LMS200/211/221/291 Laser Measurement Systems

Measurably more cost-effective
Software Version

<table>
<thead>
<tr>
<th>Device type</th>
<th>Function</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMS200</td>
<td>Firmware for indoor applications (standard)</td>
<td>V 2.30 Q501</td>
</tr>
<tr>
<td>LMS211/ LMS221/ LMS291</td>
<td>Firmware for outdoor applications (standard)</td>
<td>X 1.27 Q501</td>
</tr>
<tr>
<td>LMS211-Sxx/221-Sxx</td>
<td>Firmware for outdoor applications (special software)</td>
<td>depends on type</td>
</tr>
<tr>
<td>LMS291-Sxx</td>
<td>Firmware for outdoor applications (special software)</td>
<td>depends on type</td>
</tr>
<tr>
<td>LMSIBS</td>
<td>Configuration software (Windows based)</td>
<td>V 5.20 Q393</td>
</tr>
</tbody>
</table>

Function of this document

This document introduces the LMS200/221/221/291 Laser Measurement Systems and describes their range of applications and variety of features. The document supports the application planning, mounting and electrical installation of these systems. The description applies to the standard and the special device types of the system.

Target group

Planning personnel such as technicians, engineers and design engineers.

Supplementary documentation

The *LMSIBS Configuration Software Operating Instructions* (no. 8009116) and the *Supplement to the Operating Instructions* (no. 8010121) describe how to commission the system for the “area monitoring” applications respectively for simple measurement tasks using the LMSIBS Configuration Software.

The *LMS2xx Telegram Listing* (no. 8007954) is available for applications which require customer-specific evaluation of the measurement data by an external driver (position/object measurement and other measurement applications).

The *Technical Description for the MST200 Measurement Software Tool* (no. 8008464, for PCs) describes how to develop external evaluation programs using the MST200 Software Tool.

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Nimburger Strasse 11
79276 Reute
Germany

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Content

1 Range of Applications ................................................................. 4
1.1 LMS200/211/221/291 Laser Measurement Systems ....................... 4
2 Product Features ............................................................................. 5
3 Operating Principle .......................................................................... 7
3.1 Spot Spacing/Spot Diameter/Range .................................................. 7
4 Conditions of use/Range ................................................................... 8
4.1 Mounting Position ........................................................................... 8
4.2 Heater Operation (LMS211/LMS221) .................................................. 8
4.3 Reflectivity of Various Objects .......................................................... 8
4.4 Reflectivity in Fog (LMS211, LMS221, LMS291) ................................. 9
4.5 The “Blanking” Curve for area monitoring (LMS211/221) .................. 10
4.6 The “Contour as Reference” Curve for a. m. (LMS211/221) ................. 10
5 Areas of Use ................................................................................... 11
5.1 Object Measurement/Determining Position ..................................... 11
5.2 Area Monitoring/Detection ............................................................. 12
6 Mounting ....................................................................................... 13
7 Electrical Installation ........................................................................ 15
7.1 LMS211/LMS221 ............................................................................. 15
7.2 LMS200/LMS291 ............................................................................. 19
8 Synchronisation of two LMS2xx ..................................................... 22
8.1 Pre-conditions for Synchronisation .................................................. 22
8.2 Procedure ..................................................................................... 22
8.3 Commissioning Synchronisation ..................................................... 22
9 Heating plate for LMS200/LMS291 ................................................ 24
10 Configuration/Operating ................................................................. 26
11 Variants/Functions ......................................................................... 27
11.1 Overview of Variants ..................................................................... 27
11.2 Features ....................................................................................... 28
12 Technical Data .............................................................................. 29
13 Dimensional Drawings ................................................................... 31
13.1 LMS200/LMS291 ........................................................................ 31
13.2 LMS211 ....................................................................................... 32
13.3 LMS211 with Dust Prevention Shield ........................................... 33
13.4 LMS221 ....................................................................................... 34
13.5 Accessories ................................................................................ 35
14 Ordering Information ..................................................................... 40
14.1 LMS2xx Laser Measurement Systems .......................................... 40
14.2 Accessories ................................................................................ 41
15 Glossary of Terms ......................................................................... 46
16 EC Declaration of Conformity ...................................................... 47

Used Abbreviations

Laser Light amplification by stimulated emission of radiation
LMS Laser Measurement System
Radar Radio detecting and ranging
PLC Programmable Logic Controller
1 Range of Applications

1.1 LMS200/211/221/291 Laser Measurement Systems

- Determining the volumes or contours of bulk materials
- Determining the volumes of objects (measuring packages, pallets, containers)
- Determining the position of objects (pallets, containers, transport vessels)
- Collision prevention for vehicles or cranes
- Controlling docking processes (positioning)
- Classification of objects (vehicle detection, camera trigger)
- Process automation (e.g., calendar rollers)
- Checking overhang/area monitoring in automated multi-storey car parks
- Monitoring open spaces for building security (facades, grounds, shafts)
- and many more

Abb. 1-1: Application ranges of the LMS200/221/221/291 Laser Measurement Systems
2 Product Features

The LMS200/221/221/291 Laser Measurement Systems are non-contact measurement systems (NCSDs) in stand-alone operation for industrial applications. The systems scan their surroundings two-dimensionally with a radial field of vision using infra-red laser beams (laser radar). The systems require either reflectors nor position marks.

The laser measurement systems are used for:

- Area monitoring
- Object measurement and detection
- Determining positions

Two field sets, each with a maximum of three monitoring fields, can be configured in the LMS200/221/221/291 for area monitoring applications. One field set is always active. Each monitored field is assigned a switching output (quiescent voltage typical 24 V DC). Special devices offer relay outputs. Measurement data output can take place parallel to area monitoring.

Standard solutions are available for object measurement, e.g. measuring the volumes of packages and pallets; volume flow measurement for bulk materials, etc.

The measured data of the LMS200/221/221/291 can be individually processes in real-time with external evaluation software for determining positions and other measurement tasks.

Note From now on, the LMS200/221/221/291 Laser Measurement Systems will simply be referred to as the “LMS2xx” (unless a distinction is required).

The LMS2xx Laser Measurement Systems are not devices for protecting persons as defined by current machine safety standards.

Maintenance and Cleaning

The LMS2xx requires no maintenance. Depending on its location, the front window should be cleaned occasionally with a damp cloth. Use a soft, lint-free and clean cloth with water. In addition, it is recommended that the state of the drying agent cartridge is also checked regularly in devices used outdoors (LMS211/221) and, if necessary, it should be replaced.

Display of errors

The LMS2xx writes device and functional errors in its error log. With the help of the error diagnosis the content can be read out and interpreted in the LMSIBS Configuration Software or in a telegram. The SICK service team (Phone +49 (0)211/5301-270) is available for handling more serious errors.

Errors caused by a contaminated front window are indicated by the LMS200/LMS291 via the built-in LEDs (warning or error, depending on the contamination level, see Table 7-4, Page 21). Otherwise all LMS2xx indicate an error via a pulsed signal at the “OUT C /Weak” switching output. In addition, the special devices LMS211-/LMS221-S19/-S20 (area monitoring in security applications) offer the option of indicating a warning or error, depending on the level of front window contamination, via at the “OUT C /Weak” switching output – by switching from a static signal, typically 24 V DC (high), to signal ground (low).

Note Don’t open the LMS2xx! The producer warranty will be forfeited if the LMS2xx is opened.
Product Features

Features and Advantages
- Non-contact optical measurement, even over longer distances
- Rapid scanning times, thus measurement objects can be move at high speed
- No special target-object reflective properties necessary
- No reflectors and no marking of the measurement objects necessary
- Backgrounds and surroundings do not have any influence on the measurements
- Measurement objects may be in any position
- Measurement data is available in real-time and can be used for further processing or control tasks
- Active system – no illumination of the measurement area required
- Simple mounting and commissioning
- Completely wheaterproof variante (IP 67)

Design of the LMS2xx
A standard laser measurement system consists of the following components:
- laser scanner
- evaluation electronics
- measurement and evaluation software (firmware with integrated area monitoring)
- data interface (RS 232/RS422, switchable)
- a digital switching input
- three digital switching outputs
  (special devices of the LMS211/221 series: two relay outputs/one switching output)
- three function indicators (LED), only for LMS200/LMS291

See also Chapter 11 Variants/Functions, Page 27.
3 Operating Principle

The LMS2xx operates by measuring the time of flight of laser light pulses: a pulsed laser beam is emitted and reflected if it meets an object (Fig. 3-1). The reflection is registered by the LMS2xx’s receiver. The time between transmission and reception of the impulse is directly proportional to the distance between the LMS2xx and the object (time of flight).

The pulsed laser beam is deflected by an internal rotating mirror so that a fan-shaped scan is made of the surrounding area (laser radar). The contour of the target objects is determined from the sequence of impulses received. The measurement data is available in real-time for further evaluation via the data interface.

Automatic fog correction is active in certain LMS2xx for outdoor use (see also Table 11-2, Page 27). Raindrops and snow-flakes are cut out using pixel-oriented evaluation.

3.1 Spot Spacing/Spot Diameter/Range

In a radial field of vision, a light impulse (spot) is emitted every 0.25°, 0.5° or 1° (depending on the set variant). As a result of the beam geometry and the diameter of the individual spots, the spots overlap on the target object or up to a certain distance. Fig. 3-2 shows spot spacing in relation to the range and the corresponding spot diameter.

![Fig. 3-2: Spot sizes/spot spacing](image-url)
4 Conditions of use/Range

4.1 Mounting Position

The LMS2xx may be installed in any position. Take notice of the mounting instructions in Chapter 6 Mounting, Page 13.

4.2 Heater Operation (LMS211/LMS221)

In order to be able to use the LMS211/LMS221 at temperature ranges below 0 °C, a thermostat-controlled heater has been installed in these devices and a supplementary front window heating in the LMS211. The connected heating automatically comes into operation at \( \leq 10 \) °C order to prevent thawing within the housing. Before commissioning the LMS211/LMS221 (e.g. before starting work) the interior of the device must be heated to at least 0 °C and any ice on the front window must be melted. The LMS211/LMS221 takes about 120 minutes to warm up at an outdoor temperature of ~30 °C.

4.3 Reflectivity of Various Objects

The range of the LMS2xx depends on the reflectivity of the target object and the transmission strength of the LMS2xx. Some reflectivity values for well-known materials are listed in Table 4-2 as an overview (KODAK standards).

<table>
<thead>
<tr>
<th>Material</th>
<th>Reflectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardboard, matt black</td>
<td>10 %</td>
</tr>
<tr>
<td>Cardboard, grey</td>
<td>20 %</td>
</tr>
<tr>
<td>Wood (raw pine, dirty)</td>
<td>40 %</td>
</tr>
<tr>
<td>PVC, grey</td>
<td>50 %</td>
</tr>
<tr>
<td>Paper, matt white</td>
<td>80 %</td>
</tr>
<tr>
<td>Aluminium, anodised, black</td>
<td>110 to 150 %</td>
</tr>
<tr>
<td>Steel, rust-free shiny</td>
<td>120 to 150 %</td>
</tr>
<tr>
<td>Steel, very shiny</td>
<td>140 to 200 %</td>
</tr>
<tr>
<td>Reflectors</td>
<td>&gt;2,000 %</td>
</tr>
</tbody>
</table>

Table 4-2: Reflectivity values
In exceptional cases, sensitivity of the outdoor variants can be changed with the LMSIBS Configuration Software provided:

- Values for standard setting (see Fig. 4-2): 30 m range/10 % reflectivity
- Values for less sensitive thresholds: 25 m range/10 % reflectivity
- Values for more sensitive thresholds: 30 m range/5 % reflectivity

**Note**

Note the reflectivity graphes in the range of 0 to 1.5 m for LMS211/LMS221/LMS291. Higher sensitivity improves detection capabilities for dark objects, but increases ambient light sensitivity.

Lower sensitivity reduces detection capabilities for dark objects, but reduces ambient light sensitivity.

### 4.4 Reflectivity in Fog (LMS211, LMS221, LMS291)

The range diagrams in Fig. 4-3 to Fig. 4-4 are valid should there be fog during outdoor operation and are to be observed.
4.5 The "Blanking" Curve for Area Monitoring (LMS211/221)

The object suppression software setting is dependent on distance. An object can only be suppressed up to a certain distance. Furthermore, the LMS211/LMS221 indicates a field infringement independently of objects size.

4.6 The "Contour as Reference" Curve for A. M. (LMS211/221)

The contour as reference software setting is dependent on distance. The LMS2xx requires a minimum contour as reference depending on the distance. Loss of the contour will not be indicated by the LMS211/LMS221 via the switching outputs if the contour is too small.
5 Areas of Use

For the LMS2xx, there are three areas of use:

- Object measurement
- Determining positions
- Area monitoring

5.1 Object Measurement/Determining Position

The LMS2xx measurement data (internally processed from the raw measurement data) is used for object measurement and determining position. These measurement data correspond to the surrounding contour scanned by the LMS2xx and are output in binary format via the RS 232/RS 422 data interface.

The telegram listing required is supplied with the device (PDF file on CD-ROM).

The MST200 Measurement Software Tool provides further support for software connection to the LMS2xx (see MST200 Technical Description (no. 8008464)).

Processing Measurement Data

Processing measurement data allows individual adaptation to the system’s particular measurement task.

Possible data preparation within the LMS2xx:

- Average value formation from 2 to 250 scans
- Limiting the sector which values are transferred (e.g. beams 10 to 30) for data reduction

Possible external data processing:

- Evaluation of partial sectors of the 100° or 180° field of vision
- Averaging of the measurement values transferred (increasing accuracy and smoothness)
- Straight line and curve approximations by interpolation of measurement values
- Determination of position/volume of any object
- 3rd dimension provided by shaft decoder, etc. (length information/conveyor speed)

External evaluation (software) can take place at a PC or PLC. Fundamentally, the distance value per individual impulse (spot) is evaluated. This means that a distance value is provided every 0.25°, 0.5° or 1°, depending on the angular resolution of the LMS2xx.

<table>
<thead>
<tr>
<th>Angular resolution</th>
<th>0.25°</th>
<th>0.5°</th>
<th>1°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. scanning angle</td>
<td>100°</td>
<td>180°</td>
<td>180°</td>
</tr>
<tr>
<td>Max. no. of measured values</td>
<td>401</td>
<td>361</td>
<td>181</td>
</tr>
</tbody>
</table>

Table 5-1: Angular resolution, scanning angle and number of measured values

Angular resolution is set using the LMSIBS Configuration Software or a command (telegram).

As the individual values are given out in sequence (beginning with the value 1), particular angular positions can be allocated on the basis of the values’ position in the data string. Note that the LMS2xx’s laser beam turns towards the left (see Fig. 5-1, Page 12).

The LMS2xx is set to the “Measured values on request” mode and “Data transfer rate 9,600 bd” by default (changes can be made using the appropriate command (telegram)).
It is recommended that the LMS2xx is operated in the “9,600 bd on power-on” mode (default setting). Changing to a different data transfer rate can take place after the complete system has been started up.

5.2 Area Monitoring/Detection

In this application, the LMS2xx is responsible for automatically reporting that an area (freely definable field form) is “clear”. This means that an infringement of a field by a moved or resting object (e.g. human or subject) leads to a switching signal at the associated output.

Pixel-oriented Evaluation/Object Blanking

Pixel-oriented evaluation is used to suppress raindrops and snowflakes or other particles, and thus makes the LMS2xx less sensitive to environmental factors during outdoor operation.

This involves saving the sequential messages (measured values) from each individual spot in each scan, and a separate counter being started for each spot. Erroneous measurements can be filtered out by repeatedly examining the reported spot (multiple reading whose number depends on the setting selected). Pixel-oriented evaluation should be included in the corresponding evaluation software when external data processing is undertaken.

Blanking is used for suppressing an object that is not to be detected, e.g. a steel cable that is located within the monitored field. The object size to be filtered depends on the distance (see Fig. 4-5, Page 10).

For detailed information see the LMSIBS Configuration Software Operating Instructions (no. 8009116).
6 Mounting

Several mounting sets are available for easy installation (see Fig. 6-1 and Fig. 6-4, Page 14). They allow adjustment of devices in the vertical and horizontal axes.

The LMS2xx can be installed in any position. To prevent dazzle, avoid direct sunlight on the front window.

LMS2xx for outdoor use should generally be mounted upside down so that the connection plug is located on the lower right-hand side of the back plate (Fig. 6-1) in order not to affect contamination measurement (front window).

Outdoor Installation

Provide an appropriate, customer-specific sunshade to prevent direct sunlight falling on the LMS2xx housing (sheet metal, etc., see Fig. 6-2). Slots for square nuts M5 are provided on the rear of the LMS211/LMS221 for attachment of the sunshade.

A dust prevention shield is recommended for preventing dust and/or condensation on the front window (see LMS211). Purging air can be used if dust is present in large quantities.

Fig. 6-1: Mounting set no. 2018303 for LMS211/LMS221 (here mounted upside down)

Fig. 6-2: Sunshade for LMS211 (examples)
Mounting

Fig. 6-3: Mounting set (no. 2018303/no. 2018304) for mast mounting of LMS211/LMS221

Fig. 6-4: Mounting sets 1 to 3 for LMS200/LMS291

Weather protection hood no. 4034559 for vertical installation

Weather protection hood no. 4039833 for horizontal installation

Fig. 6-5: LMS221 weather protection hoods no. 4034559 and no. 4039833
7 Electrical Installation

7.1 LMS211/LMS221

The operating voltage for LMS211/LMS221 is 24 V DC ± 15% with a power consumption of ≤ 20 W plus the load on the three switching outputs OUT A (max. 250 mA), OUT B (max. 250 mA) and OUT C (max. 100 mA) for standard devices.

7.1.1 Data Interface

The data interface of the LMS2xx is used for setting parameters with a PC and for data traffic during external evaluation (e.g. by SICK’s LMI200 Interface). The active interface type (RS 232 or RS 422) is selected using a wire link in the connection plug. Max. cable length for RS 232: 10 m, while that of the RS 422 is 1,200 m up to 38.4 KBd and 250 m up to 500 KBd. A pre-assembled service cable is available for setting parameters (see Fig. 7-5, Page 17).

Note A shielded cable with twisted pair wires (2 x 2 TP, see Chapter 14 Ordering Information, Page 40) is required for operation with external data evaluation in real-time.

7.1.2 Power Supply

The electronics of the LMS2xx is powered directly from a stabilised 24 V DC-power supply. The heating of the LMS211/LMS221 is controlled internally by a thermostat. A unregulated 24 V DC power supply is sufficient for powering the heater (current consumption of active heater is approx. 6 A). In the connection plug (IP 67) of the LMS211/LMS221 separate terminals are available for connecting the heater.

By using separate wiring it is possible to keep the heater in operation even when the LMS211/LMS221 is switched off for longer periods – in order to maintain the operating temperature at a suitable level until the LMS211/LMS221 is switched back on (prevents subsequent thawing within the LMS211/LMS221).

Fig. 7-1: LMS211/LMS221: Wiring for area monitoring (switching application)
Electrical Installation

Chapter 7

Technical Description

Laser Measurement Systems LMS200 to LMS291

Note

Observe admissible voltage drops through the cable. The entire heating capacity (required at temperatures below –10 °C) is only available with at least 24 V rated voltage at the LMS211/LMS221 (see Chapter 12 Technical Data, Page 29). The voltage drop through cables at a current flow of 5 A is 0.114 V/m with a wire cross-section of 1.5 mm² and 0.075 V/m with a wire cross-section of 2.5 mm².

Fig. 7-2: LMS211/LMS221: Wiring for external data processing

Fig. 7-3: LMS211/LMS221: Wiring in conjunction with LMI200

<table>
<thead>
<tr>
<th>System state</th>
<th>OUT A switching output</th>
<th>OUT B switching output</th>
<th>OUT C switching output¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start (initialising)</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
</tr>
<tr>
<td>OK, all fields clear</td>
<td>typical 24 V DC²</td>
<td>typical 24 V DC²</td>
<td>typical 24 V DC²</td>
</tr>
<tr>
<td>Field A, B or C infringed</td>
<td>typical 0 V, if A infringed</td>
<td>typical 0 V, if B infringed</td>
<td>typical 0 V, if C infringed</td>
</tr>
<tr>
<td>Configuration download</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
</tr>
<tr>
<td>Request at the Restart switching input</td>
<td>depending on the parameterization (field set switching or release of a field)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front window contamination (warning)</td>
<td>typical 24 V DC²</td>
<td>typical 24 V DC²</td>
<td>typical 24 V DC²</td>
</tr>
<tr>
<td>Front window contamination (error)</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
<td>typical 0 V, 90 % on, 10 % off, 1 Hz</td>
</tr>
<tr>
<td>Error</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
<td>typical 0 V, 10 % on, 90 % off, 1 Hz</td>
</tr>
<tr>
<td>Fatal error</td>
<td>typical 0 V</td>
<td>typical 0 V</td>
<td>typical 0 V, 50 % on, 50 % off, 5 Hz</td>
</tr>
</tbody>
</table>

¹) Special devices LMS211/-221-S19/-S20: optional indication of front window contamination (warning/error) with additional static signal at OUT C switching output
²) The switching circuit is closed in the case of special devices with relay outputs

Table 7-1: LMS2xx: Behaviour of the switching outputs OUT A to OUT C
7.1.3 Electrical Connection of LMS211/LMS221 with Switching Outputs

Note:
To ensure that the incoming power supply cable is protected against short-circuits/overload, use an external power supply with current limiting (e.g. fuse)

Fig. 7-4: LMS211/LMS221 (switching outputs): Terminal assignment of the 16-pin plug/wiring the data interfaces

Fig. 7-5: LMS211/LMS221: Service cable no. 2019561 for setting parameters
7.1.4 Electrical Connection of LMS211/LMS221 with Relay Outputs

Data cable reference
ground (shield)

Relay contacts closed
in normal position.
Clear monitoring field =
contact closed
Infringed monitoring field =
contact opened

*) without jumper: RS 232
with jumper: RS 422

7.1.5 Behaviour of the Switching Outputs

The LMS211/LMS221 with switching outputs are designed in such a way, that the three
switching outputs are active (normal potential typical 24 V DC) if the corresponding fields
are clear. If, however, a field is infringed the relevant output switches to 0 V-level.

The contact of the LMS211/LMS221 with mit potential-free relay outputs on OUT A and OUT
B are set to N.O. fuction by factory. The corresponding contact is closed when the monitor-
ing field is clear and opens if there is a field infringement. This functionality of the switching
outputs means, that the connecting cables are automatically monitored for any breaks.

Output “OUT C/Weak” is designed to act as a regular field output but automatically assumes
an error signalling function if there is a break (see also Table 7-1, Page 16).
7.2 LMS200/LMS291

7.2.1 Electrical Connecting
The LMS200/LMS291 requires an operating voltage of 24 V DC ± 15 % with a power consumption of ≤ 20 W plus the load on the three switching outputs OUT A (max. 250 mA), OUT B (max. 250 mA) and OUT C (max. 100 mA) for standard devices.

The “RESTART” input can be allocated as restart or field set switching (see the LMSIBS Configuration Software Operating Instructions (no. 8009116)).

Power is supplied to the LMS200/LMS291 using a plug-in connection box (plug module) with a high enclosure rating (see Fig. 7-10), while data interface connecting takes place through another connection box (RS 232 or RS422).

7.2.2 Interface Plugs (Plug Modules)
The interface plugs are built in into plug modules. Only when attachment of the plug modules to the devices has been completed does the device corresponds to the IP 65 design and EMC requirements (ESD) according to CE. Furthermore, please note that regarding ESD protection the LMS200/LMS291 should only be operated with the plug modules mounted.

Fig. 7-9: LMS200/LMS291: Components and typical set-up

Fig. 7-10: LMS200/LMS291: Housing and plug modules with interfaces
7.2.3 Pin Assignment of the Plug Modules

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Interface</th>
<th>Wire colours of connection cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND (Ground)</td>
<td>Power supply</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>Restart</td>
<td>Switching input</td>
<td>Black</td>
</tr>
<tr>
<td>3</td>
<td>24 V DC ± 15 %</td>
<td>Power supply</td>
<td>Red</td>
</tr>
<tr>
<td>4</td>
<td>n.c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>OUT C/Weak</td>
<td>Switching output</td>
<td>Yellow</td>
</tr>
<tr>
<td>6</td>
<td>n.c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>n.c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>OUT B</td>
<td>Switching output</td>
<td>Green</td>
</tr>
<tr>
<td>9</td>
<td>OUT A</td>
<td>Switching output</td>
<td>Orange</td>
</tr>
<tr>
<td></td>
<td>Device Shield</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) "Power supply/switching in-/outputs" cable of connection set 2 and set 3

Table 7-2: LMS200/LMS291: Pin assignment of the 9-pin D Sub socket in the “Power supply/switching input/outputs” plug module

**Note** Provide current limitation (e.g. fuse) for external power supply.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Data Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RD−</td>
<td>RS 422</td>
</tr>
<tr>
<td>2</td>
<td>RD+/RxD</td>
<td>RS 422/RS 232</td>
</tr>
<tr>
<td>3</td>
<td>TD−</td>
<td>RS 422</td>
</tr>
<tr>
<td>4</td>
<td>TD+/TxD</td>
<td>RS 422/RS 232</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>n.c.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bridge to pin 8</td>
<td>Enables the RS 422 interface type</td>
</tr>
<tr>
<td>8</td>
<td>Bridge to pin 7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>n.c.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device Shield</td>
<td></td>
</tr>
</tbody>
</table>

Table 7-3: LMS200/LMS291: Pin assignment of the 9-pin D Sub plug in the “Data interface” plug module

**Switching the Data Interface Type**

The prepared data interface plug of the connection set is converted to an RS 422 type using a bridge. The data interface reverts to the RS 232 type when removing the bridge (delivery status). For the function of the data interface see Chapter 7.1.1, Page 15.

**Note** Bridging may only be carried out within the plug module.

**Fig. 7-11**: LMS200/LMS291: Convertible data interface in the plug module (RS 232 pre-selected)
### 7.2.4 Cable Guiding in the Plug Module

The cables can be routed in the module from above or from the rear.

**Note**  
In order to ensure that the LMS200/LMS291 is sufficiently sealed (IP 65), the devices must always be provided with plug modules – even when the interface is not in use. The plug modules must be provided with breech screws or PG cable glands with seals and D Sub plug respectively socket.

![Design of the plug modules](image)

**Fig. 7-12:** LMS200/LMS291: Design of the plug modules

### 7.2.5 Functions of the LEDs

![Position of the LEDs](image)

**Fig. 7-13:** LMS200/LMS291: Position of the LEDs

<table>
<thead>
<tr>
<th>State of system</th>
<th>LED green</th>
<th>LED yellow</th>
<th>LED red</th>
<th>LED yellow (Frequency)</th>
<th>OUT C switching output[^1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start (Initialising)</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>OK, all fields clear</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Field A, B or C infringed</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Configuration download</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Request at the Restart input</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Front window contamination (warning)</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>1 Hz</td>
<td>50 % on, 50 % off</td>
</tr>
<tr>
<td>Front window contamination (error)</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>1 Hz</td>
<td>90 % on, 10 % off</td>
</tr>
<tr>
<td>Error</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>1 Hz</td>
<td>10 % on, 90 % off</td>
</tr>
<tr>
<td>Fatal Error</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>5 Hz</td>
<td>50 % on, 50 % off</td>
</tr>
</tbody>
</table>

[^1]: Special devices LMS211/-221-S19/-S20: optional indication of front window contamination (warning/error) with additional static signal via OUT C switching output.

[^2]: The switching circuit is closed in the case of special devices with relay outputs.

Table 7-4: LMS200/LMS291: Function of the LEDs/behaviour of the OUT C switching output on all LMS2xx
Synchronisation of two LMS2xx

If two LMS2xx are operated in close vicinity to each other using the same transmission direction, e.g. for measuring packages, there may be mutual interferences under certain circumstances. In order to prevent this the rotating mirrors of the two LMS2xx can be synchronised. The mirrors are then maintained in a position displaced by 180° relative to each other. In the process one LMS2xx is defined as MASTER, the other the SLAVE (see also LMSIBS Configuration Software Operating Instructions (no. 8009116), Chapter "LMS Configuration").

8.1 Pre-conditions for Synchronisation

The LMS2xx are capable of synchronisation from software version V02.03 and above hardware class serial no. 9919... and above.

The LMS2xx are wired according to the connection diagram (Fig. 8-1).

8.2 Procedure

Both LMS2xx must be supplied from a common power supply unit. The separation of the power supply for the LMS2xx must first take place in the connection box (see Fig. 8-2, Page 23).

- The maximum length of each of the supply cables should not exceed 5 m.
- Wire the LMS200/291 with the power supply cables from the connection set 2.
- Connect the MASTER output “OUT C” to the “RESTART” input of the SLAVE.
- Wire a pull-down resistor of 470 Ohm/2 W to GND (supplied with the connection box). The linkage takes place in the connection box.

The remaining LMS2xx switching outputs can be led from the connection box to the control cabinet without any further measures being taken. The two LMS2xx data cables must not be wired through the connection box. When selecting the type of data interface note the admissible cable length according to Chapter 7.1.1, Page 15.

8.3 Commissioning Synchronisation

8.3.1 Reaction of the LMS2xx on Power-On

- The MASTER outputs its synchronisation pulse immediately after configuration has taken place
8.3.2  Synchronisation Behaviour of the SLAVE

Possible states after RESET during the synchronisation phase:

<table>
<thead>
<tr>
<th>Phase</th>
<th>LED</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Waiting for synchronisation signal from MASTER</td>
<td>red</td>
<td>Puls ratio 50 %, 0.5 Hz</td>
</tr>
<tr>
<td></td>
<td>yellow</td>
<td>off</td>
</tr>
<tr>
<td>2. Synchronisation phase (adaptation of the number of rotations)</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>3. Synchronisation adjusted to predefined phase state</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>4. Synchronisation completed</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>5. Operation state:</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Slave OK</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>Error</td>
<td>on</td>
<td>off</td>
</tr>
</tbody>
</table>

*) If the synchronisation process has not been completed after 100 s, the slave aborts the synchronisation process and indicates an error.

Table 8-1: Indication of the Slave synchronisation behaviour by LEDs (LMS200/LMS291 only)

The LEDs of the MASTER act as in standard mode (see Chapter 7.2.5 Functions of the LEDs, Page 21). The LEDs are only visible on the LMS200/LMS291.

After synchronisation has taken place in the initialisation phase, the synchronisation status is cyclically controlled and monitored. On loss of synchronisation for a period longer than 10 to 30 s the SLAVE enters an info in its error log. On loss of synchronisation for a period longer than 30 s the SLAVE enters an error in its error log. If the SLAVE is able to synchronise itself again to the MASTER, the SLAVE deletes the error entry or saves the entry as a non-current error.

In synchronisation mode the MASTER suffers just one restriction, namely that the “OUT C” switching output cannot be used for the area monitoring function.

Note: The connection box corresponds to enclosure rating IP 65, but IP 54 on use of the PG 11 und PG 16 cable glands supplied. If enclosure rating IP 65 is required, the appropriate PG cable glands are to be used (tradeware).
Heating plate for LMS200/LMS291

A supplementary, external heating plate is required if the LMS200/LMS291 are operated in a temperature range below 0 °C.

The heating plate is mounted between the device back plate and the mounting set 1 (Fig. 9-2). The temperature of the heating plate is controlled internally by a thermostat. Take care that the heating plate lies level on the LMS200/LMS291 device rear and that the transfer of warmth is not hindered.

The connection terminals for the power supply are below the cover. Conventional cables can be used for connection.

**Note**
Protect the heating using a FI safety switch (30 mA)!

---

<table>
<thead>
<tr>
<th>LMS200/LMS291 heating-up time</th>
<th>Approx. 20 min. when switching on at $T_U = -12$ °C</th>
</tr>
</thead>
</table>
| Electrical connections         | - Terminal compartment: screw terminals for wire diameter of max. 1.5 mm$^2$  
                                  | - Cable gland: PG 9 for cable diameter 4 to 8 mm |
| Operating voltage              | $230 \text{ V AC } 50 \text{ Hz } \pm 10 \% (125 \text{ V AC/ } 50 \text{ to 60 Hz})$ |
| Power consumption              | Approx. 30 W (cyclic, thermostat-controlled) |
| Peak current on power-on       | < 2.5 A |
| Housing                        | Aluminium die-cast |
| Enclosure rating               | Max. IP 65 according to DIN 40 050 |
| EMC test                       | According to EN 61000-6-2, EN 61000-6-4 |
| Weight                         | Approx. 1.4 kg |
| Dimensions                     | See Fig. 9-2, Page 25 |
| Mounting                       | 4 x screw M8 x 15 |
| Temperature (ambient/storage)   | -12 to +50 °C/-20 to +70 °C |
| Colour                         | Black (RAL 9005) |

**Table 9-1: Technical data of the heating plate no. 2019522**

**Note**
The heating plate is intended for use only in industrial environments. Use in residential areas can cause RF interferences.
Heating plate for LMS200/LMS291

Fig. 9-2: Installation of the heating plate on the LMS200/LMS291

ATENTION!
For safety reasons the protective conductor must be connected!

Connecting the heating plate:
- Screws M6 x 30 mm (4 x)
- Screws M8 x 15 mm (4 x)

Connection cable
(shown without terminal compartment cover and cable gland PG 9)

Installation of LMS200/LMS291 with heating plate:
Terminal compartment either pointing up or down. Cable gland 1 X PG 9.
Compartment cover with PG 9 mountable on the left or right.

Protect the heating using a FI safety switch (30 mA).

All dimensions in mm
The LMS2xx operates completely automatically. No activity is required during operation. The only exception here is the optional release of a field, previously infringed during area monitoring, using a button connected to the LMS2xx. During the external further processing of measurement data, the LMS2xx transmits the data on request from the customer's driver (application).

Configuration of the LMS2xx for area monitoring takes place with the LMSIBS Configuration Software supplied. The online Help system supports parameterisation.

The LMSIBS Configuration Software is also used for the basic configuration of the LMS2xx for the output and external further processing of measurement data in real time. In addition to other useful functions, it also allows the output and display of simple processed measurement data from the raw measurement data. The error log of the LMS2xx can be read out and interpreted with the help of the diagnosis function. Access to the configuring functions of the software is password-protected.

**PC hardware required:**
- Pentium II, 350 MHz or higher, 64 MB RAM minimum, colour monitor (min. resolution 800 x 600), mouse, CD-ROM drive, serial RS 232 or RS 422 data interface
- operating system: MS-Windows 98™ or XP™
- approx. 5 MB free hard-disk space
11 Variants/Functions

11.1 Overview of Variants

<table>
<thead>
<tr>
<th>Type</th>
<th>Scanning angle</th>
<th>Angular resolution</th>
<th>Resolution/ typical Measurement Accuracy</th>
<th>Typical Range</th>
<th>Temperature Range</th>
<th>Heating</th>
<th>Fog Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMS200-30106</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±15 mm</td>
<td>10 m</td>
<td>0 to +50 °C</td>
<td>Accessory no</td>
<td></td>
</tr>
<tr>
<td>LMS209-S02</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±15 mm</td>
<td>10 m</td>
<td>0 to +50 °C</td>
<td>Accessory no</td>
<td></td>
</tr>
<tr>
<td>LMS211-30206</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS211-30106</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±15 mm</td>
<td>10 m</td>
<td>–30 to +50 °C</td>
<td>yes no</td>
<td></td>
</tr>
<tr>
<td>LMS221-30206</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-30106</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±15 mm</td>
<td>10 m</td>
<td>–30 to +50 °C</td>
<td>yes no</td>
<td></td>
</tr>
<tr>
<td>LMS291-S05</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>0 to +50 °C</td>
<td>Accessory yes</td>
<td></td>
</tr>
<tr>
<td>LMS291-S14</td>
<td>90°</td>
<td>0.5°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>0 to +50 °C</td>
<td>Accessory yes</td>
<td></td>
</tr>
<tr>
<td>LMS291-S15</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>0 to +50 °C</td>
<td>Accessory yes</td>
<td></td>
</tr>
<tr>
<td>LMS211-S07</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS211-S14</td>
<td>90°</td>
<td>0.5°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS211-S15</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS211-S19</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS211-S20</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-S07</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-S14</td>
<td>90°</td>
<td>0.5°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-S15</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-S16</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-S19</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td>LMS221-S20</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 mm/±35 mm</td>
<td>30 m</td>
<td>–30 to +50 °C</td>
<td>yes yes</td>
<td></td>
</tr>
</tbody>
</table>

1) with 10 % reflectivity
2) max. scan angle 100° with angular resolution 0.25°
3) Features as LMS200-30106, but housing not lacquered
4) LMS Fast (without ”area monitoring” function)
5) with 2 relay outputs/1 digital switching output
6) reduced data output volume
7) default setting: data transmission rate 500 Kbd
8) external heating plate, expands the admissible temperature range from -12 to +50 °C
9) front window heating additionally to the inner heater
10) for security applications (area monitoring); max. 2 subtractive fields, indication for front window contamination (warning/error) via OUT C switching output

Table 11-2: Overview of LMS types (standard and special devices)
# 11.2 Features

<table>
<thead>
<tr>
<th>Function</th>
<th>Performance Characteristics</th>
<th>Remarks</th>
<th>Default setting</th>
</tr>
</thead>
</table>
| Monitoring fields, static | • Rectangular  
• Segmented (also teach-in) | | A, B, C segmented each 50 mm radial (indoor) each 5 cm radial (outdoor) |
| Number of field sets | 2, each with 3 fields | Each with field A, B, C |
| Switching field sets | With static signal via external switch (“Restart” input) or by telegram | | |
| Switching outputs (OUT A, B, C) | 3 | PNP, normal potential typ. 24 V DC |
| Switching outputs LMS 211/221-S07/-S20 alternative with relay contacts | 2 (OUT A, OUT B) | OUT C as PNP | Normally closed when active (set by factory) |
| Subtractive fields | LMS2xx standard: 1 field  
LMS-211/221-S19/20: 2 fields | • Standard: monitored area = field A minus field B  
• Special devices: monitored area 1 = field A minus field C  
monitored area 2 = field B minus field C | No subtractive field |
| Field evaluation | • Scan-oriented  
• Pixel-oriented  
• Contour as reference | | Pixel-oriented  
No blanking  
2 scans multiple reading |
| Restart after field infringement (reset of switching outputs) | • Direct restart, automatically  
• Restart after defined delay, automatically  
• Restart triggered manually by a button | External button for restart. Restart of the several fields independent of each other | Automatically, direct after clearing the field |
| Temporay field set | Yes | Field set is defined online by external software (telegram) |
| Measured value transfer in real-time (500 kBd, RS 422) | Yes | High Speed interface  
RS 422 on PC required |
| Selectable baud rate: 9.6 kBd, 19.2 kBd, 38.4 kBd, 500 kBd | Yes | 500 kBd required for real-time transfer  
9.6 kBd  
Parity: none |
| Measurement range in mm | Up to 8 m/16 m/32 m | Selectable range | mm (indoor use)  
cm (outdoor use) |
| Measurement range in cm | Up to 80 m | | |
| Conversion of polar co-ordinates into Cartesian co-ordinates | Yes | Max. 200 measured values as Cartesian co-ordinates | Polar co-ordinates |
| Measured value flags | • Infringement of field A, B, C or  
• Detection of reflector or  
• Dazzle, field Feld A, B | Data output supplementary information, e.g. for navigation using reflector marks | Field A, B; dazzle |
| Minimum perpendicular distance | Yes | Measured values for field A, B, C |
| Measured value output | • All measured values of a scan  
• Average measured values (up to 250 scans)  
• Measured values for partitioned sector  
• Average measured values for partitioned sector (up to 250 scans) | | Measured values on request |

Table 11-3: Overview of features
## 12 Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Indoor: LMS200, Outdoor: LMS211, LMS221, LMS291</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning angle (field of vision)</td>
<td>100°/180° (type-dependent, see Table 11-1, Page 27)</td>
</tr>
<tr>
<td>Motor speed</td>
<td>75 Hz</td>
</tr>
<tr>
<td>Angular resolution (response time)</td>
<td>0.25° (53.33 ms); 0.5° (26.66 ms); 1° (13.33 ms); selectable</td>
</tr>
<tr>
<td>Range</td>
<td>Max. 80 m (type-dependent, see Table 11-2, Page 27)</td>
</tr>
<tr>
<td>Measurement resolution</td>
<td>10 mm</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>typical ±35 mm (LMS200-30106, LMS211/LMS221-30106: typical ±15 mm)</td>
</tr>
<tr>
<td>Systematic error2)</td>
<td>LMS200-30106/LMS211-30106/LMS221-30106:</td>
</tr>
<tr>
<td></td>
<td>mm-mode: typical ±15 mm at range 1 to 8 m</td>
</tr>
<tr>
<td></td>
<td>cm-mode: typical ±4 cm at range 1 to 20 m</td>
</tr>
<tr>
<td></td>
<td>LMS211/LMS211-30206/LMS291/LMS221-30106/LMS2x1-Sxx:</td>
</tr>
<tr>
<td></td>
<td>mm-mode: typical ±35 mm at range 1 to 20 m</td>
</tr>
<tr>
<td></td>
<td>cm-mode: typical ±5 cm at range 1 to 20 m</td>
</tr>
<tr>
<td>Statistical error3)</td>
<td>LMS200-30106/LMS211-30106/LMS221-30106:</td>
</tr>
<tr>
<td></td>
<td>mm-mode: typical 5 mm at range ≤ 8 m/ reflectivity ≥ 10 %/ light ≤ 5 klx</td>
</tr>
<tr>
<td></td>
<td>LMS211/LMS211-30206/LMS291/LMS221-30106/LMS2x1-Sxx:</td>
</tr>
<tr>
<td></td>
<td>mm-mode: typical 10 mm at range 1 to 20 m/ reflectivity ≥ 10 %/ light ≤ 5 klx</td>
</tr>
<tr>
<td>Laser diode (wavelength)</td>
<td>Infra-red (λ = 905 nm)</td>
</tr>
<tr>
<td>MTBF of LMS2xx4)</td>
<td>Indoor devices: 70,000 h</td>
</tr>
<tr>
<td></td>
<td>Outdoor devices: 50,000 h</td>
</tr>
<tr>
<td>Laser class of device</td>
<td>Class 1 (eye-safe), to EN/IEC 60825-1 and to 21CFR 1040.10</td>
</tr>
<tr>
<td>Optical indicators</td>
<td>3 x LED (LMS200/LMS291 only)</td>
</tr>
<tr>
<td>Data interface</td>
<td>RS 232 or RS 422 (selectable in the connector plug)</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>RS 232: 9.6 / 19.2 kbd</td>
</tr>
<tr>
<td></td>
<td>RS 422: 9.6 / 19.2/ 38.4/ 500 kbd</td>
</tr>
<tr>
<td>Data format</td>
<td>1 start bit, 8 data bits, 1 stop bit, no parity (fixed)</td>
</tr>
<tr>
<td>Switching inputs</td>
<td>All LMS2xx except LMS2xx-S14 (LMS Fast):</td>
</tr>
<tr>
<td></td>
<td>1 x (“Restart” or “Field set switching”), U_in = 12 to 24 V, I_in = 5 mA</td>
</tr>
<tr>
<td>Switching outputs (standard device)</td>
<td>LMS200/LMS291/LMS211/LMS221:</td>
</tr>
<tr>
<td></td>
<td>3 x PNP (OUT A to OUT C), high, typical 24 V DC (“field OK”), short-circuit-proof, selectable</td>
</tr>
<tr>
<td></td>
<td>restart delay after field infringement (0; 100 ms to 255 s)</td>
</tr>
<tr>
<td></td>
<td>– OUT A, OUT B (each max. 250 mA): “field infringement”</td>
</tr>
<tr>
<td></td>
<td>– OUT C (max. 100 mA): “field infringement/error indication (Weak)5)”</td>
</tr>
</tbody>
</table>

1) Angular resolution 0.25° not possible in the area monitoring mode
2) Definition measurement accuracy:
   - **Resolution:**
     The resolution of a measuring device is the smallest possible distance different from zero between two consecutive individual measurement values.
     The resolution can be reduced by using averaged values.
   - **Systematic error:**
     Environmental conditions: good visibility, T_a = 23 °C, reflectivity 10 to 10,000 %.
     The systematic error is the sum of all the deviations over a defined extent of range and reflectivity, which cannot be reduced even using averaged values.
3) **Statistical error:**
   Standard deviation 1 sigma. The standard deviation is calculated using at least 100 measuring values of a target (object) with a certain reflectivity at a certain distance with a certain amount of illumination.
4) at T_a = 25 °C
5) For indicating an error, the output pulses with 1 Hz/5 Hz and different pulse ratios depending on the error type, see Table 7-4, Page 21.
   Special devices LMS211/221-S19/-S20: indication of front window contamination (warning/error) additionally via OUT C switching output by statical signal

| Table 12-1: Technical specifications of LMS200/LMS211/LMS221/LMS291 |
### Technical Data

#### Switching outputs (special devices)

<table>
<thead>
<tr>
<th>Type</th>
<th>LMS211/LMS221-S07/-S20:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>– 2 x relay (OUT A, OUT B), contact closed (normal position): “field OK”</td>
</tr>
<tr>
<td></td>
<td>max. switching voltage 48 V DC/26 V AC (extra-low voltage, safe isolation from mains)</td>
</tr>
<tr>
<td></td>
<td>max. switching current 0.7 A, max. switching power 30 W</td>
</tr>
<tr>
<td></td>
<td>– 1 x PNP (OUT C/Weak), High, typical 24 V DC, max. 100 mA, short-circuit-proof: “field infringement/error indication (Weak)”</td>
</tr>
<tr>
<td></td>
<td>Restart delay after field infringement 0; 100 ms to 255 s (selectable)</td>
</tr>
</tbody>
</table>

#### Electrical connections

- 1 x plug module plug with 9-pin D Sub socket (solder connection)
- 1 x plug module with 9-pin D Sub plug (solder connection)

Each module plug with PG 9 cable gland for cable diameter 4 to 8 mm

LMS211/LMS221:
- 1 x 16-pin plug (screw terminals) with 3 x PG 11 cable glands for cable diameter 5 to 12 mm

#### Operating voltage (according to IEC 364-4-41)

- LMS electronics: 24 V DC ± 15 % (max. 500 mV ripple), current consumption max. 1.8 A (with output load)
- Heating (LMS211/LMS221): 24 V DC (max. 6 V ripple), current consumption max. 6 A (cyclic)
- Heating (LMS200/LMS291, via external heating plate (accessory)): 230 V AC ± 10 %, current consumption max. 2.5 A (cyclic)

#### Power consumption

Approx. 20 W (without load),

- Additionally with heating:
  - LMS211/LMS221 approx. 140 W
  - LMS200/LMS291 approx. 30 W

#### Housing

- LMS200/LMS291: Aluminium die-cast
- LMS211/LMS221: Aluminium die-cast (ground plate), PU (casing)

#### Enclosure rating (to DIN 40 050)

- LMS200/LMS291: IP 65
- LMS211/LMS221: IP 67

#### Protection class

Class 2 (to VDE 0106/IEC 1010-1), safety insulated

#### EMC test

to EN 61000-6-2, EN 61000-6-3/A11 (2004-07)

#### Vibration test

- to IEC 68 part 2-6, table 2c
- (Frequency range 10 to 150 Hz, amplitude 0.35 mm or 5 g)

#### Shock test

- single shock: to IEC 68 part 2-27, table 2, 15 g/11 ms
- permanen shock: to IEC 68 part 2-29, 10 g/16 ms

#### Weight

Without installation accessories:

- LMS200/LMS291: approx. 4.5 kg
- LMS211/LMS221: approx. 9 kg

#### Dimensions

see Chapter 13 Dimensional Drawings, Page 31

#### Mounting

- LMS200/LMS291:
  - 7 x fastening screw threads M6, 8 mm deep
  - 4 x fastening screw threads M8, 9 mm deep
- LMS211/LMS221:
  - 4 x fastening screw threads M8, 9 mm deep
  - 14 x slots (square nuts M5) for mounting accessories like suneshade etc.

#### Ambient operating temperature

LMS200/LMS291: 0 to +50 °C (with heating plate –12 to +50 °C)

LMS211/LMS221: –30 to +50 °C (warming-up time approx. 120 min. at ~30 °C)

#### Storage temperature

-30 to +70 °C

#### Max. rel. humidity

90 %, non condensing (IP 65)

#### Colour

- LMS200: SICK Blue (RAL 5012)
- LMS209-S02: not lacquered
- LMS211/LMS221/LMS291: grey (RAL 7032)

---

5) For indicating an error, the output pulses with 1 Hz/5 Hz and different pulse ratios depending on the error type, see Table 7-4, Page 21

6) Shock absorbers (on request) are recommended for heavy vibration and impact demands (e.g. AGV applications)

---

Table 12-1: Technical specifications of LMS200/LMS211/LMS221/LMS291 (contd.)
13 Dimensional Drawings

13.1 LMS200/LMS291

Fig. 13-1: LMS200/LMS291 dimensions

All dimensions in mm

Required space upstairs approx. 55 mm for connecting the plug modules

M6, 8 mm deep (3 x)

M8, 9 mm deep (4 x)

Centre of the mirror wheel

Centre of the mirror wheel

M6, 8 mm deep (4 x)
13.2 LMS211

![Diagram of LMS211 dimensions]

- M8, 9 mm deep (4 x)
- Centre of the mirror wheel
- Centre of light exit
- Slots in the housing for square nuts M5 (4 x)
- Drying agent cartridge (replaceable)
- Required space approx. 65 mm for connecting the plug
- Slots in the housing for square nuts M5 (4 x)
- All dimensions in mm

Fig. 13-2: LMS211 dimensions
13.3 LMS211 with Dust Prevention Shield

Fig. 13-3: Dimensions of LMS211 with mounted dust prevention shield no. 2025793

All dimensions in mm
13.4 LMS221

Fig. 13-4: Abmessungen des LMS221
13.5 Accessories

Weather protection hood no. 4034559 for vertical mounting

Weather protection hood no. 4039833 for horizontal mounting

Weather protection hood no. 4034559 for vertical mounting the LMS221

Weather protection hood no. 4039833 for horizontal mounting the LMS221

All dimensions in mm

Fig. 13-5: Dimensions of LMS221 weather protection hoods no. 4034559 and no. 4039833
Fig. 13-6: Dimensions of mounting sets 1, 2 and 3 for LMS200/LMS291
Mounting profiles (types 80 x 80):
- 4 x sliding block 8StM6, heavy
- 4 x screws
- 4 x washers
(not included in delivery)

For detailed instructions see the mounting instructions enclosed to the mounting sets.

All dimensions in mm

Fig. 13-7: LMS200/LMS291 fine adjustment mounting sets no. 2020295/no. 2020296
Fig. 13-8: Mounting set no. 2018303 for LMS211/LMS221 (wall mounting)

All dimensions in mm
Fig. 13-9: Mounting sets no. 2018303/no. 2018304 for LMS211/LMS221 (mast mounting)

All dimensions in mm

Slot for tightening straps

Requested hole diameter in the mast: 10 mm

Mast mounting set no. 2018304

Wall mounting set no. 2018303

±7.5° ±7.5°
14 Ordering Information

14.1 LMS2xx Laser Measurement Systems

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Type</th>
<th>Scanning Angle</th>
<th>Angular Resolution</th>
<th>Typical range</th>
<th>Temperature Range</th>
<th>Heating</th>
<th>Fog Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1015850</td>
<td>LMS200-30106</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 m</td>
<td>0 to +50 °C</td>
<td>Accessory®</td>
<td>no</td>
</tr>
<tr>
<td>1016414</td>
<td>LMS209-S02</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 m</td>
<td>0 to +50 °C</td>
<td>Accessory®</td>
<td>no</td>
</tr>
<tr>
<td>1018023</td>
<td>LMS211-30206</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1025629</td>
<td>LMS211-30106</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>1018022</td>
<td>LMS221-30206</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1026000</td>
<td>LMS221-30106</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>10 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>1018028</td>
<td>LMS291-S05</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>0 to +50 °C</td>
<td>Accessory®</td>
<td>yes</td>
</tr>
<tr>
<td>1025329</td>
<td>LMS291-S14</td>
<td>90°</td>
<td>0.5°</td>
<td>30 m</td>
<td>0 to +50 °C</td>
<td>Accessory®</td>
<td>yes</td>
</tr>
<tr>
<td>1026226</td>
<td>LMS291-S15</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>0 to +50 °C</td>
<td>Accessory®</td>
<td>yes</td>
</tr>
<tr>
<td>1018966</td>
<td>LMS211-S07</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1025487</td>
<td>LMS211-S14</td>
<td>90°</td>
<td>0.5°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1026225</td>
<td>LMS211-S15</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1040061</td>
<td>LMS211-S19</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1040435</td>
<td>LMS211-S20</td>
<td>100°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1018965</td>
<td>LMS221-S07</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1025328</td>
<td>LMS221-S14</td>
<td>90°</td>
<td>0.5°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1026224</td>
<td>LMS221-S15</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1027192</td>
<td>LMS221-S16</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1040060</td>
<td>LMS221-S19</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>1040434</td>
<td>LMS221-S20</td>
<td>180°</td>
<td>0.25°; 0.5°; 1°</td>
<td>30 m</td>
<td>-30 to +50 °C</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

1) with 10 % reflectivity
2) max. scan angle 100° with angular resolution 0.25°
3) Features as LMS200-30106, but housing not lacquered
4) LMS Fast (without “area monitoring” function)
5) with 2 relay outputs/1 digital switching output
6) reduced data output volume
7) default setting: data transmission rate 500 Kbd
8) external heating plate, expands the admissible temperature range from -12 to +50 °C
9) front window heating additionally to the inner heater
10) for security applications (area monitoring); max. 2 subtractive fields, indication for front window contamination (warning/error) via OUT C switching output

Table 14-1: Available LMS types (standard and special devices)

Scope of Delivery:
- Ordered LMS2xx type
- CD-ROM (no. 2034261) with LMSIB Configuration Software and manuals (see Table 14-5, Page 45)
- Ordered accessories
### 14.2 Accessories

#### 14.2.1 LMS 200/LMS 291 Accessories

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015623</td>
<td>Mounting set 1, metal, weight approx. 250 g (incl. mounting accessories), black anodised. See also Fig. 13-6, Page 36.</td>
<td><img src="image1" alt="Mounting Set 1" /></td>
</tr>
<tr>
<td>2015624</td>
<td>Mounting set 2, metal, weight approx. 350 g (incl. mounting accessories), black anodised. For installation mounting set 2 is also required. See also Fig. 13-6, Page 36.</td>
<td><img src="image2" alt="Mounting Set 2" /></td>
</tr>
<tr>
<td>2015625</td>
<td>Mounting set 3, metal, weight approx. 1.6 kg (incl. mounting accessories), black anodised. For installation mounting sets 1 and 2 are also required. See also Fig. 13-6, Page 36.</td>
<td><img src="image3" alt="Mounting Set 3" /></td>
</tr>
<tr>
<td>2020925</td>
<td>Fine adjustment mounting set (2-axis), basic unit, metal, weight approx. 3.3 kg (incl. mounting accessories). See also Fig. 13-7, Page 37.</td>
<td><img src="image4" alt="Fine Adjustment Mounting Set" /></td>
</tr>
<tr>
<td>2020926</td>
<td>Extension for fine adjustment mounting set no. 2020925 (3rd axis), metal, weight approx. 1.4 kg (incl. mounting accessories). See also Fig. 13-7, Page 37.</td>
<td><img src="image5" alt="Extension for Fine Adjustment Mounting Set" /></td>
</tr>
</tbody>
</table>
| 2018963    | Connection set 1 (without cables):  
- 1 x LMS plug module (9-pin D Sub socket) for power supply/switching input/outputs  
- 1 x LMS plug module (9-pin D Sub plug) for RS 232/RS 422 data interface  
Each plug module provided with a cable gland (metal) M16 x 1.5 for cable diameter 4 to 8 mm | ![Connection Set 1](image6) |
| 2027786    | Connection set 2:  
- 1 x cable for power supply/switching input/outputs with LMS plug module (9-pin D Sub socket) and open end, 6 x 0.56 mm², shielded, length 5 m  
- 1 x data interface cable (pre-set to RS 232) with LMS plug module (9-pin D Sub plug) and 9-pin D Sub socket, shielded, length 5 m | ![Connection Set 2](image7) |
| 2027787    | Connection set 3, as 2027786, but length 10 m | – |

Table 14-2: LMS 200/LMS 291 Accessories
### Ordering Information

**Table 14-2: LMS 200/LMS 291 Accessories**

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
</table>
| 2027788   | Connection set 4:  
• 1 x cable for power supply/switching input/outputs with LMS plug module (9-pin D Sub socket) and open end, 6 x 0.56 mm², shielded, length 10 m  
• 1 x data cable (pre-set to RS 232) with LMS plug module (9-pin D Sub plug) and 9-pin D Sub socket, shielded, length 10 m.  
For connecting the LMS200/LMS291 to the PC interface card Quatech DSC-200/300 (2 x RS 422 High Speed, 500 kBd) | ![Connection set 4](image) |
| 2019522   | External heating plate, 230 V AC/30 W, metal, weight approx. 1.4 kg (incl. mounting accessories), black (RAL 9005).  
See also Fig. 9-2, Page 25. | ![External heating plate](image) |

---

**14.2.2 LMS 211/LMS 221 Accessories**

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
</table>
| 2018303   | Mounting set for wall mounting, metal, weight approx. 1.6 kg (incl. mounting accessories).  
See also Fig. 13-8, Page 38. | ![Mounting set for wall mounting](image) |
| 2018304   | Mast attachment set, metal, weight approx. 400 g (incl. mounting accessories).  
For installation mounting set no. 2018803 is also required.  
See also Fig. 13-9, Page 39. | ![Mast attachment set](image) |
| 5306222   | Steel tightening strap for mast attachment set (per metre), 19 mm x 0.7 mm | – |
| 5306221   | Steel tightening strap lock | – |
| 2025793   | Dust prevention shield for LMS211, plastic (PU), weight approx. 800 g, grey (RAL 7032).  
See also Fig. 13-3, Page 33. | ![Dust prevention shield](image) |

Table 14-3: LMS211/LMS221 Accessories
### Table 14-3: LMS211/LMS221 Accessories (contd.)

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>7040289</td>
<td>Purging air fan SLV 4, 230 V AC/50 Hz, weight approx. 13 kg</td>
<td></td>
</tr>
<tr>
<td>1029127</td>
<td>Purging air fan, 24 V DC, weight approx. 13 kg</td>
<td>–</td>
</tr>
<tr>
<td>7044003</td>
<td>Purging air hood for LMS211, weight approx. 12.45 kg</td>
<td>–</td>
</tr>
<tr>
<td>7040396</td>
<td>Purging air tube, ∅ 40 mm, length 3 m</td>
<td>–</td>
</tr>
<tr>
<td>7040397</td>
<td>Purging air tube, ∅ 40 mm, length 5 m</td>
<td>–</td>
</tr>
<tr>
<td>7040398</td>
<td>Purging air tube, ∅ 40 mm, length 10 m</td>
<td>–</td>
</tr>
<tr>
<td>4034559</td>
<td>Weather protection hood if the LMS221 is mounted in vertical position. Aluminium alloy ALMG3G22, surface IGP polyester coated, weight approx. 3.6 kg (incl. mounting accessories), grey (RAL 7032). See also Fig. 13-5, Page 35.</td>
<td><img src="image" alt="Weather protection hood" /></td>
</tr>
<tr>
<td>4039833</td>
<td>Weather protection hood if the LMS221 is mounted in horizontal position. Aluminium alloy ALMG3G22, surface IGP polyester coated, weight approx. 3.6 kg (incl. mounting accessories), grey (RAL 7032). See also Fig. 13-5, Page 35.</td>
<td><img src="image" alt="Weather protection hood" /></td>
</tr>
</tbody>
</table>
| 2019561   | Service cable, pre-set to RS 232 (switchable to RS 422 using a bridge in the LMS plug module), consists of:  
• 1 x LMS connector (16-pin socket) with data cable (RS 232/422) and 9-pin D Sub socket, shielded, length 5 m  
• 1 x cable for power supply with LMS connector (16-pin plug), 2 x 0.93 mm², shielded, length 5 m.  
The service cable is used for being interconnected between an existing connection from the LMS211/LMS221 connector (plug) to the customer-specific wired socket. | ![Service cable](image) |

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### 14.2.3 LMS2xx General Accessories

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>6011103</td>
<td>Data cable, weatherproof, diameter 7.5 mm, 2 x 2 x 0.22 mm², twisted pair, shielded, black outer line, suitable for laying directly in the ground, per metre</td>
<td>–</td>
</tr>
<tr>
<td>2016401</td>
<td>Data cable (pre-set for RS232), with 9-pin D Sub plug and socket, 2 x 2 wires, twisted pair, shielded, length 3 m. For connecting the PC to the LMS 200/LMS 291 to configure the system.</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>2016402</td>
<td>Data cable, as 2016401, but length 5 m</td>
<td>–</td>
</tr>
<tr>
<td>2016403</td>
<td>Data cable, as 2016401, but length 10 m</td>
<td>–</td>
</tr>
<tr>
<td>6022515</td>
<td>Serial interface card for PC (PCI bus), 2 x RS 422, high speed (500 kBd)</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>6022427</td>
<td>Power supply unit 100 to 240 V AC, 50 to 60 Hz/24 V DC/2.5 A, enclosure rating IP 20, 45 mm x 75 mm x (91 mm + DIN top hat rail), weight approx. 230 g</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>6010362</td>
<td>Power supply unit 100 to 240 V AC, 50 to 60 Hz/24 V DC/4 A, enclosure rating IP 20, 80 mm x 135 mm x 120 mm</td>
<td>–</td>
</tr>
<tr>
<td>6020875</td>
<td>Power supply unit 115/230 V AC, 50 to 60 Hz/24 V DC/10 A, enclosure rating IP 20, 120 mm x 124 mm x (102 mm + DIN-DIN top hat rail), weight approx. 1.2 kg</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>6020756</td>
<td>LS-70B scan finder (alignment aid) for manual/continuous operation, with LED display and acoustic indicator, power supply from 9 V block batterie (supplied).</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>2021520</td>
<td>External connection box for synchronisation of two LMS2xx, plastic, with 10 screw terminals on DIN top hat rail for wire diameter 0.2 to 2.5 mm², 130 mm x 94 mm x 57 mm, enclosure rating IP 54 (for IP 65 the appropriate PG cable glands are to be used, tradeware). See also Fig. 8-2, Page 23.</td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>4003353</td>
<td>SICK lens cloth for cleaning the front window</td>
<td>–</td>
</tr>
<tr>
<td>One request</td>
<td>Shock absorber</td>
<td>–</td>
</tr>
<tr>
<td>2034261</td>
<td>CD-ROM with LMSIBS Configuration Software and manuals See Table 14-5, Page 45</td>
<td><img src="image7.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Table 14-4: LMS2xx accessories, general
14.2.4 Software/Manuals (included in the scope of delivery)

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LMSIBS Configuration software, German/English edition</td>
<td>–</td>
</tr>
<tr>
<td>8009115</td>
<td>LMSIBS Configuration Software Operating Instructions, German edition</td>
<td>PDF</td>
</tr>
<tr>
<td>8010120</td>
<td>Supplement to the Operating Instructions</td>
<td>PDF</td>
</tr>
<tr>
<td>8009116</td>
<td>LMSIBS Configuration Software Operating Instructions, English edition</td>
<td>PDF</td>
</tr>
<tr>
<td>8010121</td>
<td>Supplement to the Operating Instructions</td>
<td>PDF</td>
</tr>
<tr>
<td>8007953</td>
<td>LMS2xx Telegram Listing, German edition</td>
<td>PDF</td>
</tr>
<tr>
<td>8007954</td>
<td>LMS2xx Telegram Listing, English edition</td>
<td>PDF</td>
</tr>
<tr>
<td>8008969</td>
<td>LMS 200 to LMS291 Technical Description, German edition</td>
<td>PDF</td>
</tr>
<tr>
<td>8008970</td>
<td>LMS 200 to LMS291 Technical Description, English edition</td>
<td>PDF</td>
</tr>
<tr>
<td></td>
<td>Acrobat Reader (latest version) for reading/printing PDF files</td>
<td>PDF</td>
</tr>
</tbody>
</table>

Table 14-5: Accessories: Software/Manuals on CD-ROM (no. 2034261)

14.2.5 LMS200/LMS291 Spare Parts

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022271</td>
<td>Front window kit</td>
<td><img src="image1" alt="Front window kit" /></td>
</tr>
</tbody>
</table>

Table 14-6: Accessories: LMS200/LMS291 spare part

14.2.6 LMS211/LMS221 Spare Parts

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>5306179</td>
<td>Drying agent cartridge, screw in thread M36 x 1.5. See also Fig. 13-2, Page 32 and Fig. 13-4, Page 34.</td>
<td><img src="image2" alt="Drying agent cartridge" /></td>
</tr>
<tr>
<td>2018301</td>
<td>16-pin plug (insert included) with housing</td>
<td><img src="image3" alt="16-pin plug" /></td>
</tr>
<tr>
<td>6004379</td>
<td>16-pin plug insert (socket), for plug no. 2018301</td>
<td><img src="image4" alt="16-pin plug insert" /></td>
</tr>
</tbody>
</table>

Table 14-7: Accessories: LMS211/LMS221 spare parts

14.2.7 System Applications/Extensions

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1016761</td>
<td>LMI200 Interface (evaluation and control unit for measurement applications)</td>
</tr>
<tr>
<td>On Request</td>
<td>Customer-specific evaluations</td>
</tr>
</tbody>
</table>

Table 14-8: Accessories: System applications/extensions
15 Glossary of Terms

**Monitoring fields**
Freely configurable, two-dimensional zones (areas). If an detected object is in a particular zone (field infringement) the LMS2xx changes the signal level at the associated switching output. This means that the LMS2xx switches the statical signal from typical 24 V DC (high) to signal ground (low). In contrast, special devices with relay outputs (normal position: contact closed) opens the external circuit.

**Field set**
A field set comprises max. 3 configurable monitoring fields (field A, B, C). The LMS2xx can store 2 field sets.

**Field set switching**
Change between the two field sets in the LMS2xx. When starting the system always field set 1 is active. Switching to field set 2 takes place via the restart input using a statical 24 V DC-signal or using a command (telegram) via the data interface.

**Field infringement**
An object is detected within a specified monitoring field.

**Field, teach-in**
Instead of configuring a segmented field the data can be taught in. The LMS2xx defines its entire free field of vision as a monitoring area. The field limits follows the environment contour precisely. Field areas that are not required can be deleted manually.

**Field, subtractive**
Allows a zone to be monitored that is the "space remaining" when field B is deducted from field A. Special devices for security applications can operate with max. 2 subtractive fields.

**Field, temporary**
A field form can be defined and activated by external data information, transfer time to the LMS2xx is about ca. 200 ms (temporary because when is power supply is removed the field is lost).

**Blanking**
Is set in cm as the so-called blanking factor. The blanking factor defines the minimum object size (depends on distance) that can lead to registration at the switching outputs. In the area monitoring, the blanking is only possible in conjunction with scan-oriented evaluation (not in conjunction with pixel-oriented evaluation).

**Field evaluation**
To prevent erroneous switching causes by particles, etc. the LMS2xx evaluates the fields using various processes (scan-oriented or pixel-oriented, always in conjunction with multiple reading).

**Field evaluation, scan-oriented**
With scan-oriented evaluation the LMS2xx stores and verifies a field infringement (at any particular location) using multiple readings. If the LMS2xx registers further infringements in subsequent scans in the field (at any particular location) the signal level at the associated switching output changes after the number of multiple readings defined have elapsed.

**Field evaluation, pixel-oriented**
In contrast to the scan-oriented evaluation, the LMS2xx evaluates every single beam in pixel-oriented mode. If further infringements occur consecutively at the same beam position, the signal level at the associated switching output changes. This method is best suited for increasing availability in rain or snow.

**Contour as reference**
Using this function the LMS2xx monitors the surrounding area (background) of a monitored field. This means that an object's existence (e.g. house wall) is constantly being verified. If the contour ceases to be registered the corresponding switching output changes the signal level even without any infringement of a field. The range of validity of the reference contour can be set as desired. The function can also be used to prevent sabotage.

**Restart**
*Automatic:* The associated field switching output is activated as soon as the field becomes clear (see above).

*After delay:* The associated field switching output is activated after a set time delay has elapsed (when the field is clear (see above)).

*With button:* The associated field switching output is activated when the external button is actuated when the field is clear (see above)).
16 EC Declaration of Conformity

Fig. 16-1 shows the scaled down copy of the EC Declaration of Conformity (page 1). Complete copy of EC Declaration of Conformity on request.

![EC Declaration of Conformity](image)

Fig. 16-1: Copy of the Declaration of Conformity, Page 1 (scaled down)
Australia
Phone +61 3 9497 4100
1800 33 48 02 – tollfree
E-Mail sales@sick.com.au

Belgium/Luxembourg
Phone +32 (0)2 466 55 66
E-Mail info@sick.be

Brasil
Phone +55 11 5091-4900
E-Mail sac@sick.com.br

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

China
Phone +852-2763 6966
E-Mail ghk@sick.com.hk

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

Deutschland
Phone +49 211 5301-0
E-Mail info@sick.de

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

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

Deutschland
Phone +49 211 5301-0
E-Mail info@sick.de

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

Großbritannien
Phone +44 (0)1727 831121
E-Mail info@sick.co.uk

Indien
Phone +91-22-2822 7084
E-Mail info@sick-india.com

Italien
Phone +39 02 27 43 41
E-Mail info@sick.it

Japan
Phone +81 (0)3 3358 1341
E-Mail support@sick.jp

Niederlande
Phone +31 (0)30 229 25 44
E-Mail info@sick.nl

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

Österreich
Phone +43 (0)22 36 62 28 80
E-Mail office@sick.at

Polska
Phone +48 22 837 40 50
E-Mail info@sick.pl

Republic of Korea
Phone +82-2 786 6321/4
E-Mail kang@sickkorea.net

Republika Slowenija
Phone +386 (0)1-47 69 990
E-Mail office@sick.si

Russland
Phone +7 495 775 05 34
E-Mail denis.kesaev@sick-automation.ru

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

Singapur
Phone +65 6744 3732
E-Mail admin@sicksgp.com.sg

Suomi
Phone +358-9-25 15 800
E-Mail sick@sick.fi

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

Taiwan
Phone +886 2 2365-6292
E-Mail sickgp@m86.hinet.net

Türkiye
Phone +90 216 587 74 00
E-Mail info@sick.com.tr

USA/Canada/México
Phone +1(952) 941-6780
1 800-325-7425 – tollfree
E-Mail info@sickusa.com

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