

Request: <STX>sMN{SPC}mLMLSetLed{SPC}0{SPC}1<ETX>

Answer: <STX>sAN{SPC}mLMLSetLed{SPC}1<ETX>

10.2.12 Set 7-segment display of the LMS

The message sets the 7-segment display on the LMS, if the 7-segment display is configured to SOPAS ET command in SOPAS ET.

Request

Message structure: **sMN mLMLSetDisp** Display

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Set 7-segment display	string	11	mLMLSetDisp
Display	7-segment display in the display of the LMS. The segments A-G are operated using the bits 0 to 6, the point using bit 7.	uint_8	1	00h display off ... 07h display 7 ... FFh display completely on

Message syntax XXIV: Request "Set LMS 7-segment display"

Answer

Message structure: **sAN mLMLSetDisp** ErrorCode

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Start measurement	string	10	mLMLSetDisp
ErrorCode	The command has been accepted if the error code 1 is returned.	bool_1	1	0 error 1 no error

Message syntax XXV: Answer to the "Set LMS 7-segment display" request

Example

Request: <STX>sMN{SPC}mLMLSetDisp{SPC}07<ETX>

Answer: <STX>sAN{SPC}mLMLSetDisp{SPC}1<ETX>

10.2.13 Save data permanently

Via the message, the parameters are saved in the EEPROM of the LMS and will also be available after the device is switched off and on again.

Important The required user level is “Authorised client” (see [section 10.2.7 “Select user level” on page 97](#)).

Request

Message structure: **sMN mEEwriteall**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Save data permanently	string	11	mEEwriteall

Message syntax XXVI: Request “Save data permanently”

Answer

Message structure: **sAN mEEwriteall ErrorCode**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Save data permanently	string	11	mEEwriteall
ErrorCode	The command has been accepted if the error code 1 is returned.	bool_1	1	0 error 1 no error

Message syntax XXVII: Answer to the “Save data permanently” request

Example

Request: <STX>sMN{SPC}mEEwriteall<ETX>

HEX string: 02 73 4D 4E 20 6D 45 45 77 72 69 74 65 61 6C 6C 03

Answer: <STX>sAN{SPC}mEEwriteall{SPC}1<ETX>

HEX string: 02 73 41 4E 20 6D 45 45 77 72 69 74 65 61 6C 6C 20 31 03

10.2.14 Start the device

The device is returned to the measurement mode after configuration.

Request

Message structure: **sMN Run**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS method by name)	string	3	sMN
Command	Start the device	string	3	Run

Message syntax XXVIII: Request "Start device"

Answer

Message structure: **sAN Run ErrorCode**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Answer (SOPAS answer)	string	3	sAN
Command	Start the device	string	3	Run
ErrorCode	The command has been accepted if the error code 0 is returned.	Bool	1	0 error 1 no error

Message syntax XXIX: Answer to the "Start device" request

Example

Request: `<STX>sMN{SPC}Run<ETX>`

Answer: `<STX>sAN{SPC}Run{SPC}0<ETX>`

10.3 Ordering information

Ordering information about the product and the accessories are to be found in the product information LMS100 ... LMS151 (No. 8012468) which is included on the provided CD-ROM "Manuals & Software Auto Ident" (No. 2039442).

10.3.1 Consumables

Artikelnummer	Typ	Beschreibung
4003353	Lens cloth	Special cloth for proper cleaning of the window
5600006	Plastic detergent	Antistatic, mild detergent solution

Tab. 33: Consumables

10.4 Glossary

Download

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

Field of view α

Angle that defines the limits to which the laser beam is deflected by the polygon mirror wheel. A v-shaped area is formed radially in the scan direction in front of the laser output aperture; this area must contain the objects to be measured.

Parameter set

Data set using which the functions implemented in the LMS are initialised and activated. Is transmitted from the LMS 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.

Scan

A scan encompasses all measured values determined referred to the scanning angle and the speed of rotation of the mirror.

SOPAS ET

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

Upload

Transmission of the parameter set from the LMS to the PC into the SOPAS ET configuration software. The values for the parameters are displayed on the file cards of the configuration software. Prerequisite for the modification of the current parameter set.

10.5 EC Declaration of Conformity

Fig. 69 shows page 1 of the EC Declaration of Conformity (size reduced). The full EC Declaration of Conformity is available on request.

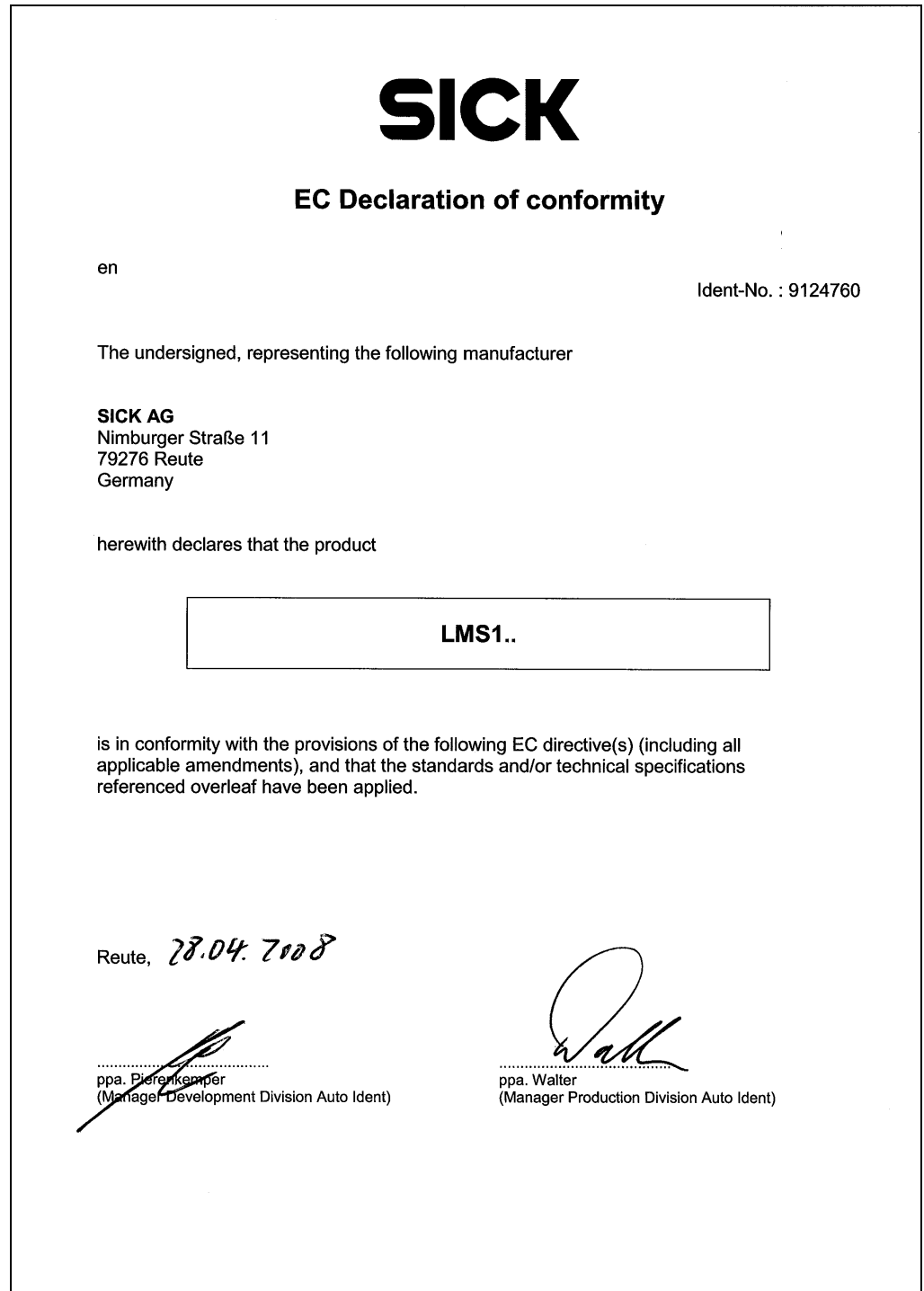


Fig. 69: Illustration containing the EC Declaration of Conformity

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