

# DL100 – CANopen®

Distance measuring device



EN

For approval  
Zur Prüfung



*Copyright protection!*

*This work is copyright-protected. The rights founded by this shall remain with company SICK AG. Reproduction of the work or parts of this work shall only be permissible within the limits of the legal provisions of copyright law. Changes and abbreviations of this work are prohibited without the express written agreement of SICK AG.*

---

## Table of contents

<b>Important safety notes</b> .....	<b>11</b>
<b>Importantes consignes de sécurité</b> .....	<b>11</b>
<b>1 General</b> .....	<b>12</b>
1.1 Information on the operating instructions .....	12
1.2 Explanation of symbols .....	13
1.3 Limitations of liability .....	14
1.4 Delivery.....	14
1.5 Customer service.....	14
1.6 EC Declaration of Conformity.....	15
1.7 Environmental protection.....	15
<b>2 Safety</b> .....	<b>16</b>
2.1 Intended use.....	16
2.2 Non-Intended use .....	16
2.3 Changes and conversions .....	17
2.4 Requirements to skilled persons and operating staff .....	17
2.5 Work safety and special danger .....	17
2.6 Warning at the device.....	18
2.7 Danger notes and operational safety.....	19
<b>3 Identification</b> .....	<b>20</b>
3.1 Type label .....	20
<b>4 Setup and function</b> .....	<b>21</b>
4.1 Setup .....	21
4.2 Function.....	22
4.3 Display and operating elements.....	23
4.4 Display .....	24
<b>5 Transport and storage</b> .....	<b>25</b>
5.1 Transport.....	25
5.2 Transport inspection.....	25
5.3 Storage .....	26
<b>6 Mounting</b> .....	<b>27</b>
6.1 Mounting process.....	27
6.2 Mounting notes.....	27
6.3 Choose and mount reflector .....	28
6.4 Placement of multiple distance measuring device .....	29

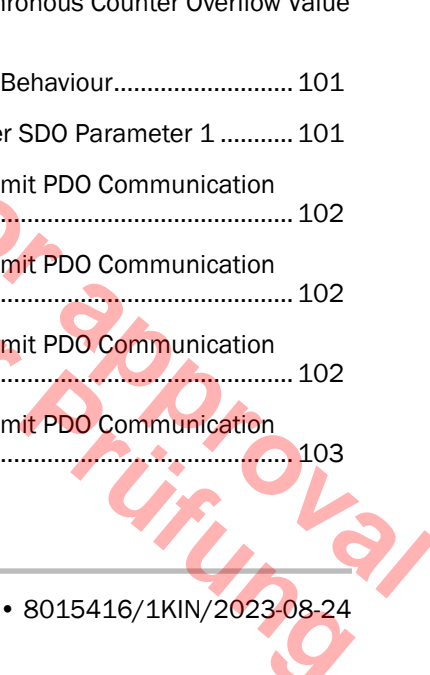
**Table of contents**

6.5	Place the distance measuring device towards the adjacent data transmission photoelectric switch.....	31
6.6	Align distance measuring device and reflector against each other .....	32
6.7	Mount alignment bracket and distance measuring device .	33
6.8	Distance measuring device above alignment bracket .....	35
<b>7</b>	<b>Electrical connection .....</b>	<b>36</b>
7.1	Safety.....	36
7.2	Wiring notes .....	36
7.3	Electrically connect distance measuring device.....	39
7.4	Connection diagrams .....	40
7.4.1	Connection diagram supply voltage .....	40
7.4.2	Connection diagram Ethernet.....	40
7.4.3	Connection diagram CANopen® output.....	41
7.4.4	Connection diagram CANopen® input.....	41
<b>8</b>	<b>Operation at the measuring device .....</b>	<b>42</b>
8.1	Measured value display .....	42
8.2	Choose parameter .....	42
8.3	Choose option.....	42
8.4	Change value .....	43
8.5	Parameter description.....	43
8.5.1	Main menu.....	43
8.5.2	Menu „SwVers“ .....	44
8.5.3	Menu „HwVers“ .....	44
8.5.4	Menu „CANopen®“ .....	45
8.5.5	Menu „more“ .....	46
8.5.6	Menu „MFx On“ .....	47
8.5.7	Menu „MF1“ .....	48
8.5.8	Submenu „MF1 – Dist“ .....	49
8.5.9	Submenu „MF1 – Speed“ .....	50
8.5.10	Submenu „MF1 – Srvce“ .....	51
8.5.11	Submenu „Preset“ – move to initialization position.....	52
8.5.12	Menu „MF2“ .....	54
8.5.13	Menu „Offset“ .....	55
8.5.14	Menu “SpecFu”.....	55
8.6	Perform reset.....	57

<b>9</b>	<b>Operation via Ethernet (Ethernet interface)</b>	<b>58</b>
9.1	IP-network configuration	58
9.2	Ethernet parameter list	59
9.2.1	Device information	59
9.2.2	User information	60
9.2.3	Measurement values	61
9.2.4	Diagnostic data	62
9.2.5	Parameter settings	63
9.2.6	Methods	71
<b>10</b>	<b>CANopen®-interface</b>	<b>72</b>
10.1	Basics	72
10.2	General CANopen® installation notes	73
10.2.1	Topology	73
10.2.2	Baud rates, length of bus line (trunk line) and drop lines	74
10.3	Address assignment (Node-ID)	74
10.3.1	Setting the Node-ID via the display	74
10.3.2	Setting the Node-ID via SOPAS ET	74
10.3.3	Setting the Node-ID via LSS	75
10.4	Baud rate setting	76
10.4.1	Setting the baud rate via the display	76
10.4.2	Setting the baud rate via SOPAS ET	76
10.4.3	Setting the baud rate via LSS	77
10.5	General information on CANopen® communication	78
10.5.1	Communication profile CiA 301	78
10.5.2	Device profile CiA 406	78
10.5.3	Object directory	78
10.5.4	EDS file	78
10.5.5	Telegram setup	79
10.5.6	COB-ID	79
10.5.7	Setup 11-bit CAN-ID	80
10.5.8	Identifier priority	81
10.5.9	CANopen® services and CAN-IDs	81
10.5.10	PDO and SDO	83
10.6	Communication	85
10.6.1	Network Management Commands	85

**Table of contents**

- 10.7 Synchronous and Asynchronous PDOs ..... 86
  - 10.7.1 Synchronous PDO ..... 86
  - 10.7.2 Asynchronous PDO ..... 86
  - 10.7.3 Transmission Type ..... 86
- 10.8 Emergency messages (EMCY messages) ..... 89
  - 10.8.1 Overview of general EMCY messages ..... 89
  - 10.8.2 Overview of manufacturer-specific EMCY messages ..... 90
  - 10.8.3 Transmission behavior of the EMCY message.... 90
  - 10.8.4 Properties of EMCY messages ..... 90
- 10.9 Overview Object directory..... 91
- 10.10 Communications segment ..... 97
  - 10.10.1 Object 1000h Device Type..... 97
  - 10.10.2 Object 1001h Error Register ..... 97
  - 10.10.3 Object 1003h Pre-defined Error Field ..... 97
  - 10.10.4 Object 1005h COB-ID SYNC..... 98
  - 10.10.5 Object 1008h Manufacturer Device Name ..... 98
  - 10.10.6 Object 1009h Manufacturer Hardware Version . 98
  - 10.10.7 Object 100Ah Manufacturer Software Version .. 98
  - 10.10.8 Object 1010h Store Parameter Field ..... 98
  - 10.10.9 Object 1011h Restore Default Parameters..... 98
  - 10.10.10 Object 1014h COB-ID EMCY ..... 99
  - 10.10.11 Object 1016h Heartbeat Consumer Entries..... 99
  - 10.10.12 Object 1017h Producer Heartbeat Time ..... 99
  - 10.10.13 Object 1018h Identity Object ..... 100
  - 10.10.14 Object 1019h Synchronous Counter Overflow Value 100
  - 10.10.15 Object 1029h Error Behaviour..... 101
  - 10.10.16 Object 1200h Server SDO Parameter 1 ..... 101
  - 10.10.17 Object 1800h Transmit PDO Communication Parameter 1 ..... 102
  - 10.10.18 Object 1801h Transmit PDO Communication Parameter 2 ..... 102
  - 10.10.19 Object 1804h Transmit PDO Communication Parameter 5 ..... 102
  - 10.10.20 Object 1805h Transmit PDO Communication Parameter 6 ..... 103



10.10.21	Object 1A00h Transmit PDO Mapping Parameter 1 .....	103
10.10.22	Object 1A02h Transmit PDO Mapping Parameter 2 .....	104
10.10.23	Object 1A04h Transmit PDO Mapping Parameter 5 .....	104
10.10.24	Object 1A05h Transmit PDO Mapping Parameter 6 .....	104
10.11	Manufacturer-specific segment (2000h to 5FFFh) .....	104
10.11.1	Object 2000h Distance .....	104
10.11.2	Object 2001h Velocity .....	105
10.11.3	Object 2002h Time Stamp .....	105
10.11.4	Object 4000h Distance Resolution .....	105
10.11.5	Object 4001h Velocity Resolution .....	105
10.11.6	Object 4002h Device Product Code .....	106
10.11.7	Object 4003h Software Versions .....	106
10.11.8	Object 4004h Device Temperature .....	106
10.11.9	Object 4005h Laser Operating Hours .....	106
10.11.10	Object 4006h Command .....	106
10.11.11	Object 4007h Reset Preset .....	106
10.12	Device profile CiA 406 (Absolute linear encoder) .....	107
10.12.1	Object 6000h Operating Parameters .....	107
10.12.2	Object 6001h Measuring Units per Revolution .....	108
10.12.3	Object 6002h Total Measuring Range in Measuring Units .....	108
10.12.4	Object 6003h Preset Value .....	109
10.12.5	Object 6004h Position Value .....	110
10.12.6	Object 6005h Linear Encoder Measuring Step Settings .....	110
10.12.7	Object 6010h Preset Values for Multi-Sensor Devices .....	111
10.12.8	Object 6020h Position Values for Multi-Sensor Devices .....	111
10.12.9	Object 6030h Speed Value .....	111
10.12.10	Object 6200h Cyclic Timer .....	111
10.12.11	Object 6500h Operating Status .....	111
10.12.12	Object 6501h Single-turn Resolution and Measuring Step .....	111
10.12.13	Object 6502h Number of Distinguishable Revolutions .....	112

**Table of contents**

10.12.14	Object 6503h Alarms .....	112
10.12.15	Object 6504h Supported Alarms .....	112
10.12.16	Object 6505h Warnings .....	113
10.12.17	Object 6506h Supported Warnings .....	113
10.12.18	Object 6507h Profile and Software Version .....	113
10.12.19	Object 6508h Operating Time .....	114
10.12.20	Object 6509h Offset Value .....	114
10.12.21	Object 650Ah Module Identification .....	114
10.12.22	Object 650Bh Serial Number .....	114
10.12.23	Parameterize linear absolute value encoders ..	115
10.13	TPDO behavior at distance value.....	115
10.14	Dynamic mapping.....	115
10.15	Status LED.....	119
<b>11</b>	<b>Cleaning and maintenance .....</b>	<b>120</b>
11.1	Cleaning .....	120
11.2	Maintenance.....	120
<b>12</b>	<b>Troubleshooting .....</b>	<b>121</b>
12.1	LED status indicators .....	121
12.2	Warning messages .....	122
12.3	Error messages.....	122
12.4	Return.....	123
12.5	Disposal.....	123
<b>13</b>	<b>Repair.....</b>	<b>124</b>
<b>14</b>	<b>Technical data.....</b>	<b>124</b>
14.1	Dimensions .....	125
14.2	Device selection for CANopen® interface.....	126
14.3	Laser/optics.....	126
14.4	Performance .....	127
14.5	Supply.....	127
14.6	Inputs.....	127
14.7	Outputs.....	128
14.8	Interfaces .....	128
14.9	Ambient conditions.....	128
14.10	Constructive setup.....	129

For approval  
zur Prüfung



---

<b>15</b>	<b>Accessories .....</b>	<b>130</b>
15.1	Reflectors and reflective tape .....	130
15.1.1	Reflectors .....	130
15.1.2	Reflective tape .....	133
15.2	Connection systems .....	134
15.2.1	Cable socket with cable .....	134
15.2.2	Cable connector with cable .....	134
15.2.3	Terminator .....	134
15.2.4	Connection cables.....	134
15.3	Mounting systems.....	135
15.3.1	Alignment bracket .....	135
15.3.2	Deflector mirror for mounting at alignment bracket .....	135
15.4	Other accessories.....	136
<b>16</b>	<b>Menu structure.....</b>	<b>137</b>
	<b>Index .....</b>	<b>140</b>

For approval  
Zur Prüfung

For approval  
Zur Prüfung

## Important safety notes



NFPA79 applications only.

UL-listed adapters providing field wiring leads are available.

Refer to the product information. → See "[www.sick.com/dl100](http://www.sick.com/dl100)".



### CAUTION!

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

## Importantes consignes de sécurité



À utiliser pour les applications NFPA79 uniquement.

Des adaptateurs homologués fournissant des fils de câblage client sont disponibles.

Se reporter aux informations du produit.

→ Voir « [www.sick.com/dl100](http://www.sick.com/dl100) ».



### ATTENTION!

Tout usage de commandes, réglages ou toute application de procédures autres que ceux décrits dans ce document peut entraîner une exposition dangereuse au rayonnement.

## General

---

# 1 General

## 1.1 Information on the operating instructions

These operating instructions offer important notes on handling of the distance measuring devices DL100 of SICK AG. A prerequisite for safe work is compliance with all indicated safety notes and instructions.

Furthermore, the local work safety regulations and general safety provisions applicable for the application of the distance measuring device must be complied with.

The operating instructions must be read carefully before taking up any work! They are part of the product and must be kept in direct proximity of the distance measuring device, accessible for the staff at all times.

When passing on the distance measuring device to third parties, the operating instructions must be passed on as well.



**NOTE!**

*These operating instructions describe all distance measuring devices DL100 with a CANopen® interface.*

---

## 1.2 Explanation of symbols

### Warnings

Warnings are marked by icons in the operating instructions. The notes are initiated by signal words that express the degree of danger.

Always comply with the notes and act carefully to avoid accidents, injury and property damage.



#### **DANGER!**

... indicates a directly dangerous situation that will lead to death or severe injury if not avoided.

---



#### **WARNING!**

... indicates a possibly dangerous situation that may lead to death or severe injury if not avoided.

---



#### **CAUTION!**

... indicates a potentially dangerous situation that may lead to minor or light injury if not avoided.

---



#### **ATTENTION!**

... indicates a potentially harmful situation that may lead to property damage if not avoided.

---

### Advice and recommendations



#### **NOTE!**

... emphasizes useful advice and recommendations, as well as information for efficient and trouble-free operation.

---

## General

---

### 1.3 Limitations of liability

All notes and information in these instructions were collected under consideration of the applicable standards and regulations, the state of the art and our long-term experience and insights.

The manufacturer does not assume any liability for damage due to:

- Non-observation of the operating instructions
- Non-intended use
- Use of untrained staff
- Unauthorized conversions
- Technical changes
- Use of unapproved wear and tear parts

The actual delivery may deviate from the features and presentations described here for special designs, when additional order options are used or due to the latest technical changes.

### 1.4 Delivery

The following is included in the delivery:

- Distance measuring device DL100
- Optional: Accessories (→ page 130, chapter 15).

Included documentation per distance measuring device:

- Quickstart.

### 1.5 Customer service

Our customer service is available for technical information.

You can find your local office on the reverse.



**NOTE!**

*For quick processing of the call, keep the data of the type label, such as type code, serial number, etc. ready.*

---

## 1.6 EC Declaration of Conformity

→ The EC Declaration of Conformity can be downloaded from "[www.sick.com/dl100](http://www.sick.com/dl100)".

## 1.7 Environmental protection



### **ATTENTION!**

#### **Danger for the environment from improper disposal of the distance measuring device!**

Improper disposal of the distance measuring device may cause damage for the environment.

Therefore:

- Always observe the applicable environmental protection provisions.
- Upon proper disassembly, send the disassembled components to recycling.
- Separate the materials by type and recycle them.

## Safety

---

## 2 Safety

### 2.1 Intended use

The distance measuring device DL100 is a measuring device consisting of an opto-electronic sensor and assessment electronics. The measuring device is only intended for non-contact recording of distances from linearly moved system parts. Distance measurement is performed by a reflector.

SICK AG assumes no liability for direct or indirect loss or damage resulting from use of the product. This in particular applies for any differing use of the product that does not meet the intended purpose and that is not described or mentioned in this documentation.

### 2.2 Non-Intended use

The distance measuring devices DL100 are no safety component according to the EC Machinery Directive (2006/42/EC).

The distance measuring devices must not be used in explosion-hazardous areas.

All uses not described in intended use are prohibited.

No accessories must be connected or installed that are not expressly specified in amount and characteristics and approved by SICK AG.



#### **WARNING!**

#### **Danger from non-intended use!**

Any non-intended use may cause dangerous situations.

Therefore:

- Only use the distance measuring device according to its intended use.
  - All information in the operating instructions must be strictly complied with.
-



## 2.3 Changes and conversions

Changes and conversions at the distance measuring device or the installation may cause unexpected dangers.

The manufacturer's written approval is required before any technical changes and expansions of the distance measuring device.

## 2.4 Requirements to skilled persons and operating staff



### **WARNING!**

#### **Danger of injury in case of insufficient qualification!**

Improper use may cause considerable injury and property damage.

Therefore:

- Any work must be performed by the designated persons only.

The following qualification requirements for the different areas of activity are described in the operating instructions:

- **Instructed persons**  
were instructed in the tasks assigned to them and possible dangers in case of improper conduct in the scope of instruction by the operator.
- **Skilled persons**  
are able to perform the tasks assigned to them based on their technical training, knowledge and experience, as well as knowledge of the relevant provisions, and to independently recognize possible danger.
- **Electricians**  
are able to perform work at electrical systems based on their technical training, knowledge and experience, as well as knowledge of the relevant standards and provisions, and to independently recognize possible dangers.  
In Germany, the electrician must meet the provisions of the accident prevention provisions BGV A3 (e.g. Elektroinstallateur-Meister). Other countries are subject to corresponding regulations that must be observed.

## 2.5 Work safety and special danger

Observe the safety notes listed here and the warnings in the other chapters of these instructions to reduce dangers to health and avoid dangerous situations.

**Safety**

**2.6 Warning at the device**

The distance measuring device DL100 has a category 2 laser installed. The measuring device is marked with a warning.



Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56 dated 8 May 2019.

Laser radiation – Never look into the light beam – Class 2 Laser Product (EN 60825-1:2014+A11:2021; IEC 60825-1:2014)

Laser output aperture

Fig. 1: Warning at the device: Laser category 2 (EN 60825-1:2014+A11:2021; IEC 60825-1:2014)  
Identical laser class for issue EN/IEC 60825-1:2007

For approval  
Zur Prüfung

## 2.7 Danger notes and operational safety

### Laser irradiation

The following notes must be observed and complied with for your own safety:



#### **CAUTION!**

#### **Optical radiation: Laser class 2**

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

- Do not look into the laser beam intentionally.
- Never point the laser beam at people's eyes.
- If it is not possible to avoid looking directly into the laser beam, e.g., during commissioning and maintenance work, suitable eye protection must be worn.
- Avoid laser beam reflections caused by reflective surfaces. Be particularly careful during mounting and alignment work.
- Do not open the housing. Opening the housing will not switch off the laser. Opening the housing may increase the level of risk.
- Current national regulations regarding laser protection must be observed.

## Identification

### 3 Identification

#### 3.1 Type label

The type label is located on the measuring device.

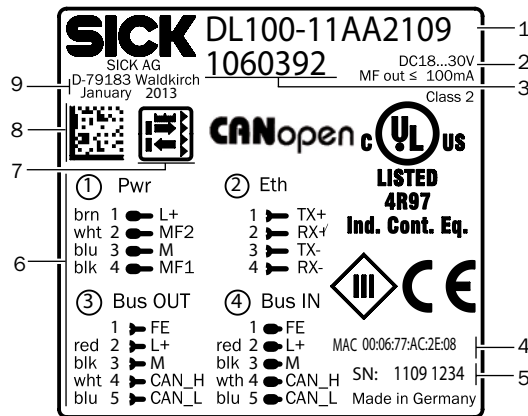


Fig. 2: Type Label

- 1 Type code → See page 126, chapter 14.2.
- 2 Supply voltage, multifunction output current
- 3 Device number
- 4 MAC address
- 5 Serial number
- 6 Assignment for supply voltage plug, Ethernet and CANopen®
- 7 Icon: Distance sensor reflector mode
- 8 Barcode
- 9 Production year and month

For approval  
Zur Prüfung

## 4 Setup and function

### 4.1 Setup

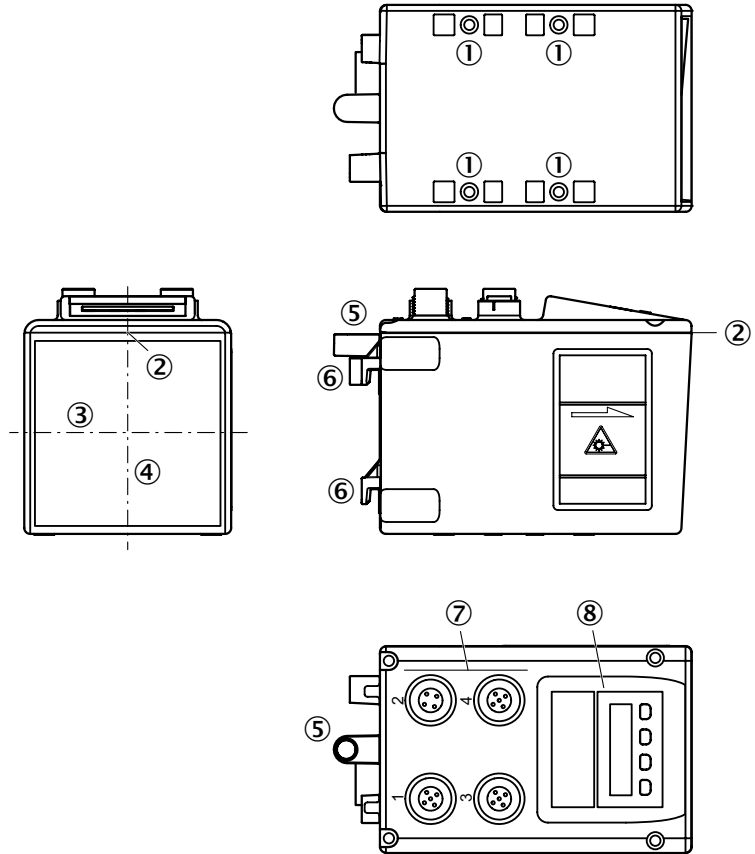


Fig. 3: Setup "distance measuring device DL100"

- 1 Threaded mounting hole M5
- 2 Device zero point
- 3 Optical axis sender
- 4 Optical axis receiver
- 5 Bore for knurled screw of the optional alignment bracket
- 6 Holder for optional alignment bracket
- 7 Electrical connection
- 8 Display and operating unit

## Setup and function

### 4.2 Function

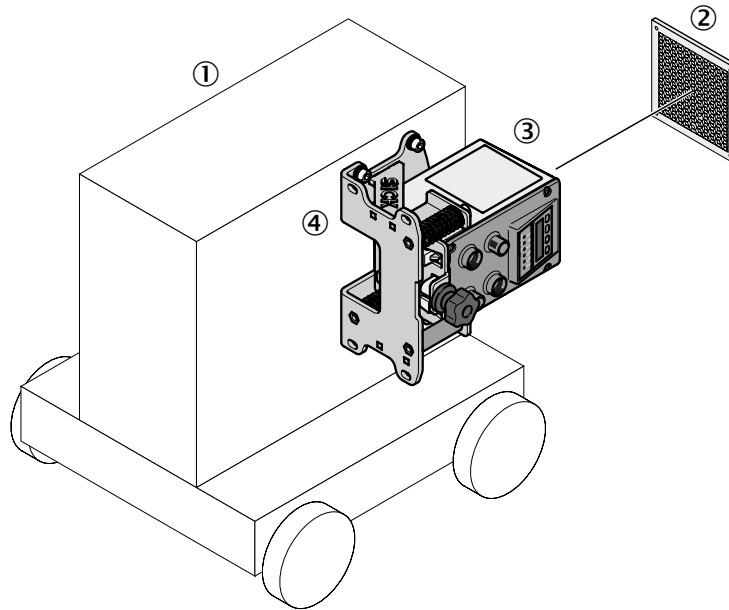


Fig. 4: Function "distance measuring device DL100"

- 1 Vehicle
- 2 Reflector
- 3 Distance measuring device DL100
- 4 Alignment bracket

The distance measuring device DL100 comprises optics, a sender/receiver unit and an evaluation unit. The sender emits the laser beam. The receiver receives light reflected by the reflector. The evaluation electrical unit determines the distance between sensor and reflector by time of flight measurement.

For measurement, either the reflector or the measuring device may move linearly along the laser beam.

The distance measuring device DL100 is equipped with two CANopen® interfaces and one Ethernet interface. The CANopen® interfaces serve communication via CANopen®. The Ethernet interface serves communication, diagnosis and parameterization via SOPAS ET.

The measured distance is transferred via the "CANopen®" interface and may be used, e.g. for the control unit or a position-control circuit.

### 4.3 Display and operating elements

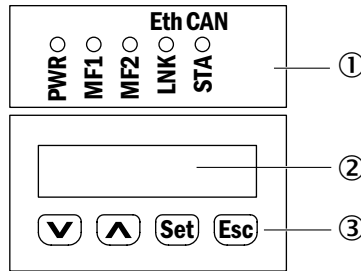


Fig. 5: Display and operating elements

- 1 LEDs
- 2 Display
- 3 Keys

#### LEDs

LED	Description
PWR	Display of operating status <ul style="list-style-type: none"> <li>• LED off: No operation</li> <li>• LED green: Trouble-free operation</li> <li>• LED orange flashing: Warning (see warning status, upper level menu)</li> <li>• LED red flashing: Interference (see error status, menu on the top level) → Troubleshooting, see page 121, chapter 12.</li> </ul>
MF1	The status for multi-function input/output MF1. <ul style="list-style-type: none"> <li>• LED on: Output high</li> <li>• LED off: Output low</li> </ul>
MF2	The status for multifunction output MF2. <ul style="list-style-type: none"> <li>• LED on: Output high</li> <li>• LED off: Output low</li> </ul>
LNK	Ethernet <ul style="list-style-type: none"> <li>• LED off: No Ethernet present</li> <li>• LED green: Ethernet present</li> <li>• LED orange flashing: Data transmission</li> </ul>
STA	Interface CANopen® → Status LED, page 119, Table 72.

Table 1: LEDs

For approval  
Zur Prüfung

## Setup and function

### Symbols for operating modes

The distance measuring device differentiates between the two operating modes "measured value display" and "menu operation".

Icon	Description
RUN	The icon RUN is displayed in the operating mode "measured value display". If there is an error and no measurement value can be determined, the icon RUN disappears.
MEN	The icon MEN is displayed in the operating mode "menu operation". The icon is also displayed when there is an error and no measurement value can be determined.

Table 2: Symbols for operating modes

### Keys





Key	Description
	<ul style="list-style-type: none"> <li>Select menu, parameters or options.</li> <li>Reduce value.</li> </ul>
	<ul style="list-style-type: none"> <li>Select menu, parameters or options.</li> <li>Increase value.</li> </ul>
	<ul style="list-style-type: none"> <li>Switch to the next lower menu level.</li> <li>Save parameter change.</li> <li>Confirm selection.</li> </ul>
	<ul style="list-style-type: none"> <li>Leave parameter without saving. Switch to the next higher menu level.</li> </ul>

Table 3: Keys

## 4.4 Display

### Measured value display

The measurement value is displayed by default:

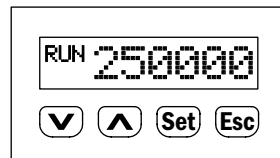


Fig. 6: Measured value display

### Menu display

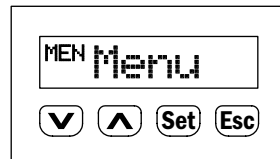


Fig. 7: Menu display



**NOTE!**

If a value or display has more than six characters, the characters are automatically displayed in sequence.

For approval  
zur Prüfung



## 5 Transport and storage

### 5.1 Transport

#### Improper transport



#### **ATTENTION!**

#### **Damage to the distance measuring device by improper transport!**

Improper transport may cause considerable property damage.

Therefore:

- Only have transport performed by trained workers.
- When unloading and during internal transport, always proceed with the greatest care and caution.
- Observe icons on the packaging.
- Only remove packaging right before commencement of installation.

### 5.2 Transport inspection

#### Improper transport

Inspect the delivery for completeness and transport damage without delay upon receipt.

If there is any externally visible transport damage, proceed as follows:

- Do not accept the delivery, or only under reservation.
- Note the scope of the damage on the transport documents or the delivery receipt of the transporter.
- Initiate complaints.



#### **NOTE!**

*Report every defect as soon as you recognize it.  
Damages claims can only be asserted within the applicable complaint periods.*

## Transport and storage

---

### 5.3 Storage

Store the distance measuring device under the following conditions:

- Do not leave it outside.
- Store dry and dust-free.
- Do not expose to any aggressive media.
- Protect from solar irradiation.
- Avoid mechanical vibrations.
- Storage temperature: –40 to 75 °C
- Relative humidity: max. 95 %, non-condensing
- At storage exceeding 3 months, regularly inspect the general condition of all components and the packaging.

For approval  
Zur Prüfung

## 6 Mounting

### 6.1 Mounting process

1. Determine mounting site under consideration of the mounting notes.  
→ See following chapter.
2. Mount alignment bracket and distance measuring device.  
→ See page 33, chapter 6.7.
3. Perform electrical connection  
→ See page 36, chapter 7.
4. Align distance measuring device and reflector against each other.  
→ See page 20, chapter 3.1.
5. Align distance measuring device with the reflector using the alignment bracket fine adjustment. → See page 35, chapter 6.8.
6. Fasten alignment of the distance measuring device.  
→ See page 35, chapter 6.8.

### 6.2 Mounting notes

Observe the following mounting notes for trouble-free operation:

- Comply with technical specifications like the measurement range.  
→ See page 127, chapter 14.4.
- Use distance measuring device with optional heating in low ambient temperatures, e.g. in deep freeze storage.
- At higher temperatures, use the distance measuring device with optional cooling casing. → See page 136, chapter 15.4.
- Protect the distance measuring device from solar irradiation.
- To avoid condensation, do not expose the distance measuring device to any quick temperature changes.
- Observe the assembly notes for the reflector.  
→ See page 27, chapter 6.2.
- Keep sufficient distance to other distance measuring devices.  
→ See page 29, chapter 6.4.
- Keep sufficient distance to data transmission photoelectric switches.  
→ See page 31, chapter 6.5.

## Mounting

### 6.3 Choose and mount reflector



**NOTE!**

→ For suitable reflectors and suitable reflective tape, see page 130, chapter 15.1

**Reflector size**

- Select the reflector size so that the light spot does still meet the reflector in case of vibrations.
- If the reflector is installed at a vehicle, a smaller reflector is typically sufficient.

**Requirements**

- Highly reflective surfaces close to the reflector can cause beam deflections or stray light and thus lead to incorrect measurements. Highly reflective surfaces may be, among others, shelf profiles, palettes wrapped with stretch foil and running rails.
- When mounting the distance measuring device in the horizontal axis of stacker crane, incline the reflector towards the ceiling, away from the rail (approx. 1° to 3°). → See following figure.
- When mounting in the vertical axis, incline away from the stacker crane's mast (approx. 1° to 3°). → See following figure.

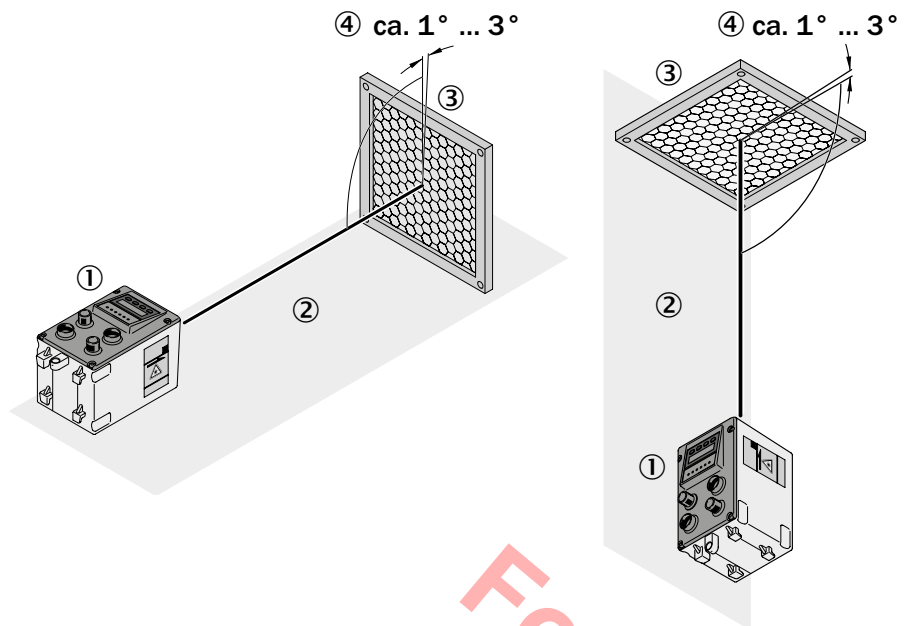


Fig. 8: Installing the reflector on highly reflective surfaces  
Left: Installed in driving axis, installed at the right in the lifting axis

- 1 Distance measuring device
- 2 Highly reflective surface
- 3 Reflector
- 4 Inclination of approx. 1° to 3°

## 6.4 Placement of multiple distance measuring device

**Multiple distance measuring device** If you want to mount several distance measuring devices, you have to consider a minimum distance between the distance measuring devices when mounting them. The minimum distance increases with the maximum scanning range of the distance measuring device.

**Formula**  $a \geq 100 \text{ mm} + 0.01 \times s_{\text{max}} [\text{mm}]$

**Example**

- Distance measuring device DL100–21xxx01
- Measuring range: 0.15 ... 100 m
- Maximum measuring distance 60 m
- $s_{\text{max}} = 60 \text{ m}$

**Calculation**

$$a \geq 100 \text{ mm} + 0.01 \times 60000 \text{ mm} \rightarrow 100 \text{ mm} + 600 \text{ mm} \rightarrow 700 \text{ mm}$$

**Result**

$$a \geq 700 \text{ mm}$$

**Light beams in the same direction**

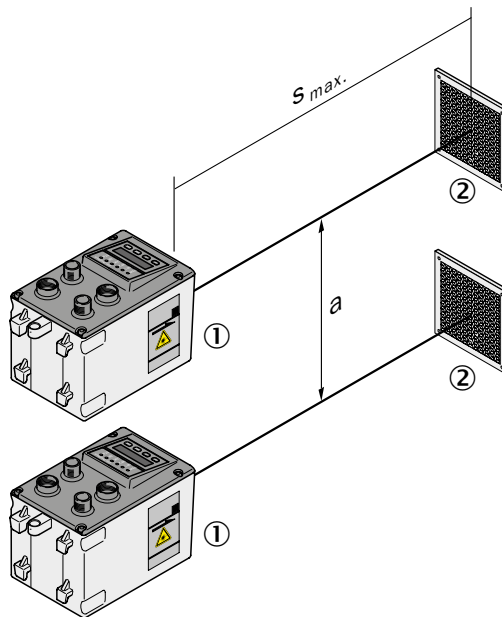


Fig. 9: Placement of two distance measuring devices with light beams in the same light direction

- 1 Distance measuring device DL100
- 2 Reflector
- a Minimum distance
- $s_{\text{max}}$  Maximum scanning range

For approval  
Zur Prüfung

## Mounting

### Light beams in the opposite direction

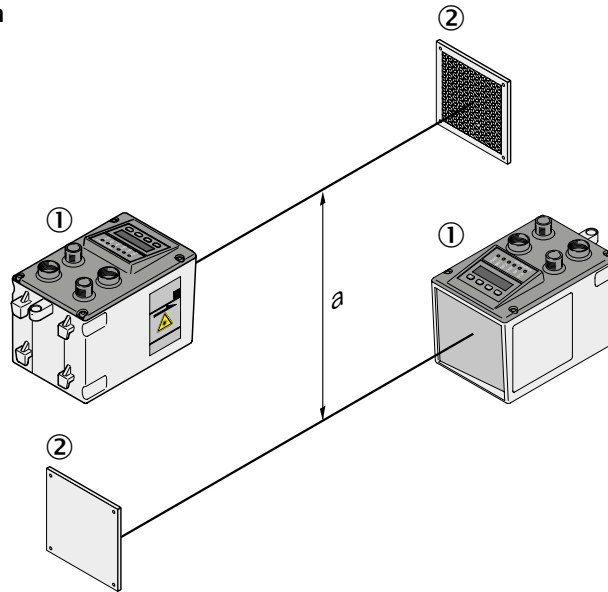


Fig. 10: Placement of two distance measuring devices with light beams in the opposite direction

- 1 Distance measuring device DL100
- 2 Reflector
- a Minimum distance

## 6.5 Place the distance measuring device towards the adjacent data transmission photoelectric switch

When mounting with a data transmission photoelectric switch of the ISD300, ISD400-1xxx and ISD400-6xxx series, a beam separation of at least 100 mm must be complied with at all times. The maximum scanning range does not influence the minimum distance. For devices of the ISD400-7xxx (ISD400 Pro) serie other minimum distances apply. Refer to operating instructions “ISD400 Pro”.

### Formula

$$a \geq 100 \text{ mm}$$

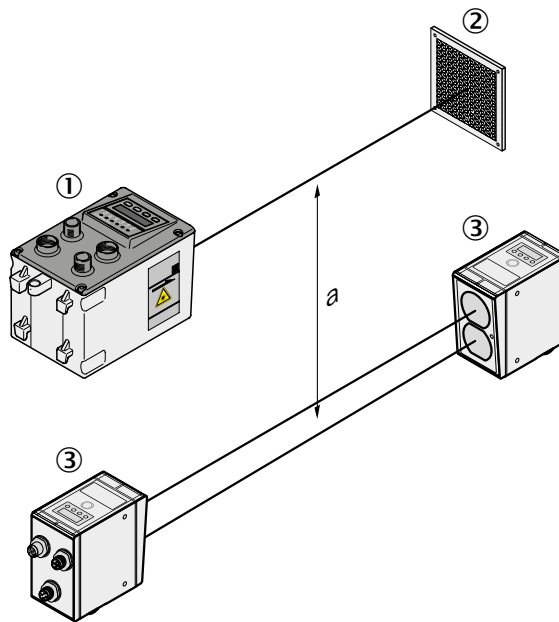


Fig. 11: Placement of the distance measuring device to the data transmission photoelectric switch ISD

- 1 Distance measuring device DL100
- 2 Reflector
- 3 Data transmission photoelectric switch ISD300, ISD400-1xxx or ISD400-6xxx
- a Minimum distance

## Mounting

### 6.6 Align distance measuring device and reflector against each other

1. Move the distance measuring device and reflector close together.
2. Align the distance measuring device so that the light spot of the sensor hits the center of the reflector.
3. Increase the distance between the distance measuring device and the reflector. The sensor light spot must continue to hit the center of the reflector.
4. Check damping. The damping value must not exceed the value in the table.

#### Damping value

The following table shows the required damping values depending on the distance between the distance measuring device and the reflector. The values in the "rated level" column should not be undercut. When the measured damping value undercuts the value in the column "warning threshold", a warning is issued.

Distance [m]	Rated level [dB]	Warning threshold [dB]
<10	-30	-42
10	-30	-42
20	-42	-54
35	-54	-66
70	-66	-78
150 1)	-78	-90
300 2)	-90	-102

1) For distance measuring devices with a measurement range of 0.15 ... 200 m or 0.15 ... 300 m

2) For distance measuring devices with a measurement range of 0.15 ... 300 m

Table 4: Damping values

For approval  
Zur Prüfung



## 6.7 Mount alignment bracket and distance measuring device

The distance measuring device is mounted by the optional alignment bracket.

→ For dimensions and item number, see page 125, chapter 14.1.

Observe the following items:

- Mounting notes: → see page 27, chapter 6.2.
- The operation must be accessible.

1. Mount alignment bracket across the four oblong holes. The alignment bracket is suitable for mounting to horizontal and vertical levels.

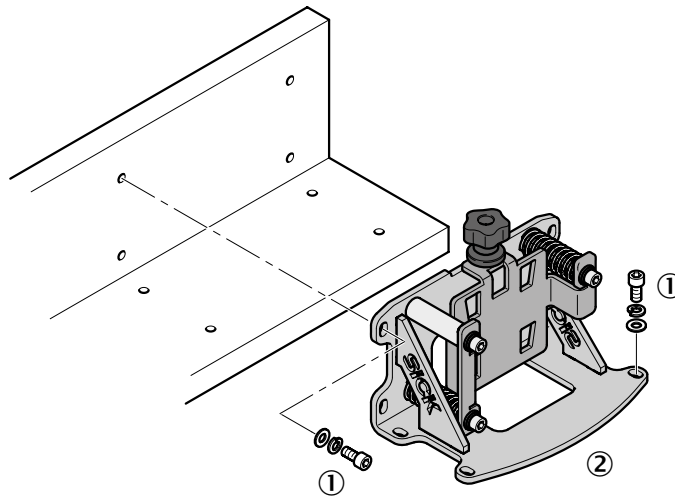


Fig. 12: Mount alignment bracket

- 1 Mounting screw M5
- 2 Alignment bracket

2. Turn out knurled screw until the distance measuring device can be inserted.
3. Move distance measuring device into the alignment bracket.

## Mounting

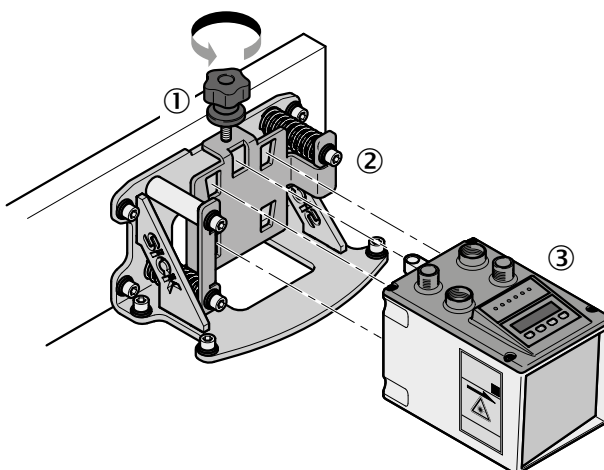


Fig. 13: Mount distance measuring device

- 1 Knurled screw
- 2 Alignment bracket
- 3 Distance measuring device

4. Attach distance measuring device via the knurled screw.

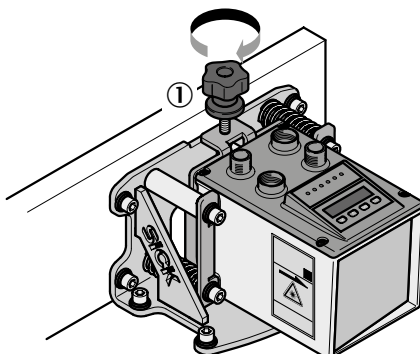


Fig. 14: Attach distance measuring device with the knurled screw

- 1 Knurled screw

For approval  
Zur Prüfung

## 6.8 Distance measuring device above alignment bracket

Align the distance measuring device with the alignment bracket according to the following figures. The sensor light spot must hit the center of the reflector.

### Alignment in X-direction

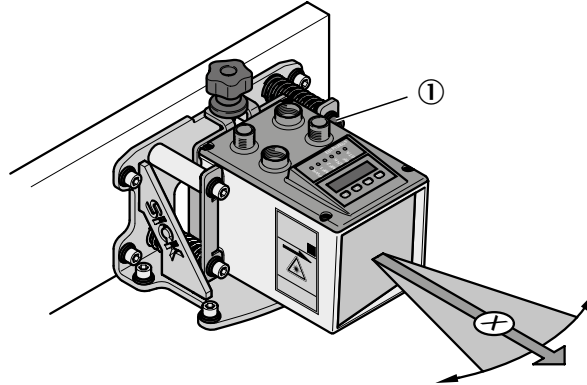


Fig. 15: Align distance measuring device in X-direction using the alignment bracket

- 1 Set screw to align the distance measuring device in X-direction

### Alignment in Y-direction

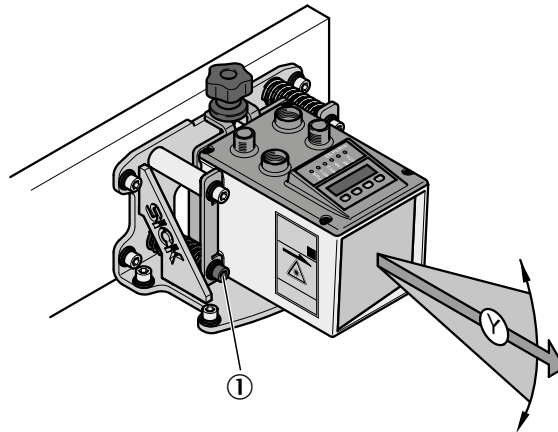


Fig. 16: Align distance measuring device in Y-direction using the alignment bracket

- 1 Set screw to align the distance measuring device in Y-direction

## Electrical connection

---

# 7 Electrical connection

## 7.1 Safety

### Wrong supply voltage

**ATTENTION!****Device damage from wrong supply voltage!**

Incorrect supply voltage may cause damage to the device.

Therefore:

- Only operate the distance measuring device with a protected low voltage and secure electrical insulation of protection class III.

### Work under voltage

**ATTENTION!****Device damage or unintended operation by work under voltage!**

Working under voltage may cause unintended operation.

Therefore:

- Only perform wiring work in the powered down condition.
- Line connections must only be established and disconnected with the supply voltage switched off.

## 7.2 Wiring notes

**ATTENTION!****Fault from improper wiring!**

Improper wiring may cause malfunctions in operation.

Therefore:

- Only use shielded cables with twisted pair wires.
- Observe wiring notes.



**WARNING!**

**Risk of damage to the device resulting from a non-grounded supply voltage or equipotential bonding currents!**

- A non-grounded supply voltage or potential differences between the supply voltage GND and the distance measuring device housing may result in the device sustaining damage.
- For this reason:
- Only operate with a grounded supply voltage.
- Ensure low-impedance and current-carrying equipotential bonding.



**NOTE!**

→ Ready-made cables, see page 134, chapter 15.2.

All electrical connections of the distance measuring device DL100 are M12 round plugs.

The connection plugs of the distance measuring device are compatible to the SpeedCon™-quick connections and standard-M12 screw connections.

Protection class IP65 is only achieved with screwed plug connectors or cover caps.

Observe the following notes for wiring:

- A proper and complete shielding concept is required for interference-free function.
- The cable shield must be applied on either side in the control cabinet and the measuring device. The cable shield of the ready-made cables is connected to the knurled nut and thus the measuring device casing.
- Connect the cable shield in the control cabinet with the operating ground on a large cross-section.
- Potential balancing currents through the cable shield must be prevented by suitable measures.
- Do not install the cable in parallel to the other lines, in particular not devices with a high electromagnetic interference, such as frequency converters.

## Electrical connection

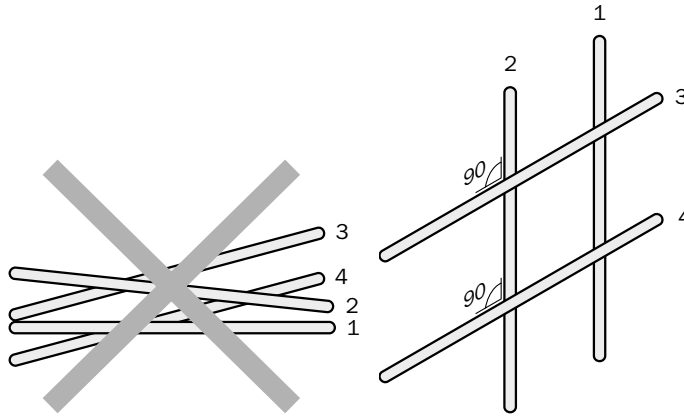


Fig. 17: Cross lines at a right angle

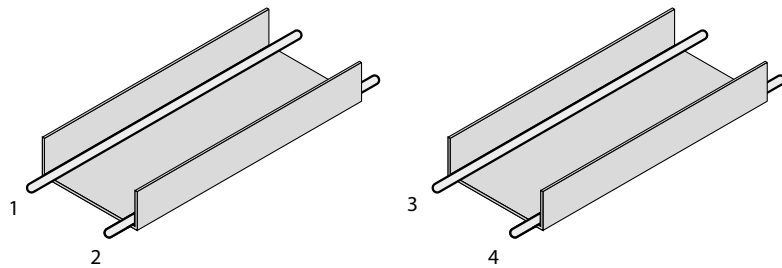


Fig. 18: Ideal placement –  
Place lines in different cable channels

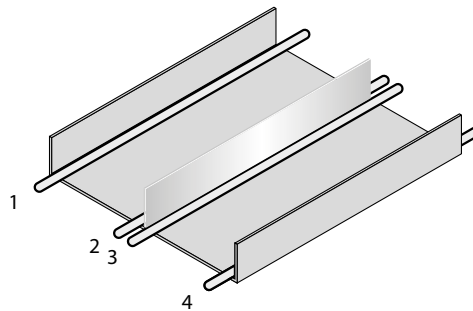


Fig. 19: Alternative installation – separate lines by metallic separation

- 1 Cables very sensitive to interference like analog measuring lines
- 2 Cables sensitive to interference, such as sensor cables, communication signals, bus signals
- 3 Cables that are sources of interference, such as control cables for inductive loads, motor brakes
- 4 Cables that are strong sources of interference, such as frequency converter output cables, supply to welding plants; power cables

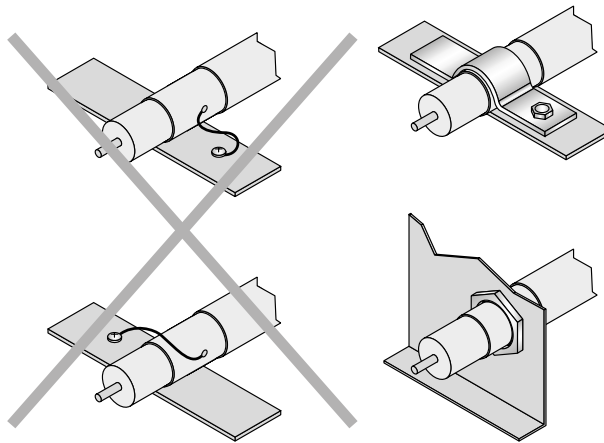


Fig. 20: Briefly connect shield with a large area - earth both sides

### 7.3 Electrically connect distance measuring device



**NOTE!**

The distance measuring device has the connection diagram and information on the inputs and outputs on the type sign.

You can connect the supply voltage either separately via connection 1 or in combination with the CANopen communication via connection 3 or connection 4.

1. Ensure that there is no voltage applied.
2. Connect the measuring device according to the connection diagram.

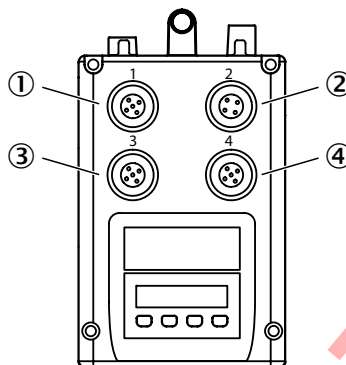


Fig. 21: Position of the electrical connections

- 1 Plug 1: Supply voltage (Pwr)
- 2 Socket 2: Ethernet
- 3 Socket 3: CANopen® output
- 4 Plug 4: CANopen® input

For approval  
Zur Prüfung

## Electrical connection

### 7.4 Connection diagrams

#### 7.4.1 Connection diagram supply voltage

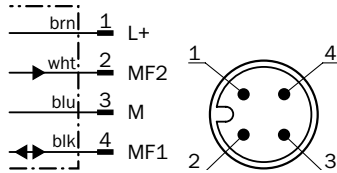


Fig. 22: Connection diagram supply voltage, plug M12, 4-pin, A-coded

Contact	Marking	Wire color	Description
1	L+	brown	Supply voltage: +18 ... +30 V DC
2	MF2	white	Multifunction output MF2 type B
3	M	blue	Supply voltage: 0 V
4	MF1	black	Multifunctional input and output MF1 type B

Table 5: Description plug supply voltage

#### 7.4.2 Connection diagram Ethernet

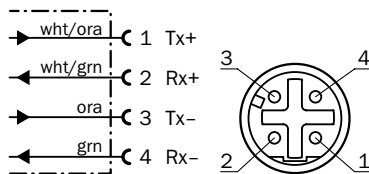


Fig. 23: Connection diagram Ethernet, socket M12, 4-pin, D-coded

Contact	Marking	Wire color	Description
1	Tx+	white/orange	Send data signal, not inverted
2	Rx+	white/green	Receive data signal, not inverted
3	Tx-	orange	Send data signal, inverted
4	Rx-	green	Receive data signal, inverted

Table 6: Description socket Ethernet

For approval  
Zur Prüfung



### 7.4.3 Connection diagram CANopen® output

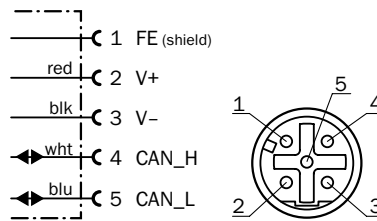


Fig. 24: Connection diagram CANopen® output socket M12, 5-pin, A-coded

Contact	Marking	Wire color	Description
1	FE	Shield	Cable shield
2	V+	red	Supply voltage: +10 ... +30 V DC
3	V-	black	Supply voltage: 0 V
4	CAN_H	white	CAN bus signal
5	CAN_L	blue	CAN bus signal
Thread	FE	Shield	Cable shield (housing)

Table 7: Description socket CANopen® output

### 7.4.4 Connection diagram CANopen® input

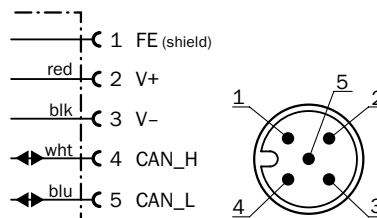


Fig. 25: Connection diagram CANopen® input, plug M12, 5-pin, A-coded

Contact	Marking	Wire color	Description
1	FE	Shield	Cable shield
2	V+	red	Supply voltage: +10 ... +30 V DC
3	V-	black	Supply voltage: 0 V
4	CAN_H	white	CAN bus signal
5	CAN_L	blue	CAN bus signal
Thread	FE	Shield	Cable shield (housing)

Table 8: Description plug CANopen® input

## Operation at the measuring device

---

# 8 Operation at the measuring device

### Damage to operation



#### ATTENTION!

#### Damage to the buttons by incorrect handling!

Incorrect handling of the keys may damage the keys. Operation is made difficult or impossible by this.

Therefore:

- Only operate keys with your fingers or a pointer.
  - Do not operate buttons with pointed or hard objects.
- 

## 8.1 Measured value display

Once the measuring device is supplied with voltage, the display will indicate the current measurement value.

## 8.2 Choose parameter

Choose a menu, a parameter or an option using the keys **Set** and **▼**. The menu path is indicated in the respective chapter.

→ For the entire menu structure, see page 137, chapter 16.

## 8.3 Choose option

1. Use the keys **Set** and **▼** to select the desired parameter.
2. Use the key **▼** or **▲** to select the desired option.
3. Perform one of the following steps:
  - Push the key **Set** to save the changes.
  - Push the key **Esc** to cancel the process. The parameter name is displayed again.
4. Perform one of the following steps to return to the measured value display:
  - Push the key **Esc** until the measured value is displayed again.
  - Wait for approx. 2 minutes. The display automatically switches back to measured value display without operation of a key. Any settings made are also saved.

## 8.4 Change value

1. Use the keys **Set** and **▼** to select the desired parameter.
2. Push the key **Set**. The current value of the parameter is displayed. The first figure on the left flashes.
3. Push the key **▲** to increase the figure. Push the key **▼** to reduce the figure.
4. Push the key **Set** to save the figure entered. The next figure flashes. Push the key **Esc** to cancel the process.
5. Repeat the steps 3 and 4 until the last figure is saved. The parameter name is displayed.
6. Push the key **Esc** until the measured value is displayed again. Alternatively, you may also wait for a few minutes. The display automatically switches back to measured value display without operation of a key.

## 8.5 Parameter description

### 8.5.1 Main menu

The measurement value is displayed by default:

Use the **▼**-key to get from the measured value display to the display "Level Bargraph". Use the keys **▼** and **▲** to browse within the main menu.

Push the **Set**-key for at least 2 seconds to get to the "Menu".

Display	Description
Measurement value	Measurement value display in mm
Level Bargraph	Level display (damping value) as bargraph
Level numeric	Level display (damping value) as numeric value → Also see page 32, Table 4.
Temperature	Display of indoor temperature of the measuring device
Operating hours counter	Operating hours display
Warnings	Display of the pending warnings. When a warning is pending, the LED <b>PWR</b> flashes orange. When no warnings are pending, no warnings are displayed. → Also see page 122, chapter 12.2, list of possible warnings.
Error	Display of the pending warnings. When an error is pending, the LED <b>PWR</b> flashes red. When no errors are pending, no errors are displayed. → Also see page 122, chapter 12.3, list of possible errors.

Table 9: Main menu

## Operation at the measuring device

### 8.5.2 Menu „SwVers“

The menu "SwVers" shows all information on the software.

You can get to the menu "SwVers" via the menu path:

Main menu → **Set** → Menu → **▼** → SwVers

Push the **Set**-key so that the parameter "App-uC" is displayed.

Use the keys **▼** and **▲** to browse within the menu. Push the **Set**-key to display the respective parameter value.

Parameter	Description
App-uC	Display of the version of the application processor
FPGA	Display of the version of the Field Programmable Gate Array
Com-uC	Display of the version of the communication processor

Table 10: Menu "SwVers"

### 8.5.3 Menu „HwVers“

The menu "HwVers" shows all information on the hardware.

You can get to the menu "HwVers" via the menu path:

Main menu → **Set** → Menu → **▼** → SwVers → **▼** → HwVers

Push the **Set**-key so that the parameter "HwVers" is displayed.

Parameter	Description
HwVers	Version number display

Table 11: Menu "HwVers"

For approval  
Zur Prüfung

### 8.5.4 Menu „CANopen®“

Use the menu "CANopn" to parametrize the CANopen® interface.

You can get to the menu "CANopn" via the menu path:

Main menu → **(Set)** → Menu → **(Set)** → CANopn

Push the **(Set)**-key so that the parameter "NodeID" is displayed.

Use the keys **(V)** and **(^)** to browse within the menu.

Parameter	Description
NodeID	<p>Set Node-ID for the CANopen device. → For further information regarding data formats see page 74, chapter 10.3.</p> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 6</li> </ul>
Baud	<p>Set baud rate for the device.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• 125k</li> <li>• 250k</li> <li>• 500k</li> <li>• 800k</li> <li>• 1000k</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 500k</li> </ul>
ResDst	<p>Choose resolution for the output value "Distance" via the digital data interface. The parameter does not influence the measurement value displayed.</p> <p><b>Prerequisite</b></p> <p>The parameter is only displayed if the option "Yes" is selected for the parameter "more".</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• 0.1</li> <li>• 0.125</li> <li>• 1.0</li> <li>• 10.0</li> <li>• 100.0</li> <li>• ModDef</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 0.1 mm</li> </ul> <p><i>Note: ModDef = Module Defined → See page 105, chapter 10.11.4.</i></p>

## Operation at the measuring device

### Menu “CANopn” (continued)

Parameter	Description
ResSpd	<p>Choose resolution for the output value "Speed" via the digital data interface. The parameter does not influence the measurement value displayed.</p> <ul style="list-style-type: none"> <li>• 0.1</li> <li>• 1.0</li> <li>• 10.0</li> <li>• 100.0</li> <li>• ModeDef</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 1 mm/s</li> </ul> <p><i>Note: ModDef = Module Defined → See page 105, chapter 10.11.4.</i></p>

Table 12: Menu “CANopn”

### 8.5.5 Menu „more“

Use the menu "More" to activate and deactivate the expanded menu view.

You can get to the menu "More" via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn →  → more

Push the **Set**-key. The currently set option is displayed here.

Options	Description
Yes / No	<p>Activate and deactivate expanded menu view.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• No</li> </ul>

Table 13: Menu "More"

For approval  
Zur Prüfung

### 8.5.6 Menu „MFx On“

Use this menu to activate and deactivate the multifunction input/output MF1 and the multifunction output MF2.

You can get to the menu "MFx On" via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn → **✓** → more → **✓** → MFx On.

Push the **Set**-key. The currently set option is displayed here.

#### Requirements for the display

- Menu "more": Option "Yes"

Options	Description
Enable / Disable	<p>Activate or deactivate multifunction input/output MF1 and multifunction output MF2</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• Enable: Multifunction input/output MF1 and multifunction output MF2 are activated.</li> <li>• Disable: Multifunction input/output MF1 and multifunction output MF2 are deactivated.</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Enable</li> </ul>

Table 14: Menu "MFx On"

For approval  
Zur Prüfung

## Operation at the measuring device

### 8.5.7 Menu „MF1“

This menu and the associated submenus can be used to set parameters for the multifunction input/output MF1.

You can get to the menu "MF1" via the menu path:

Main menu → **Set** → Menu → **Set** → CANOpn → **▼** → more → **▼** → MFx On → **▼** → MF1.

Push the **Set**-key so that the parameter "ActSta" is displayed.

Use the keys **▼** and **▲** to browse within the menu. Push the **Set**-key to display the respective parameter value.

#### Requirements for the display

- Menu "more": Option "Yes"
- Menu "MFx On": Option "Enable"

Parameter	Description
ActSta	Select level or flank of the multifunction input/output MF1. <b>Options</b> <ul style="list-style-type: none"> <li>• ActLow: LOW-level at active output (normally closed/NC) or activation of the input at dropping flank</li> <li>• ActHi: HIGH-level at active output (normally open/NO) or activation of the input at rising flank</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• ActLow</li> </ul>
Functn	Select function for the multifunction input/output. Depending on the selection, the corresponding submenu is displayed. <b>Options</b> <ul style="list-style-type: none"> <li>• Dist: MF1 is used as distance switching output.</li> <li>• Speed: MF1 is used as speed switching output.</li> <li>• Srvce: MF1 is used as service output.</li> <li>• LsrOff: MF1 is used as input to deactivate the laser.</li> <li>• Preset: MF1 is used as input for activation of the preset (overwriting the offset). Offset = Preset value - current measured value.</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• Dist</li> </ul>
Dist / Speed Srvce / LsrOff / Preset	Depending on the selection for the parameter "Functn", the corresponding submenu is displayed. For parameter description, see the respective table.  No further submenu is displayed for the option "LsrOff". When the multifunction input MF1 is active, the laser is switched off.
Count	Counts the switching events of the multifunction input/output. The counter is reset by deactivation and activation of the distance measuring device.

Table 15: Menu "MF1"



### 8.5.8 Submenu „MF1 – Dist“

This submenu is used to parameterize the multifunction output MF1 as distance switching output.

You can get to the menu "Dist" via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn →  → more →  → MFx On →  → MF1 → **Set** → ActSta →  → Functn →  → Dist

Requirements for the display

- Menu "more": Option "Yes"
- Menu "MFx On": Option "Enable"
- Parameter "Functn": Option "Dist"

Parameter	Description
Limit	Set distance-dependent switching threshold
Hysteresis	Set Hysteresis for the switching threshold

Table 16: Submenu "MF1 – Dist"

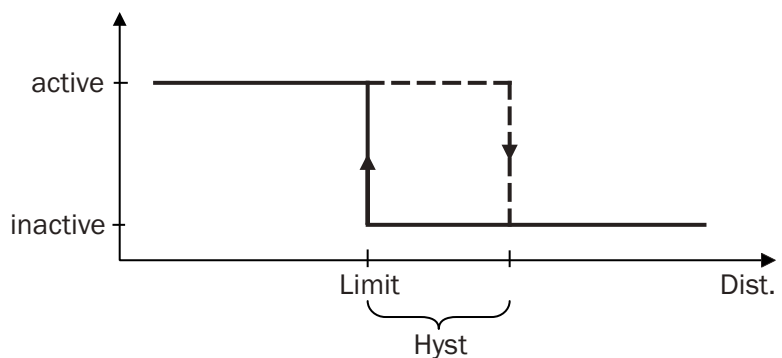


Fig. 26: Displaying the function "Dist."

Limit: Distance-dependent switching threshold

Hyst: Switching threshold hysteresis

Dist: Measured distance

## Operation at the measuring device

### 8.5.9 Submenu „MF1 – Speed“

This submenu is used to parameterize the multifunction output MF1 as speed output.

You can get to the menu "Speed" via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn → **▼** → more → **▼** → MFx On → **▼** → MF1 → **Set** → ActSta → **▼** → Functn → **▼** → Speed

Requirements for the display

- Menu "more": Option "Yes"
- Menu "MFx On": Option "Enable"
- Parameter "Functn": Option "Speed"

Parameter	Description
Limit	<p>Set speed for the switching threshold The switching output is activated when the current speed exceeds the set speed. The switching hysteresis is set firmly to <math>\pm 0.1</math>m/s.</p> <p><b>Adjustment range</b></p> <p>Range 0.0 ... 9.9 m/s</p> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 0 [mm]</li> </ul>
Sign	<p>Choose the travel direction to be monitored.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• + / -: Once the set speed is exceeded in one direction, the switching output is activated.</li> <li>• +: Once the set speed is exceeded with increasing distance, the switching output is activated.</li> <li>• -: Once the set speed is exceeded with decreasing distance, the switching output is activated.</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• + / -</li> </ul>

Table 17: Submenu "MF1 – Speed"

For approval  
Zur Prüfung

### 8.5.10 Submenu „MF1 – Srvce“

This submenu is used to parameterize the multifunction output MF1 as service output. You may activate (on) or deactivate (off) several options.

You can get to the menu "Srvce" via the menu path:

Main menu → **(Set)** → Menu → **(Set)** → CANopn → **(V)** → more → **(V)** → MFx On → **(V)** → MF1 → **(Set)** → ActSta → **(V)** → Functn → **(V)** → Srvce

Requirements for the display

- Menu "more": Option "Yes"
- Menu "MFx On": Option "Enable"
- Parameter "Functn": Option "Srvce"

Parameter	Description
WrnLsr	<p>Activating and deactivating warning messages when the measuring device must be replaced soon because the laser ages.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• On</li> <li>• Off</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>
WrnLvl	<p>Activate or deactivate warning messages when the damping value is undercut, e.g. at contamination.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• On</li> <li>• Off</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>
WrnTemp	<p>Activate or deactivate warning message when the inner temperature of the measuring device is outside of the permissible thresholds.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• On</li> <li>• Off</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>
WrnPlb	<p>Activate or deactivate warning when the measurement value is not plausible. Possible reasons may be incorrect measurements, interruption of the light beam, optical interferences or electrical interferences.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• On</li> <li>• Off</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>

## Operation at the measuring device

### Submenu "MF1 – Srvce" (continued)

Parameter	Description
NotRdy	<p>Activate or deactivate warning when the laser is not ready for operation. Possible causes may be hardware faults or the laser being switched off. This warning message is also output during initialization.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• On</li> <li>• Off</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>
Heat	<p>Activate or deactivate warning when the heating is switched on. This parameter is only displayed for measuring devices with the option "Heating".</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• On</li> <li>• Off</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>

Table 18: Submenu "MF1 – Srvce"

### 8.5.11 Submenu „Preset“ – move to initialization position

#### Description

The function "Preset" permits automation of initialization of shelf supply devices and other rail-bound vehicles during maintenance, commissioning or exchange.

During initialization, the desired output value is set in a defined position (initialization position) (Preset).

This submenu is used to parameterize the multifunction input MF1 as "Preset function".



**NOTE!**

When activating the "Preset", the measured value output of the distance measuring device is not available for a short time. We recommend performing the "Preset" in standstill or at very low speeds. The maximum activation time is typically at 10000 cycles.

For approval  
Zur Prüfung

**Submenu “MF1 – Preset”**

Main menu → **Set** → Menu → **Set** → CANopn → **▼** → more → **▼** → MFx On → **▼** → MF1 → **Set** → ActSta → **▼** → Functn → **▼** → Preset

Requirements for the display

- Menu "More" Option "On"
- Menu "MFx On": Option "Enable"
- Parameter "Functn": Option "Preset"

Parameter	Description
sPreset	<p>The preset serves as initialization value. When the multifunction input MF1 is activated, the preset is used.</p> <p><b>Adjustment range</b></p> <ul style="list-style-type: none"> <li>• -300000 ... + 300000</li> </ul> <p>Since the display only has six digits, you may only enter negative values up to "-99999" in the display.</p> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 10</li> </ul>

Table 19: Submenu "MF1 – Preset"

**Set Preset**

1. Select the function "Preset" for the multifunction input MF1
2. Enter the parameter "Preset" for the desired initialization value.
3. Move the vehicle to the initialization position.
4. Activate the multifunction input MF1, e.g. via a proximity initiator, photoelectric sensor or switch.
5. The output value of the distance measuring device corresponds to the value set for "Preset" at the initialization position.

For approval  
Zur Prüfung

## Operation at the measuring device

### 8.5.12 Menu „MF2“

This menu and the associated submenus can be used to set parameters for the multifunction output MF2.

You can get to the menu "MF2" via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn → **▼** → more → **▼** → MFx On → **▼** → MF1 → **▼** → MF2

Push the **Set** key so that the parameter "ActSta" is displayed.

Use the keys **▼** and **▲** to browse within the menu. Push the **Set** key to display the respective parameter value.

#### Requirements for the display

- Menu "more": Option "Yes"
- Menu "MFx On": Option "Enable"

Parameter	Description
ActSta	Select multifunction output level MF2.  <b>Options</b> <ul style="list-style-type: none"> <li>• ActLow: LOW-level at active output (opener/NC)</li> <li>• ActHi: HIGH-level at active output (closer/NO)</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• ActLow</li> </ul>
Functn	Select function for the multifunction output. Depending on the selection, the corresponding submenu is displayed.  <b>Options</b> <ul style="list-style-type: none"> <li>• Dist</li> <li>• Srvce</li> <li>• Speed</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• Dist</li> </ul>
Dist / Srvce / Speed	Depending on the selection for the parameter "Functn", the corresponding submenu is displayed. For parameter description, see the respective table.
Count	No further submenu is displayed for the option "LsrOff". When the multifunction input MF1 is active, the laser is switched off.

Table 20: Menu "MF2"

#### Submenu "MF2 – Dist"

This submenu corresponds to the submenu "Dist" in the menu "MF1".  
→ Also see page 49, Table 16.

#### Submenu "MF2 – Speed"

This submenu corresponds to the submenu "Speed" in the menu "MF1".  
→ Also see page 50, Table 17.

#### Submenu "MF2 – Srvce"

This submenu corresponds to the submenu "Srvce" in the menu "MF1".  
→ Also see page 52, Table 18.

### 8.5.13 Menu „Offset“

Set an offset via this menu.

You can get to the menu "Offset" via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn → **▼** → more → **▼** → MFx On → **▼** → (MF1 → **▼** → MF2 → **▼**) → Offset

Push the **Set** key. The currently set offset is displayed here.

#### Requirements for the display

- Menu "more": Option "Yes"

Value	Description
Offset	<p>Specify offset. The offset is added to the internally determined measurement value. The offset affects all outputs and the display indication.</p> <p>When the "Preset" function is activated, the offset is overwritten by triggering of the preset input.</p> <p><b>Adjustment range</b></p> <ul style="list-style-type: none"> <li>• -300000 ... +300.000 mm</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 0 [mm]</li> </ul>

Table 21: Menu "Offset"

### 8.5.14 Menu “SpecFu”

Set special functions via this menu.

You can get to the menu “SpecFu” via the menu path:

Main menu → **Set** → Menu → **Set** → CANopn → **▼** → more → **▼** → MFx On → **▼** → (MF1 → **▼** → MF2 → **▼**) → Offset → **▼** → SpecFu

Push the **Set** key so that the parameter “AvgDst” is displayed.

Use the keys **▼** and **▲** to browse within the menu.

#### Requirements for the display

- Menu “more”: Option “Yes”

Parameter	Description
AvgDst	<p>Select filter depth for the distance values.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• Medium</li> <li>• Slow</li> <li>• Fast</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Medium</li> </ul> <p><i>Note: Medium and Fast use the same averaging depth.</i></p>

## Operation at the measuring device

### Menu “SpecFu” (continued)

Parameter	Description
AvgSpd	<p>Select filter depth for the speed values.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• Medium</li> <li>• Slow</li> <li>• Fast</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Medium</li> </ul>
ErrRej	<p>Select time for error suppression. During this time, the old measurement value is output. When there still is no valid measurement value after the time selected for the parameter "ErrRej", the value "0" is output.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• 200ms: Error/warning is indicted when the error is present for longer than 200 ms.</li> <li>• 50ms: Error/warning is indicted when the error is present for longer than 50 ms.</li> <li>• Off Error/warning is indicated at once, without delay.</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 200ms</li> </ul>
Heat	<p><b>Requirements for the display</b></p> <ul style="list-style-type: none"> <li>• Only for versions with heating DL100-xxHxxxx</li> </ul> <p>This menu is used to set the temperature at which the heating is to activate. The hysteresis is set firmly to 2 K.</p> <p><b>Adjustment range</b></p> <ul style="list-style-type: none"> <li>• -10 ... +40 °C</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• -10 °C</li> </ul>
FMode	<p><b>Requirements for the display</b></p> <ul style="list-style-type: none"> <li>• Only for versions with frequency switching DL100-xxxBxxxx</li> </ul> <p>Select frequency range Frequency switching may be required at parallel placement of several distance measuring devices. → also see page 29, chapter 6.4.</p> <p><b>Options</b></p> <ul style="list-style-type: none"> <li>• Mode 1</li> <li>• Mode 2</li> <li>• Mode 3</li> <li>• Mode 4</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Mode 1</li> </ul>
Reset	Perform reset → see page 57, chapter 8.6.

Table 22: Menu “SpecFu”



## 8.6 Perform reset

1. Select the parameter "Reset" in the menu "SpecFu".  
→ See page 55, chapter
2. Push the key **Set**.
3. The safety request "Sure?" is displayed.
4. Push the button **Set** to reset the measuring device to the delivery state.  
Push the key **Esc** to cancel the process.

For approval  
Zur Prüfung

## Operation via Ethernet (Ethernet interface)

# 9 Operation via Ethernet (Ethernet interface)

You may parameterize the distance measuring device via the Ethernet interface with the SICK configuration software SOPAS ET.



**NOTE!**

*Parallel operation of CANopen fieldbus and SOPAS ET is not recommended, since SOPAS ET may impair the real-time capability of the CANopen fieldbus.*



**NOTE!**

*The configuration program SOPAS ET can be downloaded from "www.sick.com".*

## 9.1 IP-network configuration

### IP-network configuration – delivery configuration

The distance measuring device is delivered with the following IP-network configuration:

- Static IP-address
- IP-address: 192.168.100.236
- IP-network mask: 255.255.255.0
- Standard gateway: 192.168.250.100
- DHCP is off.

### Invalid IP-network configuration

If the system detects an invalid IP-network configuration then the delivery-state configuration is used instead.

### IP-address assigned by DHCP server

You may specify that the IP-addresses are assigned by a DHCP server.

If address assignment by the DHCP server fails, the distance measuring device uses the last static IP-address set. If no static IP-address has been set yet or if this address is invalid (IP-address 0.0.0.0), the delivery configuration is used instead. This process may take a few minutes.

The following causes for failed address assignment by the DHCP server are possible:

- No DHCP server present.
- The DHCP server has an interference.
- The DHCP server was not yet ready when the distance measuring device was switched on.
- The network connection has an interference.

## 9.2 Ethernet parameter list

### 9.2.1 Device information

#### Field "Device information"

Parameter	Description
Device type	Display of the device type <b>Read/Write access</b> • Read only
Serial number	Display of the device's serial number <b>Read/Write access</b> • Read only

Table 23: Page "Device information" – field "Device information"

#### Field "Product code"

Parameter	Description
Product code	Display of the product code <b>Read/Write access</b> • Read only

Table 24: Page "Device information" – field "Product code"

#### Field "Software Versions"

Parameter	Description
Application controller	Display of the version of the application processor <b>Read/Write access</b> • Read only
Communications controller	Indication of the version of the communication processor <b>Read/Write access</b> • Read only
FPGA	Display of the version of the Field Programmable Gate Array <b>Read/Write access</b> • Read only

Table 25: Page "Device information" – field "Software version"

#### Field "Hardware Version"

Parameter	Description
Hardware Version	Displaying the hardware version <b>Read/Write access</b> • Read only

Table 26: Page "Device information" – field "Hardware version"

## Operation via Ethernet (Ethernet interface)

### 9.2.2 User information



**NOTE!**

Changes on the page "User information only take permanent effect if they are stored via the button "Storage" in the field "Store user information".

#### Field "Device name"

Parameter	Description
Name	Enter optional device name for device identification.  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• Empty</li> </ul>

Table 27: Page "User information" – field "Device name"

#### Field "User information"

Parameter	Description
User information 1	Enter optional user information  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• Empty</li> </ul>
User information 2	→ See parameter "User input 1".
User information 2	→ See parameter "User input 1".

Table 28: Page "Device information" – field "User information"

#### Field "Store user information"

Parameter	Description
Storage	You may only enter user information at the user level "Maintenance". This requires the password "esick".  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Write only</li> </ul>

Table 29: Page "User information" – field "Store user information"

For approval  
Zur Prüfung

### 9.2.3 Measurement values

#### Field "Distance value"

Parameter	Description
X-Scale	Enter X-axis for graphic display of the distance value. <b>Read/Write access</b> • Read and write <b>Unit</b> • s
Y min / Y max	Enter minimum and maximum value for the Y-axis. <b>Read/Write access</b> • Read and write <b>Unit</b> • m
Auto-Scale Y	Click the button "Auto-Scale Y" to adjust the display to the current measurement values. <b>Read/Write access</b> • Read and write <b>Unit</b> • m

Table 30: Page "Measured data" – field "Distance value"

#### Field "Measurement values"

Parameter	Description
Distance	Measurement value "Distance" after filter, corrections and offset <b>Read/Write access</b> • Read only <b>Unit</b> • m
Velocity	Measurement value "Speed" <b>Read/Write access</b> • Read only <b>Unit</b> • m/s
Acceleration	Measurement value "Acceleration" <b>Read/Write access</b> • Read only <b>Unit</b> • m/s <sup>2</sup>

Table 31: Page "Measured data" – field "Measurement values"

## Operation via Ethernet (Ethernet interface)

### 9.2.4 Diagnostic data

Field	Description
Device state	Display device status: ready for operation, warning(s) active, error active, laser activated, MF1 active and MF2 active  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read only</li> </ul>
Device warning	Display of current warnings: Laser, temperature, level and plausibility  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read only</li> </ul>
Device error	Display of current errors: Laser, temperature, level and plausibility  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read only</li> </ul>
Level	Display of the current reception level (damping value)  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read only</li> </ul>
Temperature	Display of current internal device temperature  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read only</li> </ul> <b>Unit</b> <ul style="list-style-type: none"> <li>• °C</li> </ul>
Operating hours	Display of current operating hours  <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read only</li> </ul> <b>Unit</b> <ul style="list-style-type: none"> <li>• h</li> </ul>

Table 32: Page “Diagnostic data”

For approval  
Zur Prüfung

### 9.2.5 Parameter settings

#### Field "General settings"

Parameter	Description
Distance offset	<p>Specify offset value for the distance measurement value.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• -300000 ... 300000</li> </ul> <p><b>Unit</b></p> <ul style="list-style-type: none"> <li>• mm</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 0</li> </ul>
Preset	<p>Specify present value for the distance measurement value.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• -300000 ... 300000</li> </ul> <p><b>Unit</b></p> <ul style="list-style-type: none"> <li>• mm</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 0</li> </ul>

Table 33: Page "Parameter settings" – field "General settings"

For approval  
Zur Prüfung

## Operation via Ethernet (Ethernet interface)

### Field "Measurement value resolution"

Parameter	Description
Distance resolution	<p>Choose resolution for the output value "Distance". The measurement value is multiplied with the resolution. The parameter does not influence the measurement value displayed.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0.1 / 0.125 / 1.0 / 10.0 / 100.0 / ModDef</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 0.1 mm</li> </ul> <p><i>Note: ModDef = Module Defined → See page 105, chapter 10.11.4.</i></p>
Resolution speed	<p>Choose resolution for the output value "Speed". The measurement value is multiplied with the resolution. The parameter does not influence the measurement value displayed.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0.1 / 1.0 / 10.0 / 100.0 / ModDef</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 1 mm/s</li> </ul> <p><i>Note: ModDef = Module Defined → See page 105, chapter 10.11.4.</i></p>

Table 34: Page "Parameter settings" – field "Measured value resolution"

### Set Node-ID

→ See page 74, chapter 10.3.

### Set baud rate

→ See page 76, chapter 10.4.

### Field "MF1/MF2 activation"

Parameter	Description
MF activation	<p>Activate and deactivate multifunction input and output MF1 and multifunction output MF2.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: off / 1: on</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• On</li> </ul>

Table 35: Page "Parameter settings" – field "MF1/MF2 activation"



**Field "MF1 Function configuration"**

**Requirements for the display**

- Parameter "MF1 activation": Option "Enable"

Parameter	Description
Function	<p>Select function for multifunction input and output MF1.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: Distance: → See page 66, field "MF1, Threshold distance underflow"</li> <li>• 1: Velocity: → See page 66, field "MF1, Threshold velocity exceeded"</li> <li>• 2: Service: → See page 67, field "MF1, Service configuration"</li> <li>• 3: Laser</li> <li>• 4: Preset</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Distance</li> </ul>
Active condition	<p>Select level for the active condition for the multifunction input and output MF1.</p> <p>Read/Write access</p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: high / 1: low</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Low</li> </ul>

Table 36: Page "Parameter settings" – field "MF1 Function configuration"

For approval  
Zur Prüfung

## Operation via Ethernet (Ethernet interface)

### Field "MF1, Threshold distance underflow"

#### Requirements for the display

- Parameter "MF1 activation": Option "Enable"
- Parameter "Function": Option "Distance"

Parameter	Description
Threshold distance	Enter switching threshold for the multifunction output MF1. <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <b>Input value</b> <ul style="list-style-type: none"> <li>• -300000 ... 300000</li> </ul> <b>Unit</b> <ul style="list-style-type: none"> <li>• mm</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• 1990</li> </ul>
Hysteresis distance	Enter hysteresis for switching threshold for the multifunction output MF1. Read/Write access <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <b>Input value</b> <ul style="list-style-type: none"> <li>• 1 ... 300000</li> </ul> <b>Unit</b> <ul style="list-style-type: none"> <li>• mm</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• 10</li> </ul>

Table 37: Page "Parameter settings" – field "MF1, Threshold distance underflow"

### Field "MF1, Threshold velocity exceeded"

#### Requirements for the display

- Parameter "MF1 activation": Option "Enable"
- Parameter "Function": Option "Velocity"

Parameter	Description
Threshold velocity	Enter switching threshold for the multifunction output MF1. <b>Read/Write access</b> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <b>Input value</b> <ul style="list-style-type: none"> <li>• 0 ... 15000</li> </ul> <b>Unit</b> <ul style="list-style-type: none"> <li>• mm/s</li> </ul> <b>Factory setting</b> <ul style="list-style-type: none"> <li>• 5000</li> </ul>

For approval  
Zur Prüfung

## Operation via Ethernet (Ethernet interface)

### Field "MF1, Threshold velocity exceeded" (continued)

Parameter	Description
Distance change	<p>Choose the travel direction to be monitored.</p> <p>Read/Write access</p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: Increasing (positive values) / 1: decreasing (negative values) / 2: increasing and decreasing</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• increasing and decreasing</li> </ul>

Table 38: Page "Parameter settings" – field "MF1, Threshold velocity exceeded"

### Field "MF1, Service configuration"

#### Requirements for the display

- Parameter "MF1 activation": Option "Enable"
- Parameter "Function": Option "Service"

Parameter	Description
Configuration device monitoring	<p>Activating and deactivating warning messages. When the event for the warning message occurs, the multifunction switching output MF1 switches.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <p>You may activate several warning messages at once.</p> <ul style="list-style-type: none"> <li>• Warning measurement stability</li> <li>• Warning level</li> <li>• Warning laser</li> <li>• Warning temperature</li> <li>• Device not ready</li> <li>• Heater state (for device model with heating)</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• The warning messages "Measurement stability", "Level", "Laser", "Temperature" and "Device not ready" are activated. The message "Heater state" is deactivated.</li> </ul>

Table 39: Page "Parameter settings" – field "MF1, Service configuration"

For approval  
Zur Prüfung

## Operation via Ethernet (Ethernet interface)

### Field "MF2 Function configuration" Requirements for the display

- Parameter "MF2 activation": Option "Enable"

Parameter	Description
Function	Select function for the multifunction MF2 output. <b>Read/Write access</b> • Read and write <b>Input value</b> • 0: Distance / 1: Velocity / 2: Service <b>Factory setting</b> • Service
Active state	Select level for the active condition for the multifunction output MF2.  Read/Write access • Read and write <b>Input value</b> • 0: high / 1: low <b>Factory setting</b> • Low

Table 40: Page "Parameter settings" – field "MF2 Function configuration"

### Field "MF2, Threshold distance underflow"

→ See page 66, Table 37, "MF1, Threshold distance underflow"

### Field "MF2, Threshold velocity exceeded"

→ See page 67, Table 38, "MF1, Threshold velocity exceeded"

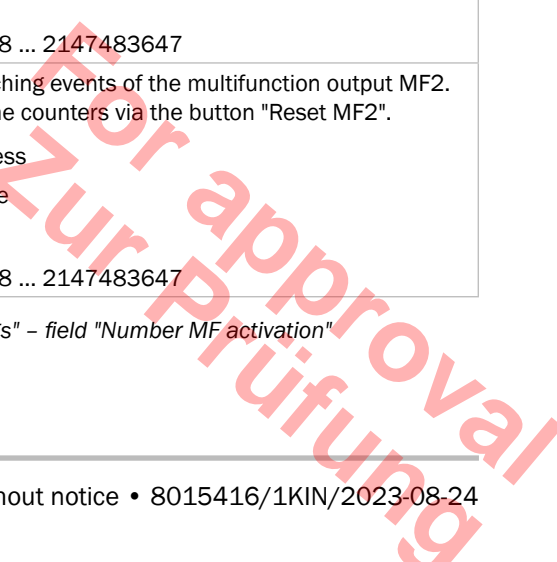
### Field "MF2, Service configuration"

→ See page 67, Table 39, "MF1, Service configuration"

### Field "Number of MF activation"

Parameter	Description
MF1	Counts the switching events of the multifunction input and output MF1. You may reset the counters via the button "Reset MF1". <b>Read/Write access</b> • Read and write <b>Input value</b> • -2147483648 ... 2147483647
M2	Counts the switching events of the multifunction output MF2. You may reset the counters via the button "Reset MF2".  Read/Write access • Read and write <b>Input value</b> • -2147483648 ... 2147483647

Table 41: Page "Parameter settings" – field "Number MF activation"



## Operation via Ethernet (Ethernet interface)

### Field "Advanced device functions"

Parameter	Description
Average filter distance	<p>Select filter depth for the distance values.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: fast / 1: medium / 2: slow</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Medium</li> </ul> <p><i>Note: Medium and Fast use the same averaging depth.</i></p>
Average filter velocity	<p>Select filter depth for the speed values.</p> <p>Read/Write access</p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: fast / 1: medium / 2: slow</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• Medium</li> </ul>
Error rejection	<p>Select time for error suppression. If there is an error, the measurement value is indicated as "0".</p> <p>Read/Write access</p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: off / 1: 50 ms / 2: 200 ms</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• 200 ms</li> </ul>

Table 42: Page "Parameter settings" – field "Advanced device function"

### Field "Heater"

#### Requirements for the display

- Devices with the option "Heating" (DL100-xxHxxxx)

Parameter	Description
Heater threshold	<p>Enter power up threshold for heating.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• -10 ... +40</li> </ul> <p><b>Unit</b></p> <ul style="list-style-type: none"> <li>• °C</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• -10</li> </ul>

Table 43: Page "Parameter settings" – field "Heater"

## Operation via Ethernet (Ethernet interface)

### Field "Frequency"

#### Requirements for the display

- Devices with the option "Frequency" (DL100-xxxBxxxx)

Parameter	Description
Frequency set	<p>Select frequency range.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Read and write</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>• 0: Mode 1 / 1: Mode 2 / 2: Mode 3 / 3: Mode 4</li> </ul> <p><b>Unit</b></p> <ul style="list-style-type: none"> <li>• °C</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>• -10</li> </ul>

Table 44: Page "Parameter settings" – field "Frequency"

### Field "Store parameter"

Parameter	Description
Storage	<p>Parameter changes only enter into permanent effect if they are saved via the button "Storage".</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Write only</li> </ul>

Table 45: Page "Parameter settings" – field "Store parameter"

### Field "Set parameters to default values"

Parameter	Description
Parameter Reset	<p>Click the button "Parameter Reset" to reset the parameters to factory settings.</p> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>• Write only</li> </ul>

Table 46: Page "Parameter settings" – field "Set parameters to default values"

For approval  
Zur Prüfung

**9.2.6 Methods**

Field	Description
Device reboot	<ul style="list-style-type: none"> <li>Click the button "Reboot" to cause the device to restart.</li> </ul> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>Write only</li> </ul>
Laser control	<p>Switch the laser on and off as follows:</p> <ul style="list-style-type: none"> <li>Use the selection button to select the desired option.</li> <li>Click the button to perform the option.</li> </ul> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>Write only</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>0: off / 1: on</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>Off</li> </ul>
Heating control	<p>Control the heating as follows:</p> <ul style="list-style-type: none"> <li>Use the selection button to select the desired option.</li> <li>Click the button to perform the option.</li> </ul> <p><b>Read/Write access</b></p> <ul style="list-style-type: none"> <li>Write only</li> </ul> <p><b>Input value</b></p> <ul style="list-style-type: none"> <li>0: Off / 1: On / 2: Auto</li> </ul> <p><b>Factory setting</b></p> <ul style="list-style-type: none"> <li>Auto</li> </ul>

Table 47: Page "Methods"

For approval  
Zur Prüfung

## CANopen®-interface

# 10 CANopen®-interface

## 10.1 Basics

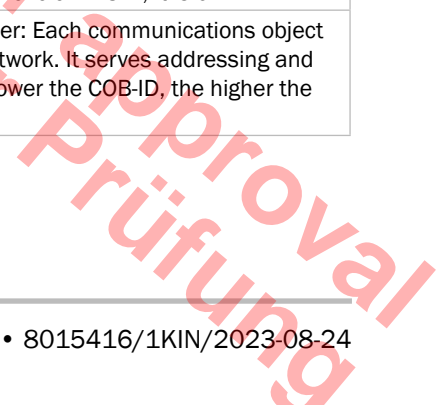
The communications standard CANopen® was defined as standardized application for distributed industrial automation systems based on CAN and CAL (CAN Application Layer). The user organization CiA® (CAN in Automation) has described CANopen® as a standard in detail, see [www.can-cia.org](http://www.can-cia.org).

The CANopen®-bus permits:

- Access to device and communications parameters
- Synchronisation of several devices
- Configuration of the network (LSS)
- Cyclical and/or acyclical process data traffic.

### Explanation of terms

Abbreviation	Explanation
PDO	Process Data Object: Used for real-time transfer of process data.
SDO	Service Data Object: Permits writing and reading access to the object directories
SYNC	Synchronization Object: Serves synchronization of network subscribers (slaves)
EMCY	Emergency Object: Serves to display errors of a slave and/or the slave peripherals.
NMT	Network Management: used for internal CANopen® network control
LSS	Layer Setting Services: LSS: Permits configuration of the baud rate and Node-ID of all or individual slaves that are addressed via the Identity Object 1018h.
RTR	Layer Setting Services: Trigger type of PDOs
Node-ID	The Node-ID addresses the slave in the network and can be freely selected via the CANopen® bus between 1 and 127.
DLC	Data Length Code: Describes the length of a CANopen® telegram
ER	Error Register: Object 1001h, maintains the error condition of a device, bit-encoded
EEC	Emergency Error Code: A code that uniquely identifies the error is transmitted in the emergency telegram. This is the “Emergency error code“ that comprises of two bytes. A temperature error, for example, is described with 40xxh.
MSEF	Manufacture Specific Error Field: Four bytes that permit the manufacturer to describe the error code more precisely. If an emergency telegram does not have an MSEF, it is 0.
COB	Communication Object Identifier: Each communications object has a unique COB-ID in the network. It serves addressing and prioritisation of the PDOs. The lower the COB-ID, the higher the priority.





**Explanation of terms  
(continuation)**

Abbreviation	Explanation
EDS	Electronic Data Sheet: The EDS lists all objects, their supported baud rates, the manufacturer and lots of other information. The EDS is, however, only a template for the device and contains only the default value of an object. The master can set a slave to its default values via the EDS. EDS are also used as an exchange format between software tools.

Table 48: CANopen® specific settings

**10.2 Gerneral CANopen® installation notes**

**10.2.1 Topology**

The CAN network is designed as a line structure. We generally advise against drop lines because self-reflection may occur. If drop lines are required, observe the maximum values according to page 74, Table 49. A final resistor (terminator) of 120 Ohm must be connected to the ends of the bus line (trunk line).

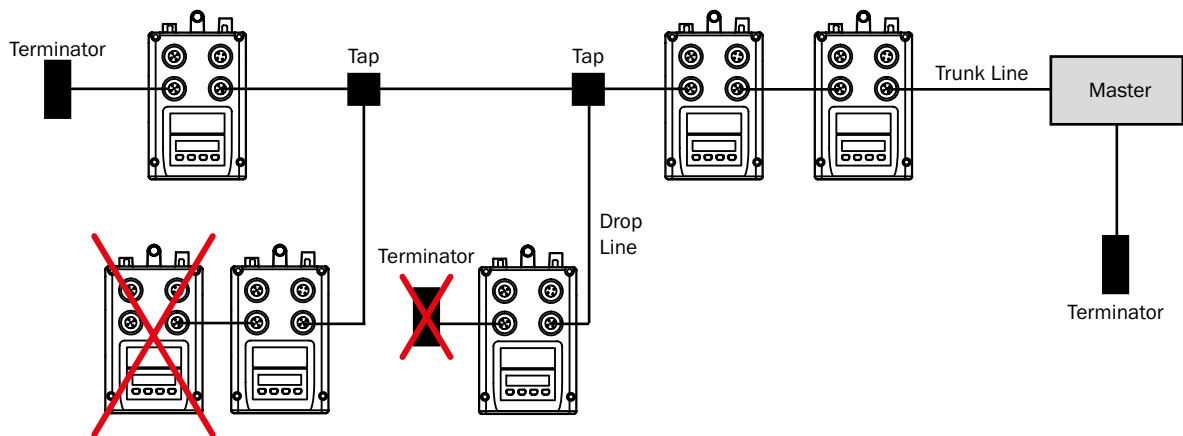


Fig. 27: CANopen® topology (example)

For approval  
Zur Prüfung

## CANopen®-interface

### 10.2.2 Baud rates, length of bus line (trunk line) and drop lines

The baud rate must be adjusted to the line length. The following baud rates are supported by the DL100.

To avoid signal reflections, the indicated line lengths should not be exceeded in drop lines.

Baud rate [kbit/s]	Maximum bus length [m]	Nominal bit time [µs]	Area of sample point [%]	Length of drop line [m]	Total length of all drop lines [m]
1000	25	1	75 ... 90	1.5	7.5
800	50	1.25	75 ... 90	2.5	12.5
500	100	2	85 ... 90	5.5	27.5
250	250 <sup>1)</sup>	4	85 ... 90	11	55
125	500 <sup>1)</sup>	8	85 ... 90	22	110

1) The internal overall delay of the device is considered as follows: 210 ns at 1 Mbit/s and 800 kbit/s, 310 ns (incl. 2 x 40 ns optocoupler) at 500 kbit/s and 250 kbit/s, 450 ns (incl. 2 x 100 ns optocoupler) at 125 kbit/s, 1.5 times this at ≤ 50 kbit/s

2) It is recommended to put the sample point as close as possible to 87.5 % of the bit time.

Table 49: Baud rate, length of bus line (trunk line) and drop lines

### 10.3 Address assignment (Node-ID)

The Node-ID of the device can be set via the display, SOPAS ET or via CANopen® LSS (Layer Setting Service). The default value for the Node-ID is 6.

#### 10.3.1 Setting the Node-ID via the display

1. Push the **Set**-key until „Menu“ is displayed.
2. Push the die **Set**-key three times. The display shows “NodeID”.
3. If required, use the key **▼** or **▲** to change the Node-ID.
4. Push the **Set**-key until “NodeID” is displayed again.
5. Leave the menu by pushing the **Esc**-key three times.

→ For the entire menu structure, see page 137, chapter 16.

#### 10.3.2 Setting the Node-ID via SOPAS ET

1. Select the parameter page in the menu tree. A dialog window is opened in the main widow.
2. Enter the Node-ID in grouping CANopen configuration.



The screenshot shows a dialog window titled "CANopen Configuration". It contains two input fields: "Node-ID" with the value "6" and "Baudrate" with a dropdown menu showing "500 kBd".

### 10.3.3 Setting the Node-ID via LSS

The following table shows an example for how to set the Node-ID to 4 (D1 = 04h) via LSS.

A power cycle is required after the input via LSS.

Dir	COB-ID	DLC	Com- mand D0	Index L-byte D1	Index H-byte D2	Subin- dex D3	Byte 0 L-byte D4	Byte 1 D5	Byte 2 D6	Byte 3 H-byte D7	Description
Master	07E5h	08h	04h	01h	00h	00h	00h	00h	00h	00h	lss switch_glob 1 Puts LSS network into configuration mode.
Slave	-	-	-	-	-	-	-	-	-	-	Note: There is no feed- back from the slave.
Master	07E5h	08h	11h	04h	00h	00h	00h	00h	00h	00h	LSS Set Node-ID (in this example Node-ID = 4).
Slave	07E4h	08h	11h	00h	00h	00h	00h	00h	00h	00h	Feedback of the com- mand LSS Set Node-ID (in this example Node- ID = 4).
Master	07E5h	08h	17h	00h	00h	00h	00h	00h	00h	00h	Saves the setting.
Slave	07E4h	08h	17h	00h	00h	00h	00h	00h	00h	00h	Feedback that the set- ting has been saved.
Master	07E5h	08h	04h	00h	00h	00h	00h	00h	00h	00h	lss switch_glob 0 Puts LSS network into con- figuration mode.
Slave	-	-	-	-	-	-	-	-	-	-	Note: There is no feed- back from the slave.

Table 50: Input via LSS

For approval  
Zur Prüfung

## CANopen®-interface

### 10.4 Baud rate setting

The DL100 supports the following baud rates:

- 125 kBit/s
- 250 kBit/s
- 500 kBit/s (default)
- 800 kBit/s
- 1000 kBit/s

The Node-ID of the device can be set via the display, SOPAS ET or via CANopen® LSS (Layer Setting Service).

#### 10.4.1 Setting the baud rate via the display

1. Push the **Set**-key until „Menu“ is displayed.
  2. Push the die **Set**-key three times. The display shows “NodeID”.
  3. Push the key **▼**. The display shows “Baud”.
  4. Push the **Set**-key. The set baud rate is displayed.
  5. If required, use the key **▼** or **▲** to change the Node-ID.
  6. Push the **Set**-key until “Baud” is displayed again.
  7. Leave the menu by pushing the **Esc**-key three times.
- For the entire menu structure, see page 137, chapter 16.

#### 10.4.2 Setting the baud rate via SOPAS ET

1. Select the parameter page in the menu tree. A dialog window is opened in the main widow.
2. Enter the Baud rate in grouping CANopen configuration.



**CANopen Configuration**

Node-ID  Baudrate

### 10.4.3 Setting the baud rate via LSS

The following table shows an example of how to set the baud rate to 125 kBd (Table Index = D1 = 04h) via LSS.

A power cycle is required after the input via LSS.

Dir	COB-ID	DLC	Command D0	Index L-byte D1	Index H-byte D2	Subindex D3	Byte 0 L-byte D4	Byte 1 D5	Byte 2 D6	Byte 3 H-byte D7	Description
Master	07E5h	08h	04h	01h	00h	00h	00h	00h	00h	00h	lss switch_glob 1 Puts LSS network into configuration mode.
Slave	-	-	-	-	-	-	-	-	-	-	Note: There is no feedback from the slave.
Master	07E5h	08h	13h	04h	00h	00h	00h	00h	00h	00h	lss set_bitrate  To set the baud rate, see page 78, Table 52. Table Index is illustrated in D1, Table Selection in D2. Table Selection always has to be 0.
Slave	07E4h	08h	13h	00h	00h	00h	00h	00h	00h	00h	Feedback of the command LSS set bit rate.
Master	07E5h	08h	17h	00h	00h	00h	00h	00h	00h	00h	Saves the setting.
Slave	07E4h	08h	17h	00h	00h	00h	00h	00h	00h	00h	
Master	07E5h	08h	04h	00h	00h	00h	00h	00h	00h	00h	lss switch_glob 0 Puts LSS network into configuration mode.
Master	07E5h	08h	04h	00h	00h	00h	00h	00h	00h	00h	lss switch_glob 0 Sets LSS network into operating mode.
Slave	-	-	-	-	-	-	-	-	-	-	Note: There is no feedback from the slave.

Table 51: Enter baud rate via LSS

## CANopen®-interface

Baud rate [kBd]	Table Index	Table Selection	Supported by DL100
1000	0	0	X
800	1	0	X
500	2	0	X
250	3	0	X
125	4	0	X
Reserve	5	0	-
50	6	0	-
20	7	0	-
10	8	0	-

Table 52: LSS Baud rates

## 10.5 General information on CANopen® communication

### 10.5.1 Communication profile CiA 301

The DL100 supports the communications profile CiA 301 in version 4.2.

### 10.5.2 Device profile CiA 406

The device profile is an encoder profile and permits a 1:1 exchange with devices that also use the device profile CiA 406. The device profile is structured in separate classes. The DL100 supports the device profile CiA 406 (Absolute Linear Encoder), Version 3.2, class 2.

### 10.5.3 Object directory

CANopen® is based on an object directory in which every object can be addressed via an index.

The object directory is structured in three different parts:

- Communications segment
- Manufacturer specific segment
- Device-specific segment

### 10.5.4 EDS file

You can download the EDS file online from "[www.sick.com/dl100](http://www.sick.com/dl100)".

### 10.5.5 Telegram setup

A CANopen® telegram comprises of the COB-ID, the data length (DLC) and up to 8 byte that are structured as follows:

- 1 byte command
- 2 byte index (Low Byte/ High Byte)
- 1 byte subindex
- 0 to 4 byte data.

COB-ID	DLC	Command	Index L-byte	Index H-byte	Subindex	Byte 0 L-byte	Byte 1	Byte 2	Byte 3 H-byte
		D0	D1	D2	D3	D4	D5	D6	D7

Table 53: Telegram setup

### 10.5.6 COB-ID

The COB-ID serves as identifier. It is the first part of the message. The COB-ID structure is illustrated in the following figure:

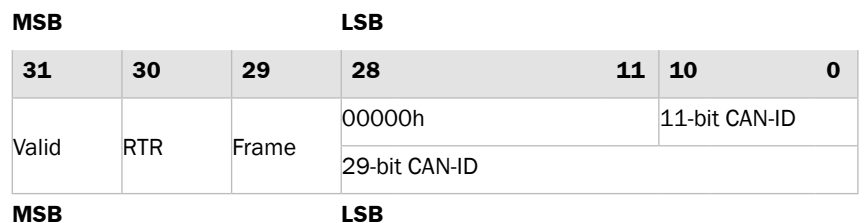


Fig. 28: Structure of the TPDO COB-ID

Bits	Value	Description
Valid	0b	PDO present/valid
	1b	PDO not present/not valid
RTR	0b	RTR permitted in this PDO
	1b	No RTR permitted in this PDO
Frame	0b	11-bit CAN-ID valid (CAN basis frame)
	1b	29-bit CAN-ID valid (expanded CAN frame)
29-bit CAN-ID	x	29-bit CAN-ID of the expanded CAN frame (CAN-specification 2.0 B)
11-bit CAN-ID	x	11-bit CAN-ID of the CAN basis frame (CAN-specification 2.0 A)

Table 54: Description of the individual bits within the COB-ID

## CANopen®-interface

### 10.5.7 Setup 11-bit CAN-ID



**NOTE!**

The DL100 supports only 11-Bit CAN-IDs.

The 11-bit CAN-ID is made up of the “Function code” and the Node-ID. It is part of the COB-ID.

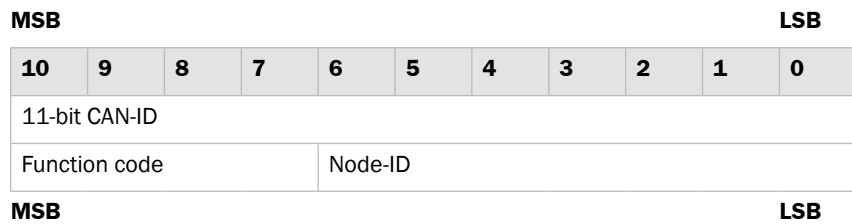


Fig. 29: Structure of the 11-bit CAN-ID

#### Example for SYNC object with NODE-ID 6

The SYNC object has the value 80h as identifier. The value for the Node-ID is added to the identifier. This leads to a CAN-ID with the value 86h, which is made up as follows:

- Function code: 0001b
- Node-ID: 0000110b

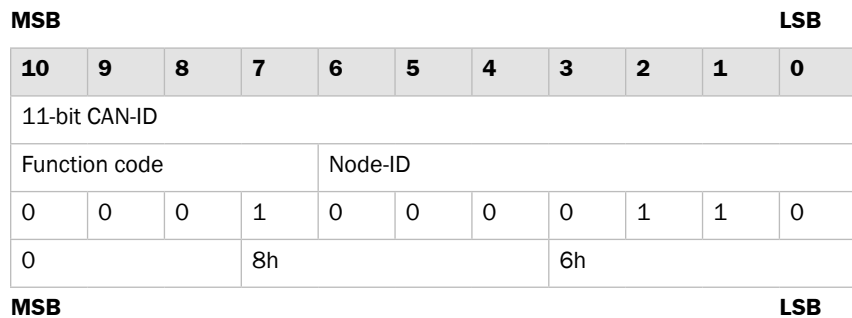


Fig. 30: Example SYNC object

For approval  
Zur Prüfung



### 10.5.8 Identifier priority

The lower the COB-ID, the higher the priority of the message. The following figures show the structure and priority of the CAN identifiers.

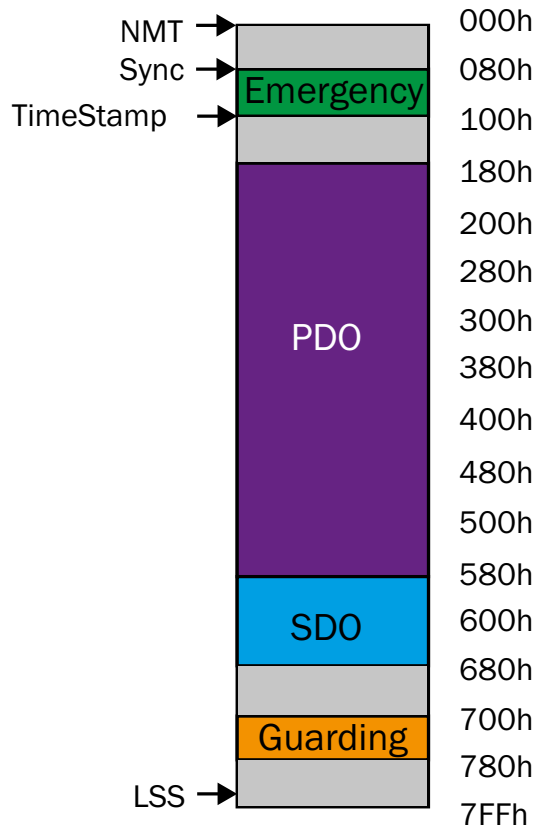


Fig. 31: COB-ID and priority

### 10.5.9 CANopen® services and CAN-IDs

The following table shows a detailed overview of the present services and the associated CAN-ID according to specification CiA 301. The illustration of the transfer direction (Rx/Tx) is always from the slave's view.

Identifier 11-bit (binary)	Identifier (decimal)	Identifier (hexadecimal)	Function
00000000000	0	0h	NMT
00000000001	1	1h	Global fail safe command
	2 - 112	2h - 70h	Not assigned
00001110001	113	71h	NMT master node-ID [Network redundancy] (Tx)/Active NMT
			Master detection and NMT flying master negotiation (Rx)
00001110010	114	72h	NMT flying master negotiation (Tx)
00001110011	115	73h	Active NMT master detection (Tx)

## CANopen®-interface

Identifier 11-bit (binary)	Identifier (decimal)	Identifier (hexadecimal)	Function
00001110100	116 – 117	74h – 75h	NMT master detection
00001110110	118	76h	Force NMT flying master negotiation (Tx)
	119 – 126	77h – 7Eh	Not assigned
00001111111	127	7Fh	NMT indicate active state [Network redundancy] (Tx)
00010000000	128	80h	SYNC
0001xxxxxxx	129 – 255	81h – FFh	EMCY
00100000000	256	100h	TIME
0010yyyyyyy	257 – 320	101h – 140h	SRDO (Tx)
0010zzzzzzz	321 – 384	141h – 180h	SRDO (Rx)
0011xxxxxxx	385 – 511	181h – 1FFh	PDO1 (Tx)
	512	200h	Not assigned
0100xxxxxxx	513 – 639	201h – 27Fh	PDO1 (Rx)
	640	280h	Not assigned
0101xxxxxxx	641 – 767	281h – 2FFh	PDO2 (Tx)
	768	300	Not assigned
0110xxxxxxx	769 – 895	301h – 37Fh	PDO2 (Rx)
	896	380h	Not assigned
0111xxxxxxx	897 – 1023	381h – 3FFh	PDO3 (Tx)
	1024	400h	Not assigned
1000xxxxxxx	1025 – 1151	401h – 47Fh	PDO3 (Rx)
	1152	480h	Not assigned
1001xxxxxxx	1153 – 1279	481h – 4FFh	PDO4 (Tx)
	1280	500h	Not assigned
1010xxxxxxx	1281 – 1407	501h – 57Fh	PDO4 (Tx)
	1408	580h	Not assigned
1011xxxxxxx	1409 – 1535	581h – 5FFh	SDO (Tx)
	1536	600h	Not assigned
1100xxxxxxx	1537 – 1663	601h – 67Fh	SDO (Rx)
	1664 – 1759	680h – 6DFh	Not assigned
11011100000	1760	6E0h	Dynamic SDO request (Tx)
	1761 – 1792	6E1h – 700h	Not assigned
1110xxxxxxx	1793 – 1919	701h – 77Fh	NMT Error-Control
	1920 – 2019	780h – 7E3h	Not assigned
11111100100	2020	7E4h	LSS (Tx)
11111100101	2021	7E5h	LSS (Rx)

Identifier 11-bit (binary)	Identifier (decimal)	Identifier (hexadecimal)	Function
	2022 – 2047	7E6h – 7FFh	Not assigned
xxxxxxx = Node-ID 001–127			
yyyyyyy = Node-ID 001–032			
zzzzzzz = Node-ID 033–064			

Table 55: Illustration of the CANopen® services and the associated CAN-IDs

### 10.5.10 PDO and SDO

#### PDO

In CANopen®, the process data are structured in segments at up to 8 bytes. These segments are called process data objects (PDOs) and serve to transport real-time data. The PDOs corresponds to a CAN telegram each and are assigned via its specific CAN identifier and determined in their priority. A difference is made between receive PDOs (RPDOs) and transmit PDOs (TPDOs). The designation is applied from the device's point of view. The DL100 does not contain any RPDOs.

#### SDO

A server SDO object provides a service for parameterizing of object directory entries. Each CANopen® device needs at least one server SDO object (1200h) that receives and sends requests.

The service data objects are addressed via index and subindex. Data can be requested from the master or written into the object. The function is defined via the "Function code" of the COB-ID:

- 580h + Node-ID: Master < Slave
- 600h + Node-ID: Master > Slave

Entries in the object directory are transmitted with these relatively high and therefore low-priority IDs.

There is a protocol for this SDO transfer. 4 bytes are needed for encoding of the transmission direction of the index and subindex. The other 4 bytes of the 8 bytes of a CAN data field are available for the data content.

For objects with a data content in excess of 4 bytes, there are two additional protocols for the fragmented SDO transfer.

For approval  
Zur Prüfung

## CANopen®-interface

The following command bytes specify whether data are read or set and how many data bytes it is about.

Command byte	Command description	Data length	Comment
22h	Download Response	Max. 4 Byte	Send parameter to slave
23h	Download Response	4 Byte	–
2Bh	Download Response	2 Byte	–
2Fh	Download Response	1 Byte	–
60h	Download Response	–	Confirmation of transfer to master
40h	Upload Response	–	Request parameter from slave
42h	Upload Response	Max. 4 Byte	Parameter to master with max. 4 byte
43h	Upload Response	4 Byte	–
4Bh	Upload Response	2 Byte	–
4Fh	Upload Response	1 Byte	–
80h	Abort Message	–	Slave reports error code to master

Table 56: Command bytes

Dir	COB-ID	DLC	Com- mand D0	Index L-byte D1	Index H-byte D2	Sub- index D3	Byte 0 L-byte D4	Byte 1 D5	Byte 2 D6	Byte 3 H-byte D7	Description
Master	0000h	02h	01h	06h	–	–	–	–	–	–	Node-ID 6 in Operational Mode
Slave	–	–	–	–	–	–	–	–	–	–	No response
Master	0606h	08h	40h	00h	10h	00h	00h	00h	00h	00h	Read from Node-ID 6 Index 1000h, Subindex 00h (Device Type)
Slave	0586h	08h	43h	00h	10h	00h	96h	01h	08h	00h	Response of Node-ID 6: 80196h
Master	0600h	08h	40h	04h	60h	00h	00h	00h	00h	00h	Request position value
Slave	0580h	08h	43h	04h	60h	00h	DCh	05h	00h	00h	Answer position value 1500 mm (at resolution 1 mm)

Table 57: Example SDO access: Reading of object 1000, subindex 00h



**NOTE!**

The hexadecimal display of the index and data D0 to D3 will take place in reverse order within the respective byte. example: Index 6004h is illustrated as 04h | 60h.

For Approval  
Prüfung

Dir	COB-ID	DLC	Com- mand D0	Index L-byte D1	Index H-byte D2	Sub- index D3	Byte 0 L-byte D4	Byte 1 D5	Byte 2 D6	Byte 3 H-byte D7	Description
Master	0600h	08h	40h	04h	60h	00h	00h	00h	00h	00h	Request position value
Slave	0580h	08h	43h	04h	60h	00h	DCh	05h	00h	00h	Answer position value 1500 mm (at resolution 1 mm)

Table 58: Example SDO access: Request of the position, object 6004h

## 10.6 Communication

### 10.6.1 Network Management Commands

The following network management commands (NMT) have been defined according to specification CiA 301:

COB-ID	DLC	Com- mand D0	Index L-byte D1	Index H-byte D2	Sub- index D3	Byte 0 L-byte D4	Byte 1 D5	Byte 2 D6	Byte 3 H-byte D7	Description
Master	0000h	02h	01h	Node-ID	-	-	-	-	-	Operational NMT
Master	0000h	02h	02h	Node-ID	-	-	-	-	-	Stop NMT
Master	0000h	02h	80h	Node-ID	-	-	-	-	-	Pre-Operational NMT
Master	0000h	02h	81h	Node-ID	-	-	-	-	-	Reset Node
Master	0000h	02h	82h	Node-ID	-	-	-	-	-	Reset Communication

Table 59: Network Management Commands

COB-ID	DLC	Com- mand D0	Index L-byte D1	Index H-byte D2	Sub- index D3	Byte 0 L-byte D4	Byte 1 D5	Byte 2 D6	Byte 3 H-byte D7	Description
Master	0000h	02h	01h	06h	-	-	-	-	-	Node-ID 6 in Operational Mode
Slave	-	-	-	-	-	-	-	-	-	No response

Table 60: Example NMT command: Set NMT of node 6 to Operational Mode

## CANopen®-interface

---

### 10.7 Synchronous and Asynchronous PDOs

In a **synchronous** PDO, the slave always answers to the cyclical master query (SYNC object).

In a **cyclically asynchronous** PDO, the slave always answers cyclically – independently of the master query (SYNC object).

In an **acyclically asynchronous** PDO, the slave always answers to a master query – independently of the SYNC object.

#### 10.7.1 Synchronous PDO

A synchronous PDO is sent for each SYNC query of the master. This corresponds to transmission type 1.

Transmission type can be configured and indicates for which xth SYNC-query of the master the PDO is sent.

Example:

- Transmission Type 1: Every SYNC-query
- Transmission Type 2: Every 2nd SYNC-query
- Transmission Type 3: Every 3rd SYNC-query

#### 10.7.2 Asynchronous PDO

The “Event Timer” can be changed via the subindex 05h of the associated PDO. The unit of the “Event Timer” is milliseconds.

If the “Event Timer” is 5, the PDO1 is sent every 5 ms.

#### 10.7.3 Transmission Type

The “Transmission Type” specifies how dispatch of the PDO is triggered and how received PDOs are treated. A difference is made between TPDOs (transmit PDOs) and RPDOs (receive PDOs) The designation is applied from the device's point of view. The DL100 does not contain any RPDOs.

**TPDOs**

According to the CiA 301-specification, version 4.2, the TPDOs are defined as follows:

Value	Description
00h	Synchronous (acyclical)
01h	Synchronous (cyclically every SYNC query)
02h	Synchronous (cyclically every 2nd SYNC query)
03h	Synchronous (cyclically every 3rd SYNC query)
04h ... F0h	Synchronous (cyclically every 4th SYNC query)... Synchronous (cyclically every 240th SYNC-request)
F1h ... FBh	Reserve
FCh	Only RTR (synchronous)
FDh	Only RTR (event-driven)
FEh	Event-driven (manufacturer-specific)
FFh	Event-driven (device profile and application profile specific)

Table 61: Overview of the TPDO transmission types

**Synchronous**

For synchronous data transfer, the PDO is transferred after the SYNC query. The CANopen device starts to determine data when receiving the SYNC request.

In acyclical and synchronous data transmission, an internal CANopen event is specified and data determination is started with the next SYNC query. The PDO is then transferred.

For cyclical and synchronous data transmission, data determination is started at receipt of every SYNC query, every second SYNC query or every third SYNC query, etc. depending on the setting. The PDO is then transferred.

**Only RTR**

For RTR data transfer, the PDO is transferred only after receipt of an “RTR frame”.

For a RTR and synchronous data transfer, the CANopen device starts data determination only when receiving a SYNX query. The PDO is saved.

For an RTR and event-driven data transfer, the CANopen device starts when receiving a SYNX query. The PDO is transferred at once.

**Event driven**

For an event-driven data transmission, the PDO may be transferred based on an internal event in the CANopen device. The definition of events is not contained in the specification. Events may be specified in device profiles and application profiles.

For approval  
Zur Prüfung

## CANopen®-interface

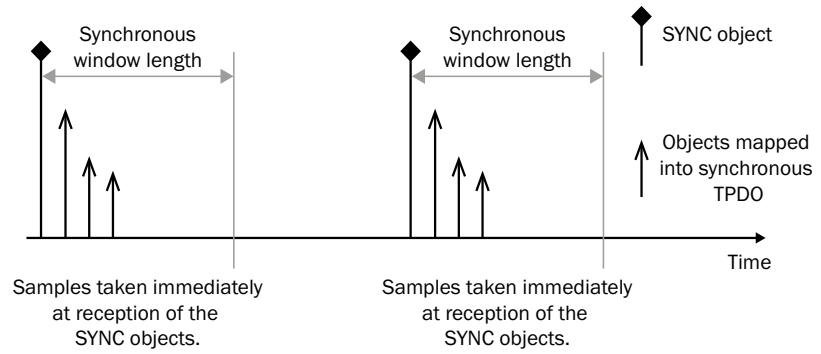


Fig. 32: Bus synchronization and data determination

For approval  
Zur Prüfung



## 10.8 Emergency messages (EMCY messages)

### 10.8.1 Overview of general EMCY messages

Messages of the type “Emergency” are used to signal errors of a device. A code that uniquely identifies the error is transmitted in the emergency telegram (defined in the communications profile DS-301 and the respective device profiles DSP-40x).

An EMCY-message is made up of: MSEF (byte 7 to byte 3), ER (byte 2) and EEC (byte 1 to byte 0). The MSEF contains manufacturer-specific information for 5 bytes.

ER and EEC description	MSEF	ER								EEC	EEC
	Byte 7 ... 3	Byte 2								Byte 1	Byte 0
		7	6	5	4	3	2	1	0		
ER: – EEC: Error reset or no error <sup>1)</sup>	0	0	0	0	0	0	0	0	0	00h	00h
ER: Temperature warning EEC: CANopen device temperature	0	0	0	0	0	1	0	0	1	42h	00h
ER: Temperature error EEC: CANopen device temperature	0	0	0	0	0	1	0	0	1	42h	80h
ER: Communication-error (overrun, error state) EEC: HB or life guard error <sup>2)</sup>	Byte 3: Lost Node-ID	0	0	0	1	0	0	0	1	81h	30h
ER: Communication-error (overrun, error state) EEC: Protocol error, PDO not processed due to length error	0	0	0	0	1	0	0	0	1	82h	10h
ER: Communication-error (overrun, error state) EEC: Protocol error, PDO length exceeded	0	0	0	0	1	0	0	0	1	82h	20h
ER: manufacturer-specific	0	1	0	0	0	0	0	0	1	FFh	XXh

1) Only when all warnings/errors have been removed will the emergency message “Error reset or no error” be sent.

2) The heartbeat event is reset by: A new heartbeat producer has been received. Object 1016h has been newly written.

Table 62: Overview of general EMCY messages

Other supported CAN-internal EMCY-messages:

- CAN overrun (objects lost): 8110h
- CAN in error passive mode: 8120h
- Restored by “Bus off”: 8140h

## CANopen®-interface

### 10.8.2 Overview of manufacturer-specific EMCY messages

ER and EEC description	MSEF	ER								EEC	EEC
	Byte 7 ... 3	Byte 2								Byte 1	Byte 0
		7	6	5	4	3	2	1	0		
ER: Manufacturer-specific EEC: Laser Prefail Warning (W1)	0	1	0	0	0	0	0	0	1	FFh	01h
ER: Manufacturer-specific EEC: Level Prefail Warning (W2)	0	1	0	0	0	0	0	0	1	FFh	02h
ER: Manufacturer-specific EEC: Plausibility Prefail Warning (W3)	0	1	0	0	0	0	0	0	1	FFh	03h
ER: Manufacturer-specific EEC: Laser Error (F1)	0	1	0	0	0	0	0	0	1	FFh	81h
ER: Manufacturer-specific EEC: Level Error (F2)	0	1	0	0	0	0	0	0	1	FFh	82h
ER: Manufacturer-specific EEC: Plausibility Error (F3)	0	1	0	0	0	0	0	0	1	FFh	83h

Table 63: Overview of manufacturer-specific EMCY messages

### 10.8.3 Transmission behavior of the EMCY message

The EMCY message is only sent once, even if the warning and/or the error is retained for an extended period. As long as no new warning and no new error occurs, no further EMCY message is sent.

If a warning or error is removed, an EMCY message with EEC 0 (Error reset or no error) is sent. The Error Register (ER) contains only the pending warnings or errors, however.

If no warning and no error are present anymore, the error register is reset to 0.

### 10.8.4 Properties of EMCY messages

A communications error (Overrun EEC 0x8110, Error state EEC 0x8120) remains in the error register (object 1001h) (bit 0 and bit 4 set) until the command “Communication Reset” or “Application Reset” was performed.

For approval  
Zur Prüfung

## 10.9 Overview Object directory

The objects listed in the tables are supported by the DL100.

**Notice for the objects 1800h, 1804h and 1805h:** The object “Compatibility Entry” is not located in the EDS file. The object “Number of Entries” remains at 6 entries, however.

For more detail information on the objects, see page 97, chapter 10.10. In the PDF document, you can get to the description by clicking the respective object in the column “Index”.

Index	Sub-index	Name	Data type	Access	Range of values		
					Min	Max	Default
[1000h]		Device Type	Unsigned32	const	-	-	524694d, 80196h
[1001h]		Error Register	Unsigned8	ro	0	153d, 99h, (All errors set)	0
[1003h]		Pre-defined Error Field			0	254d, FEh	0
	0h	Number of Errors	Unsigned32	rw	0		0
	1h	Standard Error Field	Unsigned32	ro	0		0
	2h	Standard Error Field	Unsigned32	ro	0		0
	3h	Standard Error Field	Unsigned32	ro	0		0
	4h	Standard Error Field	Unsigned32	ro	0		0
	5h	Standard Error Field	Unsigned32	ro	0		0
[1005h]		COB-ID SYNC	Unsigned32	ro	-	-	128d, 80h
[1008h]		Manufacturer Device Name	String	const	-	-	DL100 product family
[1009h]		Manufacturer Hardware Version	String	const	0	99999999d, 5F5E0FFh	0
[100Ah]		Manufacturer Software Version	String	const	-	-	-
[1010h]		Store Parameter Field					
	0h	Number of Entries	Unsigned32	ro	-	-	1
	1h	Save all Parameters	Unsigned32	rw	-	-	0
[1011h]		Restore Default Parameters					
	0h	Number of Entries	Unsigned32	ro	-	-	1
	1h	Restore all Default Parameters	Unsigned32	rw	-	-	-
[1014h]		COB-ID EMCY	Unsigned32	ro	-	-	128d + NodeID, 80h + NodeID

## CANopen®-interface

Index	Sub-index	Name	Data type	Access	Range of values		
					Min	Max	Default
[Hex]	[Hex]						
[1016h]		Heartbeat Consumer Entries					
	0h	Number of Entries	Unsigned32	ro	-	-	2
	1h	Consumer Heartbeat Time 1	Unsigned32	rw	0	50331647d, 2FFFFFFh	0
	2h	Consumer Heartbeat Time 2	Unsigned32	rw	0	50331647d, 2FFFFFFh	0
[1017h]		Producer Heartbeat Time	Unsigned16	rw	0	FFFh, 65535d	0
[1018h]		Identity Object					
	0h	Number of Entries	Unsigned8	ro	-	-	4
	1h	Vendor Id	Unsigned32	ro	-	-	33554518d, 2000056h
	2h	Product Code	Unsigned32	ro	-	-	5
	3h	Revision Number	Unsigned32	ro	-	-	0
	4h	Serial Number	Unsigned32	ro	0	99999999d, 5F5E0FFh	0
[1019h]		Synchronous Counter Overflow Value	Unsigned8	rw	0	240d, F0h	0
[1029h]		Error Behaviour					
	0h	Number of Entries	Unsigned8	ro	-	-	1
	1h	Communication Error	Unsigned8	rw	0	0	0
[1200h]		Server SDO Parameter 1					
	0h	Number of Entries	Unsigned8	ro	2	2	2
	1h	COB-ID Client > Server	Unsigned32	ro	-	-	1536d + NodeID, 600h + NodeID
	2h	COB-ID Server > Client	Unsigned32	ro	-	-	1408d + NodeID, 580h + NodeID
[1800h]		Transmit PDO Communication Parameter 1					
	0h	Number of Entries	Unsigned8	ro	-	-	6
	1h	COB-ID	Unsigned32	ro	-	-	384d + NodeID, 180h + NodeID
	2h	Transmission Type	Unsigned8	rw	0	255d, FFh	255d, FFh
	3h	Inhibit Time	Unsigned16	rw	0	65535d, FFFFh	0
	4h	Compatibility Entry	Unsigned8	ro	-	-	0
	5h	Event Timer	Unsigned16	rw	0	65535d, FFFFh	0
	6h	Sync Start Value	Unsigned8	rw	0	255d, FFh	0

Index	Sub-index	Name	Data type	Access	Range of values		
					Min	Max	Default
[Hex]	[Hex]						
[1801h]		Transmit PDO Communication Parameter 2					
	0h	Number of Entries	Unsigned8	ro	-	-	2
	1h	COB-ID	Unsigned32	ro	-	-	640d + NODE-ID, 280h + NODE-ID
	2h	Transmission Type	Unsigned8	rw	-	-	1
[1804h]		Transmit PDO Communication Parameter 5					
	0h	Number of Entries	Unsigned8	ro	-	-	6
	1h	COB-ID	Unsigned32	rw	1	4294967295d, FFFFFFFFh	2147483648d, 80000000h
	2h	Transmission Type	Unsigned8	rw	0	255d, FFh	254d, FEh
	3h	Inhibit Time	Unsigned16	rw	0	65535d, FFFFh	0
	4h	Compatibility Entry	Unsigned8	ro	-	-	0
	5h	Event Timer	Unsigned16	rw	-	-	0
	6h	Sync Start Value	Unsigned8	rw	0	255d, FFh	0
[1805h]		Transmit PDO Communication Parameter 6					
	0h	Number of Entries	Unsigned8	ro	-	-	6
	1h	COB-ID	Unsigned32	rw	1	4294967295d, FFFFFFFFh	2147483648d 80000000h
	2h	Transmission Type	Unsigned8	rw	0	255d, FFh	254d, FEh
	3h	Inhibit Time	Unsigned16	rw	0	65535d, FFFFh	0
	4h	Compatibility Entry	Unsigned8	ro	-	-	0
	5h	Event Timer	Unsigned16	rw	0	65535d, FFFFh	0
	6h	Sync Start Value	Unsigned8	rw	0	255d, FFh	0
[1A00h]		Transmit PDO Mapping Parameter 1					
	0h	Number of Entries	Unsigned8	ro	-	-	1
	1h	Mapping Entry 1	Unsigned32	ro	-	-	1610874912d, 60040020h
[1A01h]		Transmit1 PDO Mapping Parameter 2					
	0h	Number of Entries	Unsigned8	ro	-	-	1
	1h	Mapping Entry 1	Unsigned32	ro	-	-	1610874912d 60040020h

## CANopen®-interface

Index	Sub-index	Name	Data type	Access	Range of values		
[Hex]	[Hex]				Min	Max	Default
[1A04h]		Transmit PDO Mapping Parameter 5					
	0h	Number of Entries	Unsigned8	rw	0	8	0
	1h	Mapping Entry 1	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	2h	Mapping Entry 2	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	3h	Mapping Entry 3	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	4h	Mapping Entry 4	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	5h	Mapping Entry 5	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	6h	Mapping Entry 6	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	7h	Mapping Entry 7	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	8h	Mapping Entry 8	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
[1A05h]		Transmit PDO Mapping Parameter 6					
	0h	Number of Entries	Unsigned8	rw	0	8	0
	1h	Mapping Entry 1	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	2h	Mapping Entry 2	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	3h	Mapping Entry 3	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	4h	Mapping Entry 4	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	5h	Mapping Entry 5	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	6h	Mapping Entry 6	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	7h	Mapping Entry 7	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
	8h	Mapping Entry 8	Unsigned32	rw	0	4294967295d, FFFFFFFFh	0
[2000h]		Distance	Integer32	ro	Device-profile-dependent, DL100 – 300 m	Device-profile-dependent: DL100 + 300 m	–
[2001h]		Velocity	Integer32	ro	–10 m/s	10 m/s	0
[2002h]		Time Stamp	Unsigned32	ro	0	$2^{32}-1$	0
[2003h]		Level	Integer16	ro	127	0	0
[2004h]		Warnings	Unsigned8	ro	0	15	0
[2005h]		Errors	Unsigned8	ro	0	15	0

Index	Sub-index	Name	Data type	Access	Range of values		
[Hex]	[Hex]				Min	Max	Default
[4000h]		Distance Resolution	Unsigned8	rw			2
[4001h]		Velocity Resolution	Unsigned8	rw			1
[4002h]		Device Product Code	String	const	–	–	–
[4003h]		Software Versions					
	0h	Number of Entries	Unsigned8	const	–	–	3
	1h	Application Controller	String	const	–	–	–
	2h	FPGA	String	const	–	–	–
	3h	Communication Controller	String	const	–	–	–
[4004h]		Device Temperature	Integer8	ro	Device-profile-dependent (reference)	Device-profile-dependent (reference)	–
[4005h]		Laser Operating Hours	Unsigned32	ro	0	$2^{32}-1$	–
[4006h]		Command	Unsigned8	rw			0
[6000h]		Operating Parameters	Unsigned16	rw	0	12	0
[6001h]		Measuring Units per Resolution	Unsigned32	rw	1	1	1
[6002h]		Total Measuring Range in Measuring Units	Unsigned32	rw	1	$2^{32}-1$	1
[6003h]		Preset value	Unsigned32	rw	0	300000	0
[6004h]		Position value	Unsigned32	ro	0	Device-profile-dependent: DL100 +300 m	0
[6005h]		Linear Encoder Measuring Step Settings					
	0h	Number of Elements	Unsigned32	ro	–	–	2
	1h	Position Measuring Step	Unsigned32	rw	100000d, 186A0h	100000000d, 5F5E100h	100000d, 186A0h
	2h	Speed Measuring Step	Unsigned32	rw	10d, Ah	10000d, 2710h	100d, 64h
[6030h]		Speed Value					
	0h	Number of Available channels	Integer16	ro	–	–	1
	1h	Speed Value Channel 1	Integer16	ro	$-2^{15}-1$	$2^{15}-1$	0
[6200h]		Cyclic Timer Value	Unsigned16	rw	0	$2^{16}-1$	0
[6500h]		Operating Status	Unsigned16	ro	0	12	0
[6501h]		Single-turn Resolution and Measuring Step	Unsigned32	ro	100000	100000000	100000
[6502h]		Number of Distinguishable Revolutions	Unsigned16	ro	–	–	1

## CANopen®-interface

Index	Sub-index	Name	Data type	Access	Range of values		
					Min	Max	Default
[Hex]	[Hex]						
[6503h]		Alarms	Unsigned16	ro	0	28673d, 7001h (All alarms set.)	0
[6504h]		Supported Alarms	Unsigned16	ro	-	28673d, 7001h (All alarms set.)	28673d, 7001h (All alarms set.)
[6505h]		Warnings	Unsigned16	ro	0	28673d, 7001h (All warnings set.)	0
[6506h]		Supported Warnings	Unsigned16	ro	-	-	12298d, 300Ah (All warnings set.)
[6507h]		Profile and Software Version	Unsigned32	ro	-	-	XXXX0302h
[6508h]		Operating Time	Unsigned32	ro	0	2 <sup>32</sup> -1	0
[6509h]		Offset Value	Integer32	ro	-300000	300000	0
[650Ah]		Module Identification					
	0h	Number of Available Manufacturer Offset Values	Integer32	ro	-	-	3
	1h	Manufacturer Offset	Integer32	ro	-	-	0
	2h	Manufacturer Minimal Position Value	Integer32	ro	-	-	Profile specific
	3h	Manufacturer Maximal Position Value	Integer32	ro	-	-	Profile specific
[650Bh]		Serial Number	Unsigned32	ro	-	99999999d, 5F5E0FFh	0

Table 64: Overview object directory



## 10.10 Communications segment

### 10.10.1 Object 1000h Device Type

The object describes the device type.

- Byte 0 to 1 (0196h = 406d) are the device profile CiA 406.
- Byte 2 to 3 (0008h = 8d) are the subprofile of an absolute linear encoder.

### 10.10.2 Object 1001h Error Register

The error register shows the error condition of the device. A set bit shows that the corresponding error is present.

Bit	Mandatory/Optional	Description	Supported
0	Mandatory	General error	Yes
1	Optional	Current error	No
2	Optional	Voltage error	No
3	Optional	Temperature error	Yes
4	Optional	Communications error (buffer overrun)	Yes
5	Optional	Device-profile-specific error	No
6	Optional	Reserve (always 0)	No
7	Optional	Manufacturer-specific errors	Yes

### 10.10.3 Object 1003h Pre-defined Error Field

The object “Pre-defined Error Field” is an error storage. A newly occurred error is saved in the subindex 1 and fields that are already in the error field move one subindex forward. The newly occurred error is sent through the emergency object as well. Subindex 0 contains the current error status. Writing the value 0 to subindex 0 completely deletes the error history.

Subindex	Name	Description
0h	Number of Entries	
1h – 5h	Standard Error Field 1 – 5	

## CANopen®-interface

### 10.10.4 Object 1005h COB-ID SYNC

Indication of the COB-ID of the synchronization object.

### 10.10.5 Object 1008h Manufacturer Device Name

Name of the device family.

### 10.10.6 Object 1009h Manufacturer Hardware Version

Corresponds to the delivery condition of the serial number. The HW version may change due to repair.

### 10.10.7 Object 100Ah Manufacturer Software Version

Indication of the software version of the application controller.  
Format Vxxx.xxx.xxx (primary.secondary.rev)

### 10.10.8 Object 1010h Store Parameter Field

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1010h.
1h	Save all Parameters	To execute the command "Save all Parameter", enter the signature "save" (65766173h) into subindex 1h. The communications segment, manufacturer-specific segment and profile segment are saved.

### 10.10.9 Object 1011h Restore Default Parameters

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1011h.
1h	Save all Parameters	<p>To execute the command "Restore all Default Parameters", enter the signature "load" (64616F6Ch) into subindex 1h.</p> <p>When the command "Restore all Default Parameters" was sent, the default values are not active yet. There are the following options for activating the default values:</p> <ul style="list-style-type: none"> <li>• Perform power cycle: All values in the object directory (communications segment, manufacturer-specific segment and profile segment) are set to default values.</li> <li>• Send command "Reset communication" (82h + Node-ID): Only the communications segment is reset.</li> <li>• Send command "Reset node (81 h + Node-ID): All values in the object directory (communications segment, manufacturer-specific segment and profile segment) are set to default values.</li> </ul> <p>The default values are saved automatically. The Node-ID and baud rate are excluded and contain their current value.</p>

### 10.10.10 Object 1014h COB-ID EMCY

Indication of the COB-ID of the EMCY object

### 10.10.11 Object 1016h Heartbeat Consumer Entries

The object 1016h defines when a heartbeat is expected from other slaves. The monitoring starts after the first heartbeat received.

Note: The “Consumer Heartbeat Time” should be higher than the corresponding “Producer Heartbeat Time”. Before receiving the first heartbeat, the status of the “Producer Heartbeat” is unknown.

The “Consumer Heartbeat Time” comprises of 4 bytes and contains the Node-ID and the “Heartbeat Time” in milliseconds.

MSB		LSB	
31	24	23	16 15 0
Reserved (00h)		Node-ID	
		Heartbeat time	

Table 65: Structure of “Consumer heartbeat time”, according to CiA 301-specification, version 4.2

If the “Consumer Heartbeat Time” is equal to 0, the Node-ID equal to 0 or above 127, the corresponding “Consumer Heartbeat” is deactivated. If several “Consumer Heartbeat times” unequal 0 are assigned for a Node-ID, the device answers with the SDO abort message “06040043h”.

Subindex	Name	Description
0h	Number of Entries	The default value of 2 indicates that two “Consumer Heartbeats” are available. One “Consumer Heartbeat” (subindex 1h) is mandatory. All others are optional.
1h	Consumer Heartbeat Time 1	
2h	Consumer Heartbeat Time 2	

### 10.10.12 Object 1017h Producer Heartbeat Time

The object defines the cycle time of the heartbeat as a multiple of milliseconds. The value 0 deactivates the “Producer Heartbeat”. A heartbeat message comprises of a byte and contains the current slave communications condition.

The following functions are possible:

- 00h: Bootup
- 04h: Stopped
- 05h: Operational
- 7Fh: Pre-Operational

For approval  
Zur Prüfung

## CANopen®-interface

### 10.10.13 Object 1018h Identity Object

The object contains general data on the slave.

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1018h.
1h	Vendor ID	The vendor ID (2000056h) identifies the manufacturer uniquely and is assigned by the CiA®.
2h	Product Code	Continuous, unique number within the vendor ID that is assigned by the manufacturer.
3h	Revision Number	The revision number is made up of the primary (bit 31 to 16) and secondary numbers (bit 15 to 0) of the software version. The software version refers to the application controller.
4h	Serial Number	Contains the 8-digit serial number.

### 10.10.14 Object 1019h Synchronous Counter Overflow Value

Per default, the SYNC message is made up of the pre-defined CAN-identifier 80h and 0 Byte data. Optionally, the SYNC message can be expanded by a 1-byte counter value. For each SYNC message sent, this counter increases by value 1. The same applies to PDOs coupled to the SYNC message. The subindex 06h (Sync Start Value) in the PDO communications parameters can also be used to adjust at which SYNC counter value the corresponding PDO is to be sent for the first time. Further sending of the PDO takes place as previously in strict dependence on the entry in subindex 02h (transmission type). The maximum SYNC counter value can be adjusted with this object (Synchronous Counter Overflow Value). The counter value 0 deactivates the SYNC counter.

Value	Description
0	The SYNC message should be transmitted as a CAN message with the data length "0".
1	Reserve
2 – 240	The SYNC message should be transmitted as a CAN message with a data length "1". The first data byte contains the counter.
241 – 255	Reserve

### 10.10.15 Object 1029h Error Behaviour

If a CANopen error occurs in the device and the “NMT” is in the condition “Operational”, the device autonomously switches to the condition “pre-operational” by default. If the object 1029h is implemented, the “NMT” can alternatively switch to the condition “Stopped” or remain in the current NMT condition after a CANopen communications error occurs.

CANopen communications errors may be:

- Bus-off of the CAN interface
- Life guarding event with the status “Occurred” but via the reason “Time out”
- Heartbeat event with the status “Occurred” but via the reason “Time out”

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1029h.
1h	Communication Error	<ul style="list-style-type: none"> <li>• 00h: Change to the NMT-condition “Pre-operational”. Only if the NMT condition was “Operational” before.</li> <li>• 01h: No change of the NMT condition</li> <li>• 02h: Change to the NMT-condition “Stopped”.</li> <li>• 03h – 7Fh: Reserve</li> <li>• 80h – FFh: Manufacturer-specific</li> </ul>

### 10.10.16 Object 1200h Server SDO Parameter 1

The object describes the SDO server object. It provides the SDO communication.

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1200h.
1h	COB-ID Client > Server	
2h	COB-ID Server > Client	

For approval  
Zur Prüfung

## CANopen®-interface

### 10.10.17 Object 1800h Transmit PDO Communication Parameter 1

Communications parameters for asynchronous transfer of object 6004h, subindex 0h (position).

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1800h.
1h	COB-ID	The COB-ID is fixed and made up of 180h + Node-ID.
2h	Transmission Type	Defines the transmission type.
3h	Inhibit Time	The "Inhibit Time" defines the minimum time that must pass between two subsequent calls of a PDO. The PDO must be deactivated first for an "Inhibit Time" parameter adjustment. See page 115, chapter 10.14 "Dynamic Mapping".
4h	Compatibility Entry	No function.
5h	Event Timer	Asynchronous PDOs (Transmission Type FEh or FFh) are triggered, e.g. via the "Event Timer". This subindex defines the period of the "Event Timer" as a multiple of milliseconds. If the value is equal to 0, the asynchronous PDO is deactivated and no longer sent.
6h	Sync Start Value	Indicates the SYNC from which onwards the PDO is to be sent.  The PDO must be deactivated first for a "Sync Start Value" parameter adjustment. See page 115, chapter 10.14 "Dynamic Mapping".

### 10.10.18 Object 1801h Transmit PDO Communication Parameter 2

Communications parameters for synchronous transfer of object 6004h, subindex 0h (position)

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1801h.
1h	COB-ID	The COB-ID is fixed and made up of 280h + Node-ID.

### 10.10.19 Object 1804h Transmit PDO Communication Parameter 5

Communications parameter of the freely configurable PDOs 5.

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1804h.
1h	COB-ID	The following COB-IDs are not permitted:  0h: NMT  701h to 77Fh: NMT Error Control  Setting of these COB-IDs is rejected by the SDO-Abort message "6040043h (Parameter incompatible)".  If you want to activate the TPDO4, although mapping is deactivated (1A04:00, Number of Entries = 0), the SDO-Abort-message "08000022h" is generated. According to the specification CiA 301 (Version 4.2, page 36, length of the process data at least 1) it is not permitted for TPDOs that have no mapping entries to be sent.
2h	Transmission Type	Defines the transmission type.

Subindex	Name	Description
3h	Inhibit Time	The “Inhibit Time” defines the minimum time that must pass between two subsequent calls of a PDO.
4h	Compatibility Entry	No function.
5h	Event Timer	Asynchronous PDOs (Transmission Type FEh or FFh) are triggered, e.g. via the “Event Timer”. This subindex defines the period of the “Event timer” as a multiple of milliseconds. If the value is equal to 0, the asynchronous PDO is deactivated and no longer sent.
6h	Sync Start Value	Indicates the SYNC from which onwards the PDO is to be sent. The PDO must be deactivated first for a “Sync Start Value” parameter adjustment. See page 115, chapter 10.14 “Dynamic Mapping”.

### 10.10.20 Object 1805h Transmit PDO Communication Parameter 6

Communications parameter of the freely configurable PDOs 6.

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1805h.
1h	COB-ID	0h: The following COB-IDs are not permitted: 0h: NMT 701h to 77Fh: NMT Error Control Setting of these COB-IDs is rejected by the SDO-Aport message “6040043h (Parameter incompatible)”. If you want to activate the TPDO4, even though mapping is deactivated (1A05:00, Number of Entries = 0), the SDO-Abort-message “08000022h” is generated. According to the specification CiA 301 (Version 4.2, page 36, length of the process data at least 1) it is not permitted for TPDOs that have no mapping entries to be sent.
2h	Transmission Type	Defines the transmission type.
3h	Inhibit Time	The “Inhibit Time” defines the minimum time that must pass between two subsequent calls of a PDO.
4h	Compatibility Entry	No function.
5h	Event Timer	Asynchronous PDOs (Transmission Type FEh or FFh) are triggered, e.g. via the “Event Timer”. This subindex defines the period of the “Event timer” as a multiple of milliseconds. If the value is equal to 0, the asynchronous PDO is deactivated and no longer sent.
6h	Sync Start Value	Indicates the SYNC from which onwards the PDO is to be sent. The PDO must be deactivated first for a “Sync Start Value” parameter adjustment. See page 115, chapter 10.14 “Dynamic Mapping”.

### 10.10.21 Object 1A00h Transmit PDO Mapping Parameter 1

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1A00h.
1h	Mapping Entry 1	Mapping fix.

## CANopen®-interface

### 10.10.22 Object 1A02h Transmit PDO Mapping Parameter 2

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1A01h.
1h	Mapping Entry 1	Mapping fix.

### 10.10.23 Object 1A04h Transmit PDO Mapping Parameter 5

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1A04h.
1h – 8h	Mapping Entry 1 – 8	See page 115, chapter 10.14 “Dynamic Mapping”.

### 10.10.24 Object 1A05h Transmit PDO Mapping Parameter 6

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 1A05h.
1h – 8h	Mapping Entry 1 – 8	See page 115, chapter 10.14 “Dynamic Mapping”.

## 10.11 Manufacturer-specific segment (2000h to 5FFFh)

All objects may be taken from page 91, chapter 10.9. Only those objects are described in more detail below.

### 10.11.1 Object 2000h Distance

The object 2000h issues the current distance value in the selected resolution. The resolution can be selected in object 4000h or 6005h subindex 01h.

For approval  
Zur Prüfung



### 10.11.2 Object 2001h Velocity

The object 2001h issues the current velocity value in the selected resolution. The resolution for the velocity value can be set in object 4001h or 6005h subindex 02h.

The filter settings “slow”, “medium” or “fast” affect the speed. The filter settings are parameterized via the display or SOPAS ET.

### 10.11.3 Object 2002h Time Stamp

The object 2002h issues the time stamp corresponding to the measuring and velocity value. The time stamp starts directly after activation of the voltage supply at 0  $\mu$ s. The unit of the time stamp is in microseconds.

The time stamp is applied with a rounding error of 5% on average.

### 10.11.4 Object 4000h Distance Resolution

The resolutions for the distance value can be set in object 4000h. The following distance resolutions are possible:

- 0 = 0.1 mm (Default)
- 1 = 0.125 mm
- 2 = 1mm
- 3 = 10 mm
- 4 = 100 mm
- 5 = ModDef (Distance Resolution Settings, controlled via object 6005:01h)

If the value is equal to 5, the resolution is only possible via object 6005h, Subindex 1, “Linear Encoder Measuring Step Setting”. If the value is unequal 5, object 6005h is ignored.

### 10.11.5 Object 4001h Velocity Resolution

The resolutions for the velocity value can be set in object 4001h. The following speed resolutions are possible:

- 0 = 0.1 mm/s
- 1 = 1 mm/s (Default)
- 2 = 10 mm/s
- 3 = 100 mm/s
- 4 = ModDef (Velocity Resolution Settings, controlled via object 6005:02h)

If the value is equal to 4, the resolution is only possible via object 6005h, Subindex 2, “Linear Encoder Measuring Step Setting”. If the value is unequal 4, object 6005h is ignored.

## CANopen®-interface

### 10.11.6 Object 4002h Device Product Code

Indication of the product code, e.g.: DL100-21AA2109

### 10.11.7 Object 4003h Software Versions

Indication of the software versions in the device

Subindex	Name	Description
0h	Number of Entries	Indication of the number of subindices within object 4003h.
1h	Application controller	Indication of the application controller version in the device
2h	FPGA	Indication of the FPGA version in the device
3h	Communication controller	Indication of the communication controller version in the device

### 10.11.8 Object 4004h Device Temperature

Indication of the temperature in the device in the unit °C.

### 10.11.9 Object 4005h Laser Operating Hours

Indication of the laser operating hours in the unit hours.

### 10.11.10 Object 4006h Command

The following commands are available in the DL100.

- Value: 00h: Initial (no function)
- Value: 01h: Laser off
- Value: 02h: Laser on
- Value: 03h: Reset preset (preset = offset = 0), deletes a present preset
- Value: 04h...FFh: Reserve

### 10.11.11 Object 4007h Reset Preset

Performs a cold start so that the preset on the CPR is not activated event-triggered.

For approval  
Zur Prüfung

## 10.12 Device profile CiA 406 (Absolute linear encoder)

The device profile is an encoder profile and permits a 1:1 exchange with devices that also use the device profile CiA 406. The device profile is structured in separate classes. The DL100 supports the device profile CiA 406 (Absolute linear encoder), Version 3.2, class 2 (C2).

### 10.12.1 Object 6000h Operating Parameters

Bit	15 ... 12	11 ... 5	4	3	2	1	0
Name	msp1...msp4	r	hsfc	md	sfc	cdc	cs
Default value	0	0	0	0	0	0	0
Implemented	No	-	No	Yes	Yes	No	No

Table 66: Operating parameter, bit-coded

#### Cs: Code sequence

Only relevant for rotating rotary encoders.

#### Cdc: Commissioning diagnostic control

This bit activates (value = 1) the commissioning diagnosis control. This can be user-specific/sensor-specific functions that are called, e.g., during the individualization phase. This bit can be used to activate and deactivate a self-test in the encoder.

This test should only be performed when the encoder positions are not used by any other device (encoder stand still). The result of the self-test is displayed in the object 6503h/0, Bit 1 (cde).

A self-test is optional. I.e. this bit does not have to be supported. It is recommended that object 6500h/0, Bit 1 (cdc) displays whether the encoder has a self-test. The DL100 currently does not have any self-test.

#### Sfc: Scaling function control

Activates (Sfc = 1) the scaling functions. They are provided via the objects 6001h (Measuring Units per Revolution), 6002h (Total Measuring Range in Measuring Units) and 600Ah (High Resolution Total Measuring Range in Measuring Units).

The DL100 supports only 6002h. If “Sfc” is deactivated (value = 0), the above object settings are ignored. Object 6001h is comparable to object 4000h.



#### NOTE!

If you want to activate “Sfc”, any previously present preset must be deleted (see 4006h). A present preset can be recognized because the object 6509h is then unequal 0. If the “Sfc” bit is set, no preset should be set again.

#### Md: Measuring direction

The bit “md” specifies the counting direction and inverts the current measured value.

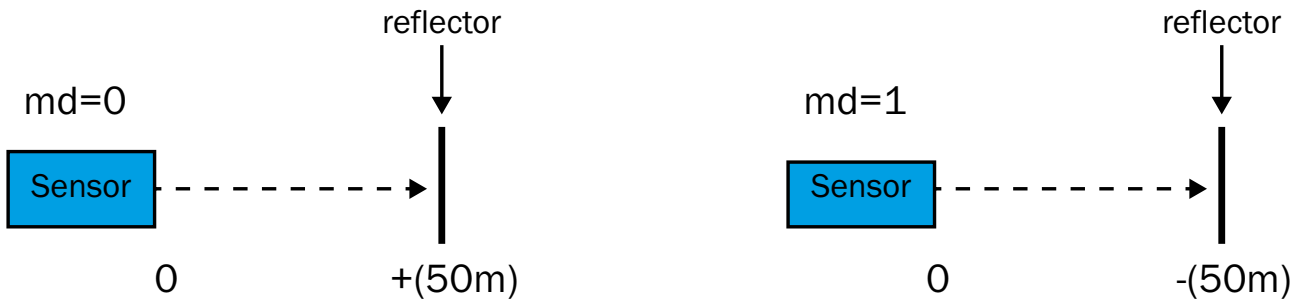
Since the object 6004h can only take on positive values, it is always 0 when the “md” bit is set.

**CANopen®-interface**



**NOTE!**

If you want to change the counting direction, any previously present preset must be deleted (see 4006h). A present preset can be recognized because the object 6509h is then unequal 0.



**10.12.2 Object 6001h Measuring Units per Revolution**

Number of steps per revolution.

According to the specification CiA 406 V3.2.0, table 18, page 16, the object 6001h is indicated as mandatory for class 2. The value is, however, always “1” for the linear encoder here. The object 6001h therefore has no function.

**10.12.3 Object 6002h Total Measuring Range in Measuring Units**

This object can distribute the entire measuring range into sections (e.g. 100 m, profile 1, DL100). The following example is to explain the function.

This function is only active when the “sfc” bit from object 6000h is equal to 1.

**Example**

- Input = 7. The total measuring route is structured in 7 sections.
- 100 m/7 = 14.2857 m. One section is therefore 14.2857 m.

If the 14.2857 m are overrun, the measured value starts again at 0.

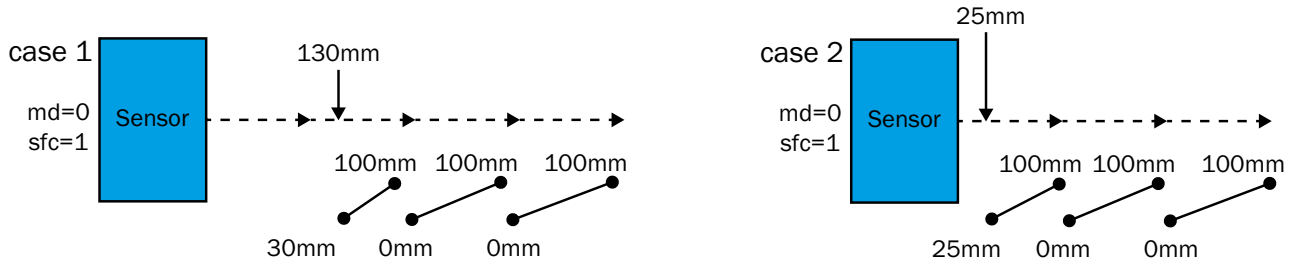
For approval  
Zur Prüfung

**Case 1**

DL100 Device Profile 1 = 100m

Object 6002h: total Measuring in Measuring Units = 1000

-----> =100mm

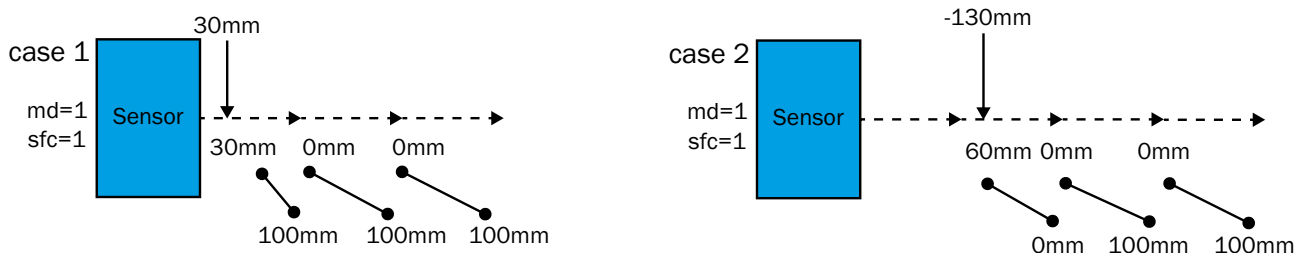


**Case 2:**

DL100 Device Profile 1 = 100m

Object 6002h: total Measuring in Measuring Units = 1000

-----> =100mm



**10.12.4 Object 6003h Preset Value**

The preset is determined as follows:

- $Distance_{offset} = Distance_{preset} - Distance_{mess}$
- $Distance_{out} = Distance_{mess} + Distance_{offset}$

The preset is input in unit mm.

**RULE:** The difference between preset and measured value must not exceed 300000 mm.

If input of the preset is equal to 0, the current distance is set to zero ( $Distance_{offset} = -Distance_{mess}$ ).

Setting a preset value automatically updates the object 6509h (Offset Value).

The value range of the preset is  $\pm 300.000$  mm. Negative values are not permitted according to specification CiA 406. The data type of the 6003h object is unsigned32.

## CANopen®-interface

### Example 1

- Distance value display: 300 mm
- Input preset: +100 mm
- $Distance_{offset} = Distance_{preset} - Distance_{mess} = 100\text{ mm} - 300\text{ mm} = -200\text{ mm}$
- $Distance_{out} = Distance_{mess} + Distance_{offset} = 300\text{ mm} + (-200\text{ mm}) = 100\text{ mm}$

### Example 2

- Distance value display: 300 mm
- Input Preset: +300000 mm
- $Distance_{offset} = Distance_{preset} - Distance_{mess} = 300000\text{ mm} - 300\text{ mm} = 299700\text{ mm}$
- $Distance_{out} = Distance_{mess} + Distance_{offset} = 300\text{ mm} + 299700\text{ mm} = 300000\text{ mm}$

### 10.12.5 Object 6004h Position Value

The manufacturer-specific object 2000h must be used for illustration of negative values. The manufacturer-specific object 6004h distances is mapped to the object 6004h.

The object “Position Value” is of data type ulnt32 according to specification CiA 406 and can only display positive values. If there is a negative value, object 6004h has the value 0. There is a cast of INTEGER32 to ulnt\_fast32\_t.

### 10.12.6 Object 6005h Linear Encoder Measuring Step Settings

This object has the same function as object 4000h, with the difference that any resolution may be indicated between the smallest and the largest resolution.

Subindex	Name	Description
0h	Linear Encoder Measuring Step Settings	Indication of the number of subindices within object 6005h.
1h	Position Measuring Step	The indication as a multiple of 1 nm. <ul style="list-style-type: none"> <li>• Smallest resolution (default): 1/10 mm =&gt; 0.1 mm / 1 nm = 100000</li> <li>• Highest resolution: 100 mm =&gt; 100 mm / 1nm = 100000000</li> </ul>
2h	Speed Measuring Steps	The indication as a multiple of 0.01 mm/s <ul style="list-style-type: none"> <li>• Smallest resolution (default): 1/10 mm/s =&gt; 0.1 mm/s / 0.01 mm/s = 10</li> <li>• Highest resolution: 100 mm/s =&gt; 100 mm/s / 0.01 mm/s = 10000</li> </ul>

For approval  
Zur Prüfung

### 10.12.7 Object 6010h Preset Values for Multi-Sensor Devices

This object has no function (no implementation) and is not listed in the EDS file.

According to the specification CiA 406 V3.2.0, table 18, page 16, the object 6010h is indicated as mandatory for class 2, but only for encoders of type 10d. This encoder is of type 8d (Absolute Linear Encoder).

See specification CiA 406 V3.2.0, page 23: “This object is only mandatory for multi-sensor encoders (object 1000h encoder type: code 10d).“

### 10.12.8 Object 6020h Position Values for Multi-Sensor Devices

This object has no function (no implementation) and is not listed in the EDS file

According to the specification CiA 406 V3.2.0, table 18, page 16, the object 6010h is indicated as mandatory for class 2, but only for encoders of type 10d. This encoder is of type 8d (Absolute Linear Encoder).

See specification CiA 406 V3.2.0, page 24: “This object is only mandatory for multi-sensor encoders (object 1000h encoder type: code 10d).“

### 10.12.9 Object 6030h Speed Value

Subindex	Name	Description
0h	Number of Available Channels	Number of available channels
1h	Speed Value Channel 1	The manufacturer-specific object 2001h “Average Velocity” is mapped to the object 6030h.  The object “Speed Value” is of data type Int16 according to specification CiA 406 V3.2.0. There is a cast of INTEGER32 to Int_fast16_t. The edge areas are covered.

### 10.12.10 Object 6200h Cyclic Timer

This object contains the “Event Timer” of the TPDO1. A change to the TPDO1 “Event Timer” automatically updates the object 6200h and vice versa.

### 10.12.11 Object 6500h Operating Status

Is a copy of 6000h.

### 10.12.12 Object 6501h Single-turn Resolution and Measuring Step

Indication of the resolution as a multiple of 1 nm. E.g. a resolution of 1 mm corresponds to 1000000.

## CANopen®-interface

### 10.12.13 Object 6502h Number of Distinguishable Revolutions

For linear encoders, i.e. also for the DL100, this value is always “1”.

### 10.12.14 Object 6503h Alarms

The object shows pending alarms.

Bit	Function
0	Plausibility error
1 ... 11	Reserve (Reserve-Bit = 0)
12	Laser error
13	Level error
14	Temperature error
15	Reserve (Reserve-Bit = 0)

- **pe** (Position error): If there is a plausibility error, “pe” is set to 1. If there is no plausibility error, “pe” is set to 0.
- **msa1** (Manufacturer-specific alarm1): If there is a laser error, “msa1” is set to 1. If there is no laser error, “msa1” is set to 0.
- **msa2** (Manufacturer-specific alarm2): If there is a level error, “msa2” is set to 1. If there is no level error, “msa2” is set to 0.
- **msa3** (Manufacturer-specific alarm3): If there is a temperature error, “msa3” is set to 1. If there is no temperature error, “msa3” is set to 0.
- **msa4**: Reserve

### 10.12.15 Object 6504h Supported Alarms

The following alarms are supported:

Bit	15	14	13	12	11 ... 2	1	0
Name	msa4	msa3	msa2	msa1	r	cde	pe
Default value	0	1	1	1	0	0	1
Supported	No	Yes	Yes	Yes	-	No	Yes

Table 67: Supported Alarms, Bit-coded



### 10.12.16 Object 6505h Warnings

The object shows pending warnings.

Bit	Function
0	Reserve (Reserve-Bit = 0)
1	Level warning
2	Reserve (Reserve-Bit = 0)
3	Laser warning
4 ... 11	Reserve (Reserve-Bit = 0)
12	Plausibility warning
13	Temperature warning
14 ... 15	Reserve (Reserve-Bit = 0)

- **lcr** (Light control reserve): If there is a level warning, “lcr” is set to 1. If there is no level warning, “lcr” is set to 0.
- **otlw** (Operating time limit): If there is a laser warning, “otlw” is set to 1. If there is no laser warning, “otlw” is set to 0.
- **msw1** (Manufacturer-specific warning1): If there is a plausibility warning of the measured value, “msw1” is set to 1. If there is no plausibility warning of the measured value, “msw1” is set to 0.
- **msw2** (Manufacturer-specific warning2): If there is a temperature warning, “msw2” is set to 1. If there is no temperature warning, “msw2” is set to 0.

### 10.12.17 Object 6506h Supported Warnings

The following warnings are supported:

Bit	15 ... 14	13	12	11 ... 9	8 ... 4	3	2	1	0
Name	mswX	msw2	msw1	r	X	otlw	CPUws	lcr	fe
Default value	0	1	1	0	0	1	0	1	0
Supported	No	Yes	Yes	–	No	Yes	No	Yes	No

Table 68: Supported Warnings, Bit-coded

### 10.12.18 Object 6507h Profile and Software Version

Byte 3-2: Application controller version byte 1-0: 406 Encoder Profile Version. The currently published version of the encoder profile 406 of the CiA is 3.2.0.

The current status of a “work draft” is illustrated by the third digit. If the third digit is 0, it is a published version.

## CANopen®-interface

### 10.12.19 Object 6508h Operating Time

Indication of the operating hours as a multiple of 0.1 h. E.g. 1 h operation corresponds to 10 \* 0.1h Object 6508h corresponds to object 4005h. 4005h is mapped to 6508h.

### 10.12.20 Object 6509h Offset Value

By default, the offset value is 0. If the object 6003h “Preset value” specifies a preset, the object 6509h is automatically updated as follows:

$$\text{Distance}_{\text{offset}} = \text{Distance}_{\text{preset}} - \text{Distance}_{\text{mess.}}$$

The new offset value must be saved.

### 10.12.21 Object 650Ah Module Identification

Information of module identification

Subindex	Name	Description
0h	Number of Available Manufacturer Offset Values	Indication of the number of subindices within object 650Ah.
1h	Manufacturer Offset	Contains a manufacturer-specific offset value. For the DL100, it is currently 0.
2h	Manufacturer Minimal Position Value	Contains the minimum distance value. Depending on device profile, DL100 – 300 m
3h	Manufacturer Maximal Position Value	Contains the maximum distance value. Depending on device profile, DL100 – 300 m

Index 0 contains a manufacturer-specific offset value. For the DL100, this value is 0. Index 1 contains the minimum distance value. Index 2 of the maximum distance value.

The following min/max values apply:

- Profile 1: –100 m / +100 m
- Profile 2: –200 m / +200 m
- Profile 3: –300 m / +300 m

### 10.12.22 Object 650Bh Serial Number

Contains the 8-digit serial number.

For approval  
Zur Prüfung

### 10.12.23 Parameterize linear absolute value encoders

The following procedure is recommended when commissioning a linear rotary encoder:

- sfc: activate/deactivate
- md: activate/deactivate
- Sensor parameters (e.g. resolutions)

### 10.13 TPDO behavior at distance value

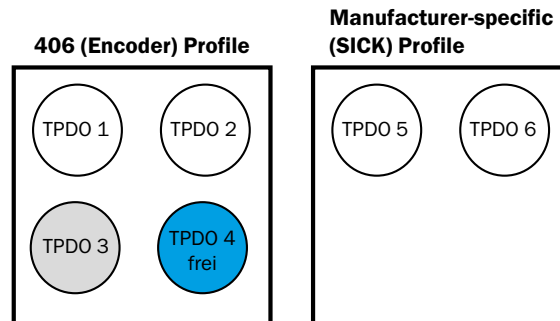
If there are only synchronous TPDOs, the distance value refers to the receipt time of the SYNC object (CANopen®-master time basis).

If there are only asynchronous TPDOs, the distance value refers to the execution time of the internal CANopen®-processing (sensor time basis).

If there are synchronous and asynchronous TPDOs, the distance value refers to the execution time of the internal CANopen®-processing and not to the receipt time of the SYNC object.

### 10.14 Dynamic mapping

The device profile CiA 406 (encoder profile) implemented in the DL100 contains the free TPDOs “TPDO 3” and “TPDO4”. In this case, it is preferable to map the manufacturer-specific TPDOs on the device profile CiA 406.



TPDO1 to TPDO4 are in the pre-defined number circle (181h to 57Fh)

TPDO1 and TPDO2 are CiA 406-specific. TPDO5 and TPDO6 are manufacturer-specific and deactivated by default (COB-ID 0x80000000).

The pre-defined PDO range must be used. Assignment to CAN-IDs usually happens by a bus designer using a configuration software that assumes correct assignment of CAN-IDs.

The following configurations are recommended.

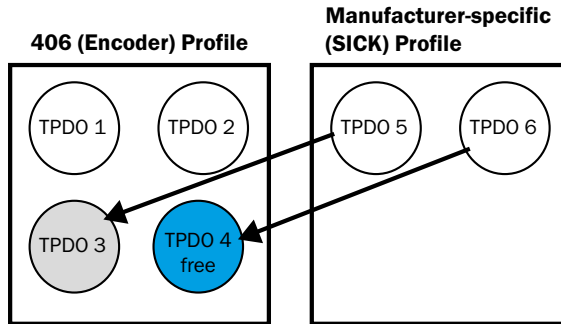
## CANopen®-interface

### Version 1

If a manufacturer-specific TPDO is to be used, it must be mapped to the number circle of TPDO4 (480h + Node-ID).

If the manufacturer-specific TPDO5 and TPDO6 are to be used, the TPDOs must be mapped as follows:

- TPDO5 to the number circle of TPDO3 (380h + Node-ID)
- TPDO6 to the number circle of TPDO4 (480h + Node-ID).

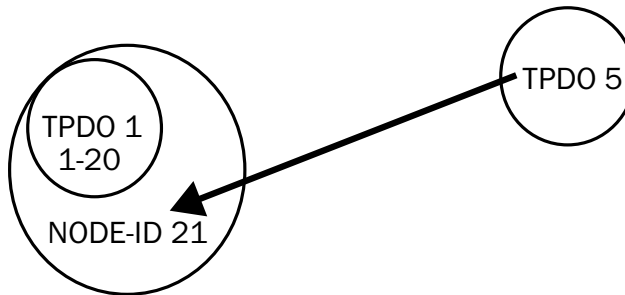


**Note:** The number circle of TPDO3 can be used because the DL100 does not support the object 6008h (High Precision Position Value).

### Version 2

Another option is mapping a manufacturer-specific TPDO, e.g. TPDO5, in the still-free number circle of TPDO1 (180h + Node-ID).

If there are, e.g., 20 participants with the Node-IDs 1 to 20, the TPDO5 can be mapped to the free number circle of TPDO1. For this, the Node-ID of the DL100 must be set to 21 (15h) and the COB-ID of the TPDO5 to 195h (180h+15h=195h).



### Version 3

If there are, e.g., 2 participants with the Node-IDs 1 to 20, the TPDO5 can be mapped to the free number circle of TPDO1. This is possible because the TPDOs from 5 upwards are no longer bound to the Node-ID.

Example: TPDO5 can be mapped to 183h. Thus, TPDO5 would come from a virtual Node-ID 3.

Observe that, if the Node-ID of the device is a different Node-ID, e.g. 6, in this example, the TPDO with the virtual Node-ID 3 belongs to the device with the Node-ID 6.

For approval  
Zur Prüfung

**Version 4**

If the pre-defined area cannot be used, use CAN-IDs instead. Only CAN-IDs with “None“ or “Reserved” must be used for freely configurable PDOs.

TPDO5 and TPDO6 are deactivated by default COB-ID = 80000000h.

Note: The DL100 always uses a only 11-bit CAN-ID.

The following table must be used for the selection of the CAN-ID:

11-bit CAN-ID	Used by COB
0 (000h)	NMT
1 (001h) – 127 (07Fh)	Reserved
128 (080h)	SYNC
129 (081h) – 255 (0FFh)	EMCY
256 (100h)	TIME
257 (101h) – 384 (180h)	Reserved
180h + Node-ID	TxPDO1
385 (180h+1h) - 511 (180h+7Fh)	
200h + Node-ID ...	RxPDO1
280h + Node-ID ...	TxPDO2
300h + Node-ID ...	RxPDO2
380h + Node-ID ...	TxPDO3
400h + Node-ID ...	RxPDO3
480h + Node-ID ...	TxPDO4
500h + Node-ID	RxPDO4
1281 (500h+1h) – 1407 (500h+7Fh)	
1408	None
1409 (581h) – 1535 (5FFh)	Default SDO (TX)
1536 (600h)	None
1537 (601h) – 1663 (67Fh)	Default SDO (RX)
1664 (680h)- 1759 (6DFh)	None
1760 (6E0h) – 1791 (6FFh)	Reserved
1792 (700h)	None
1793 (701h) – 1919 (77Fh)	NMT Error-Control, Guarding, Heartbeat
1920 (780h) – 2019 (7E3h)	Reserved
2020 (7E4h)	RxLSS
2021 (7E5h)	TxLSS
2022 (7E6h) – 2047 (7FFh)	Reserved

Table 69: Version 4 for configuration DL100

**Example**

It should be configured in TPDO with the following properties

- TPDO should be active
- TPDO should support RTR
- TPDO uses 11-bit CAN-ID.

## CANopen®-interface

### Example (continuation)

The first three bits (MSB) are

- TPDO active MSB = 0
- TPDO supports RTR MSB – 1 = 0
- TPDO uses 11-bit CAN-ID. MSB – 2 = 0

The other bits come from the 11 bit CAN-ID that is to be set. This is no longer Node-ID related from TPDO5.

The following table must be used for the selection of the CAN-ID: In this example, the CAN-ID 4FFh is selected. This leads to the following telegram:

MSB	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	LSB				
valid	RTR	frame	00000h																			11-Bit CAN-ID															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1				
0	0	0	0																			4FFh															
PDO exists	RTR allowed	11-Bit CAN-ID																																			

Dynamic mapping serves to map objects to a TPDO. By default, the TPDOs5 and 6 are empty and can take up objects. Dynamic mapping permits putting objects that can be mapped into the TPDOs.

TPDO1 and TPDO2 are already statically mapped in the device profile CiA 406 and cannot be used for dynamic mapping.

The following objects can be mapped:

Index	Subindex	Name	Data type	Resulting mapping entry
2000h	0h	Distance	Integer32	0x2000 00 20
2001h	0h	Velocity	Integer32	0x2001 00 20
2002h	0h	Time Stamp	Unsigned32	0x2002 00 20
2003h	0h	Level	Integer16	0x2003 00 10
2004h	0h	Warnings	Unsigned8	0x2004 00 08
2005h	0h	Errors	Unsigned8	0x2005 00 08
6004h	0h	Position Value	Unsigned32	0x6004 00 20
6030h	1h	Speed Value Channel 1	Integer16	0x6030 01 10
6503h	0h	Alarms	Unsigned16	0x6503 00 10
6505h	0h	Warnings	Unsigned16	0x6505 00 10

Table 70: POD

For approval  
Zur Prüfung

**Procedure for dynamic mapping**

1. Deactivate PDO (e.g. object 1800h): Set bit 31 of COB-ID to 1.
2. Set number of mapping entries in subindex 0 e.g. of object 1A00h to 0. This renders all mapping entries from now on invalid. The number of mapping entries is in subindex 0.
3. Set desired mapping entries in subindex 1 to 8, e.g. 0x60040020. A mapping entry is made up as follows:

	Byte 3 ... 2	Byte 1	Byte 0
<b>Meaning</b>	Index	Subindex	Number of bits
<b>Example</b>	6004h (Position Value)	00h	32d = 20h

Table 71: Setup of a mapping entry

4. Set number of mapping entries. If, e.g., two mapping entries have been set to valid, the number of mapping entries must be set to 2 in subindex 0.

**10.15 Status LED**

The DL100 uses a red/green bicolor LED to display the bus status and the Network State Machine. In case of conflict, red dominates.

The following conditions are supported:

LED STA	Status	Description	Category
Red: Off	No error	The device is in working condition.	Mandatory
Red: Single flashing	Warning level reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).	Mandatory
Red: Double flashing:	Control Event error	A “Guard” event (NMT slave or NMT master) or a heartbeat event (Heartbeat Consumer) has occurred.	Mandatory
Red: Quadruple flashing	Event Timer error	A PDO that was expected has not been received within the term of the event timer.	Optional
Red: On	Bus off	The CAN-Bus Controller is off.	Mandatory
Green: Flickering	AutoBitrate/LSS	The auto-bitrate detection is in progress or LSS services are in progress (alternately flickering with error LED).	Optional
Green: Flashes	PRE-OPERATIONAL	The device is in state PRE-OPERATIONAL	Optional
Green: Single flashing	STOPPED	The device is in state STOPPED	Mandatory
Green: On	OPERATIONAL	The device is in state OPERATIONAL	Mandatory

Table 72: Display of CANopen® status messages via LED “STA”

For approval  
Zur Prüfung

## Cleaning and maintenance

# 11 Cleaning and maintenance

## 11.1 Cleaning



### ATTENTION!

#### Damage to the device from improper cleaning!

Improper cleaning may cause damage to the device.

Therefore:

- Do not use any cleaning agents with aggressive contents.
- Do not use any pointed objects for cleaning.

Clean the front screens with a lint-free cloth and plastic cleaning agent at regular intervals.

The cleaning interval mainly depends on the ambient conditions.

## 11.2 Maintenance

The distance measuring device DL100 requires the following maintenance work at regular intervals:

Interval	Maintenance work	To be performed by
Cleaning intervals depending on ambience conditions and climate	Cleaning housing	Skilled person
Every 6 months	Check screw and plug connections at regular intervals.	Skilled person

Table 73: Maintenance plan

For approval  
Zur Prüfung



## 12 Troubleshooting

The following table describes possible interferences and measures for removal.

Contact the manufacturer for interferences that cannot be removed based on the following description. You can find your local office on the reverse.

### General interferences, warnings and errors

The distance measuring device differentiates between general interferences, warnings and errors. General interferences are not displayed. When a warning is pending, the LED **PWR** flashes orange. A measurement value is output. When an error is pending, the LED **PWR** flashes red. The measurement value "0" is output.

### 12.1 LED status indicators

Display	Possible causes	Troubleshooting
The display shows the value "0000".	The measuring device's light spot does not hit the reflector.	Correct alignment between measuring device and reflector.
	The obstacle is in the light path.	Remove obstacle from the light path.
	Distance between distance measuring device and reflector exceeds the maximum scanning range indicated in the technical data. → See page 127, chapter 14.4.	<ul style="list-style-type: none"> <li>Decrease the distance between the distance measuring device and the reflector.</li> <li>Select a distance measuring device with a larger maximum scanning range.</li> </ul>
LED <b>PWR</b> is not lit. Display is lit.	Measuring device defective.	Send in device for repair.
LED <b>PWR</b> flashes orange.	A warning is pending.	→ For possible causes and their removal, see page 122, chapter 12.2.
LED <b>PWR</b> flashes red.	An error is pending.	→ For possible causes and their removal, see page 122, chapter 12.3.
LED <b>STA</b>	→ See page 119, Table 72.	→ See page 119, Table 72.

Table 74: LED status display

For approval  
Zur Prüfung

## Troubleshooting

### 12.2 Warning messages

Display	Meaning / possible causes	Troubleshooting
NoWrn	No warnings	–
wPlb	Measured value not plausible. Light path between measuring device and reflector interrupted.	Observe light spot on the reflector. The light spot must not move from the reflector. If required, re-align measuring device and reflector or use a larger reflector. → For alignment and mounting, see page 27, chapter 6.
	Optical interferences	<ul style="list-style-type: none"> <li>Remove optical interferences.</li> <li>Re-align distance measuring device and reflector. → For alignment and mounting, see page 27, chapter 6.</li> </ul>
wLaser	The measurement laser is still operational but at the end of its service life.	Keep replacement device ready.
wLevel	Current damping value is below the recommended damping value. The recommended damping value depends on the distance between measuring device and reflector. → For recommended damping values, see page 32, Table 4.	<ul style="list-style-type: none"> <li>Clean external lens surfaces like the reflector and the lens</li> <li>Decrease the distance between the measuring device and the reflector.</li> <li>Use a distance measuring device with a higher range. → See page 126, chapter 14.2.</li> </ul>
wTemp	Internal device temperature is close to the permissible range. → For the permissible ambient temperature, see page 89, chapter 10.8.	<ul style="list-style-type: none"> <li>Check ambience temperature, improve ventilation if applicable.</li> <li>Shield against radiation heat, e.g. share the measuring device in case of direct solar irradiation.</li> <li>Use device with heating at low ambient temperatures.</li> <li>Use cooling housings for high ambient temperatures.</li> </ul>

Table 75: Warning messages

### 12.3 Error messages

Display	Meaning / possible causes	Troubleshooting
NoErr	No error	–
ePlb	Measured value not plausible. Light path between measuring device and reflector interrupted.	Observe light spot on the reflector. The light spot must not move from the reflector. If required, re-align measuring device and reflector or use a larger reflector. → For alignment and mounting, see page 27, chapter 6.
	Optical interferences	<ul style="list-style-type: none"> <li>Remove optical interferences.</li> <li>Re-align distance measuring device and reflector. → For alignment and mounting, see page 27, chapter 6.</li> </ul>
eLaser	The service life of a measurement laser is exceeded.	Interchange measuring device.

Display	Meaning / possible causes	Troubleshooting
eLevel	Current damping value is below the warning threshold. The warning threshold depends on the distance between measuring device and reflector. → For recommended damping values, see page 32, Table 4.	<ul style="list-style-type: none"> <li>• Clean external lens surfaces like the reflector and the lens.</li> <li>• Decrease the distance between the measuring device and the reflector.</li> <li>• Use a distance measuring device with a higher range. → See page 126, chapter 14.2.</li> </ul>
eTemp	The internal device temperature is outside of the permissible range. → For the permissible ambient temperature, see page 128, chapter 14.9.	<ul style="list-style-type: none"> <li>• Check ambience temperature, improve ventilation if applicable.</li> <li>• Shield against radiation heat, e.g. shade the measuring device in case of direct solar irradiation.</li> <li>• Use device with heating at low ambient temperatures.</li> <li>• Use cooling housings for high ambient temperatures.</li> </ul>

Table 76: Error messages

## 12.4 Return

For efficient processing and quick determination of causes, include the following in your return:

- Information on a contact
- A description of the application
- A description of the error that occurred

## 12.5 Disposal

Observe the following items for disposal:

- The distance measuring device must not be disposed of in the household waste.
- Dispose of the distance measuring device according to the respective country-specific provisions.

## Repair

---

### 13 Repair

Repairs must only be performed by the manufacturer. The manufacturer's warranty will lapse in case of interruptions and changes to the device.

### 14 Technical data



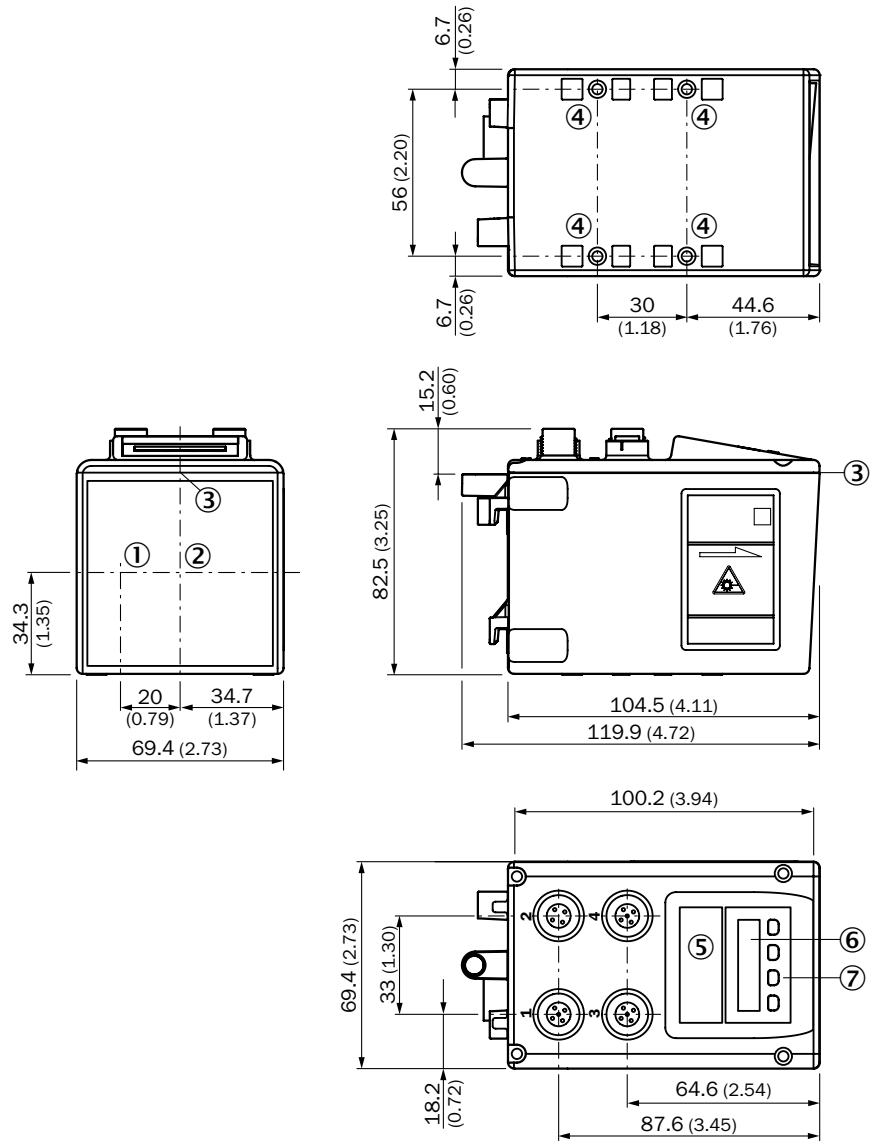
**NOTE!**

You may download, save and print the online data sheet with technical data, dimensions and connection diagrams for your distance measuring device online at "[www.sick.com/dl100](http://www.sick.com/dl100)".

---

For approval  
Zur Prüfung

## 14.1 Dimensions



All dimensions in mm (inch)

Fig. 33: Dimensions distance measuring device DL100

- 1 Optical axis sender
- 2 Optical axis receiver
- 3 Device zero point
- 4 Threaded mounting hole M5
- 5 LED "Status"
- 6 Display
- 7 Operating elements

For approval  
Zur Prüfung

**Technical data**

**14.2 Device selection for CANopen® interface**

Ambiance temperature <sup>1)</sup>	Current consumption at 24 V DC	Measuring range	Accuracy	Operating mode	Repeatability <sup>2)</sup>	Dead time	Order no.	Type code
[ °C]	[mA]	[m]	[mm]			[ms]		
-20 ... +55 -20 ... +75 (with TPCC cooling case 6048328) <sup>2)</sup>	<250	0.15 ... 60	± 3.0	Fast/Medium	1.5	10	1060392	DL100-11AA2109
				Slow	0.75	30		
		0.15 ... 130	± 4.0	Fast/Medium	2.0	10	1060394	DL100-12AA2109
				Slow	1.0	30		
		0.15 ... 220	± 5.0	Fast/Medium	2.5	10	1060396	DL100-13AA2109
				Slow	1.25	30		
-40 ... +55 (with integrated heating) -40 ... +75 with TPCC cooling case 6048328)	<1000	0.15 ... 60	± 3.0	Fast/Medium	1.5	10	1060393	DL100-11HA2109
				Slow	0.75	30		
		0.15 ... 130	± 4.0	Fast/Medium	2.0	10	1060395	DL100-12HA2109
				Slow	1.0	30		
		0.15 ... 220	± 5.0	Fast/Medium	2.5	10	1060397	DL100-13HA2109
				Slow	1.25	30		

1) For temperatures below -10 °C, a start-up time of typically 7 minutes is required.

2) Statistic error 1 σ, depends on the operating mode

Table 77: Device selection



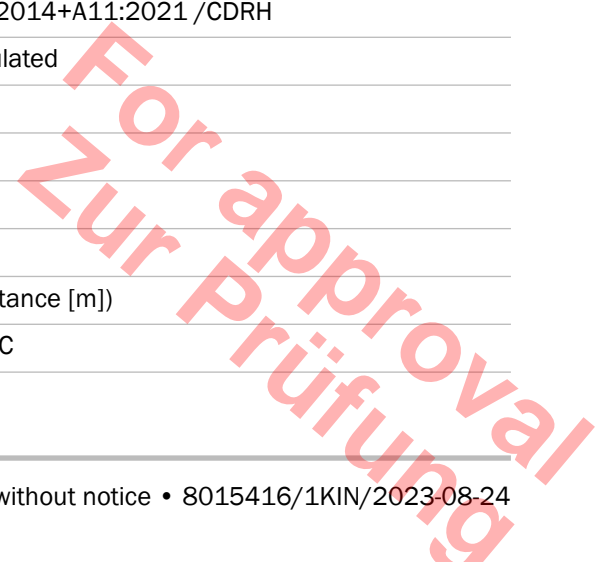
**NOTE!**

→ For more information on the versions of the other interfaces, see "www.sick.com/dl100".

**14.3 Laser/optics**

Light source	Laser diode, red light
Laser protection class	2 pursuant to EN 60825-1:2014+A11:2021 /CDRH
CW modulation	± 0.85 Po sine-shape modulated
Maximum output	≤ 1.9 mW
Pulse duration	6.8 ns
Wave length	655 nm
Frequency	≥ 90 MHz
Light spot dimensions	Typical 5 mm + (2 mm x distance [m])
Average service life	Typical 100 000 h at +25 °C

Table 78: Laser/Optics



## 14.4 Performance

Measurement ranges	<ul style="list-style-type: none"> <li>DL100-11XXXXXX: 0.15 m ... 60 m</li> <li>DL100-12XXXXXX: 0.15 m ... 130 m</li> <li>DL100-13XXXXXX: 0.15 m ... 220 m</li> </ul>
Measuring accuracy	See type specific data → page 126, chapter 14.2
Repeatability	See type specific data → page 126, chapter 14.2
Initialization time	<ul style="list-style-type: none"> <li>Typical 1.5 s</li> <li>After reflector loss: &lt; 40 ms</li> </ul>
Reaction time/Dead time	2 ms
Resolution	Adjustable: 0.1 mm / 0.125 mm / 1.0 mm / 10 mm / 100 mm / free
Output rate	synchronous to PLC request

Table 79: Performance data

## 14.5 Supply

Supply voltage VS	18 V DC ... 30 V DC
Current consumption	<ul style="list-style-type: none"> <li>Without heating: &lt; 250 mA at 24 V DC</li> <li>With heating : &lt; 1.000 mA at 24 V DC</li> </ul>
Residual ripple	< 5 Vss within the permissible supply voltage UV

Table 80: Supply

## 14.6 Inputs

Inputs	<p>Multifunction input MF1, adjustable</p> <ul style="list-style-type: none"> <li>Hi &gt; 12 V</li> <li>Lo &lt; 3 V</li> </ul> <p>→ See page 48, Table 15, parameter "ActSta".</p>
Protective circuit	No, not reverse polarity protected

Table 81: Inputs

## Technical data

### 14.7 Outputs

Outputs	Multifunction outputs MF1 and MF2, type: B (push/pull), adjustable <ul style="list-style-type: none"> <li>• Hi &gt; UV – 3 V</li> <li>• Lo &lt; 2 V</li> </ul> → See page 48, Table 15 and page 54, Table 20, parameter “ActSta.”
Maximum output current	Max. 100 mA
Output load	<ul style="list-style-type: none"> <li>• Capacity: 100 nF</li> <li>• Inductive 20 mH</li> </ul>

Table 82: Outputs

### 14.8 Interfaces

CANopen®	Process data interface
Baud rate	Depends on cable length
Ethernet	Configuration interface

Table 83: Interfaces

### 14.9 Ambient conditions

Protection class	III Suitable for operation in PELV systems (Protective Extra Low Voltage - safety extra-low voltage) with secure separation.
Electromagnetic compatibility <sup>1)</sup>	EN 61000-6-2, EN 55011, category A
Ambient temperature range	See type-specific data
Storage temperature range	–40 °C ... +75 °C
Enclosure rating	IP65
Air pressure influence	0.3 ppm/hPa
Temperature influence	1 ppm/K
Temperature drift	Typical 0.1 mm/K
Maximum movement speed	10 m/s
Maximum acceleration change	10 m/s <sup>2</sup>
Vibration resistance (sine)	EN 60068-2-6
Noise	EN 60068-2-64
Shock resistance	EN 60086-2-27

1) When used in the household area, the device may cause interferences.

Table 84: Ambient conditions



## 14.10 Constructive setup

Dimensions	→ See page 125, chapter 14.1.
Weight	<ul style="list-style-type: none"> <li>• Distance measuring device: 800 g</li> <li>• Alignment bracket (optional): 800 g</li> </ul>
Materials	<ul style="list-style-type: none"> <li>• Casing: Cast aluminium GD-AISI12Cu1 (3.2982.05)</li> <li>• Front screen: PMMA</li> </ul>
Connections	M12, SpeedCon™
Display	<ul style="list-style-type: none"> <li>• 6 points with a 5 x 7 point matrix</li> <li>• Overflow is displayed with the maximum value that can be displayed, -99999 bzw. 999999.</li> </ul>

Table 85: Constructive setup

For approval  
Zur Prüfung

**Accessories**

**15 Accessories**

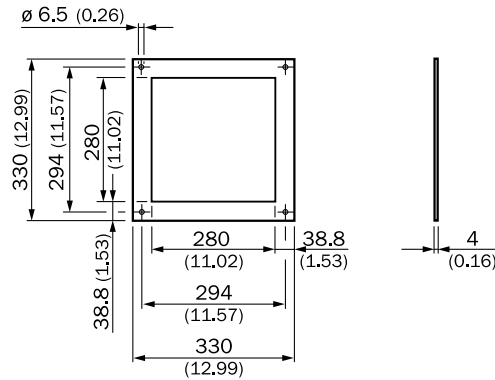


**NOTE!**

Only some of the available accessories are shown here. Complete details on all accessories are available at “[www.sick.com/dl100](http://www.sick.com/dl100)”.

**15.1 Reflectors and reflective tape**

**15.1.1 Reflectors**

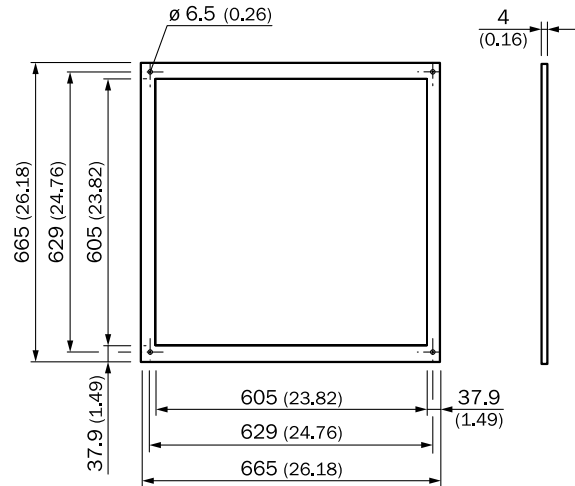


All dimensions in mm (inch)

Fig. 34: Reflector 0.3 x 0.3 m<sup>2</sup> Diamond Grade, mounted

Description	Reflector 0.3 x 0.3 m <sup>2</sup> Diamond Grade, mounted on base plate ALMG3
Type	PL240DG
Part no.	1017910

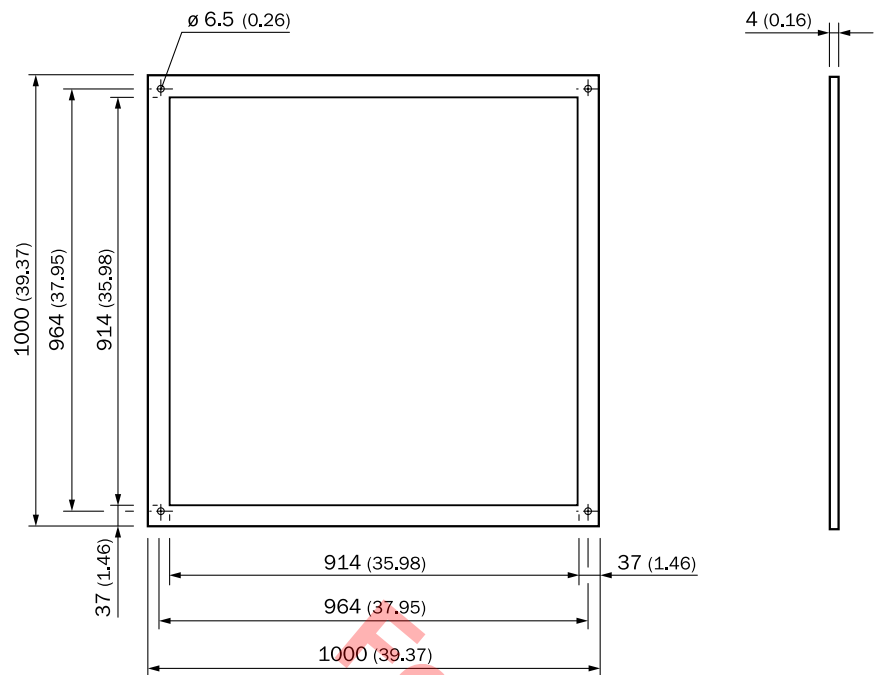
For approval  
Zur Prüfung



All dimensions in mm (inch)

Fig. 35: Reflector 0.6 x 0.6 m<sup>2</sup> Diamond Grade, mounted

Description	Reflector 0.6 x 0.6 m <sup>2</sup> Diamond Grade, mounted on base plate ALMG3
Type	PL560DG
Part no.	1016806

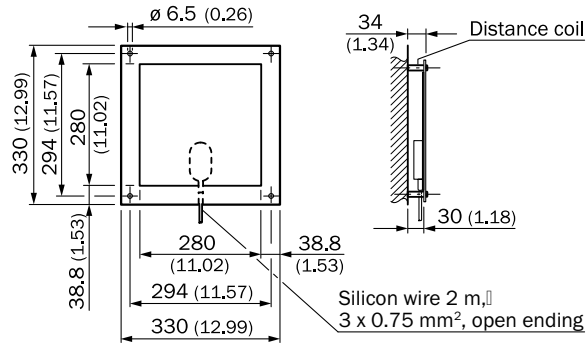


All dimensions in mm (inch)

Fig. 36: Reflector 1.0 x 1.0 m<sup>2</sup> Diamond Grade, mounted

Description	Reflector 1.0 x 1.0 m <sup>2</sup> Diamond Grade, mounted on base plate ALMG3
Type	PL880DG
Part no.	1018975

**Accessories**



All dimensions in mm (inch)

Fig. 37: Reflector 0.3 x 0.3 m<sup>2</sup> Diamond Grade, mounted, including heating

Description	Reflector 0.3 x 0.3 m <sup>2</sup> Diamond Grade, mounted, on base plate ALMG3, including controlled heating +20 °C, 230 V AC, 200 W, IP 64
Type	PL240DG-H
Part no.	1022926

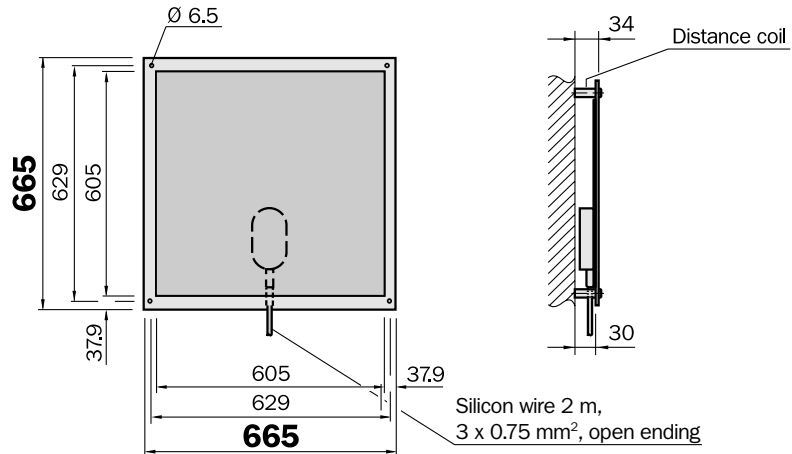


Fig. 38: Reflector 0.6 x 0.6 m<sup>2</sup> Diamond Grade, mounted, including heating

Description	Reflector 0.6 x 0.6 m <sup>2</sup> Diamond Grade, mounted, on base plate ALMG3, including controlled heating +20 °C, 230 V AC, 200 W, IP 64
Type	PL560DG-H
Part no.	1023888

For approval  
Zur Prüfung

### 15.1.2 Reflective tape



Fig. 39: "Diamond grade" reflective tape

Description	"Diamond grade" reflective tape, size customizable
Type	REF-DG
Part no.	4019634
Description	"Diamond grade" reflective tape, curve 749 x 914 mm <sup>2</sup>
Type	REF-DG
Part no.	5320565

For approval  
Zur Prüfung

## Accessories

### 15.2 Connection systems

#### 15.2.1 Cable socket with cable

Description	Cable socket, M12, 5-pin, straight, 5 m, CAN/CANopen®, shielded on pin 1
Type	DOL-1205-G05M_Can
Part no.	6021166

#### 15.2.2 Cable connector with cable

Description	Cable connector, M12, 5-pin, 5 m, PVC
Type	DeviceNet cable
Part no.	6030741

#### 15.2.3 Terminator

Description	Cable plug, M12, 5-pin, straight, terminator, DeviceNet and CANopen®
Type	STE-1205-GKEND
Part no.	6037193

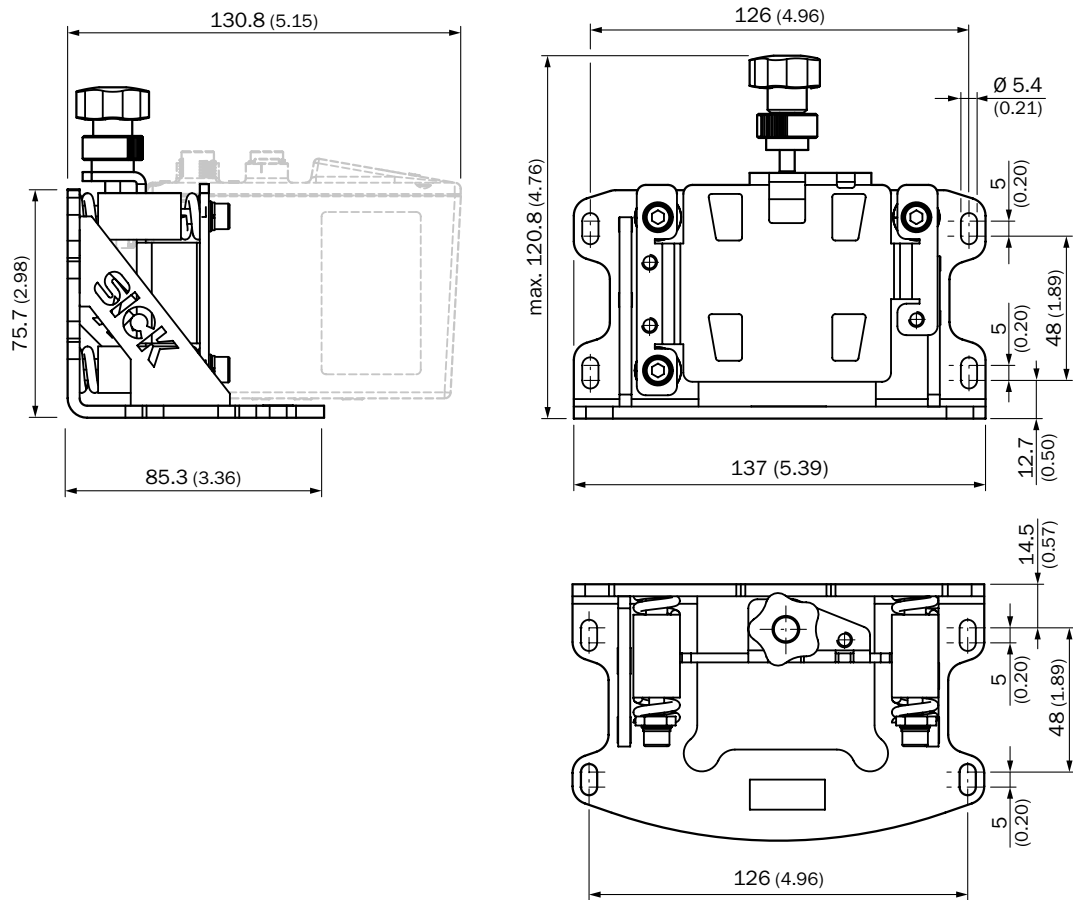
#### 15.2.4 Connection cables

Description	Connection cable, M12, 5-pin, plug straight/socket straight, 5 m, CAN/CANopen®, shielded
Type	DSL-1205-G05MK
Part no.	6021168

For approval  
Zur Prüfung

## 15.3 Mounting systems

### 15.3.1 Alignment bracket



All dimensions in mm (inch)

Fig. 40: Alignment bracket

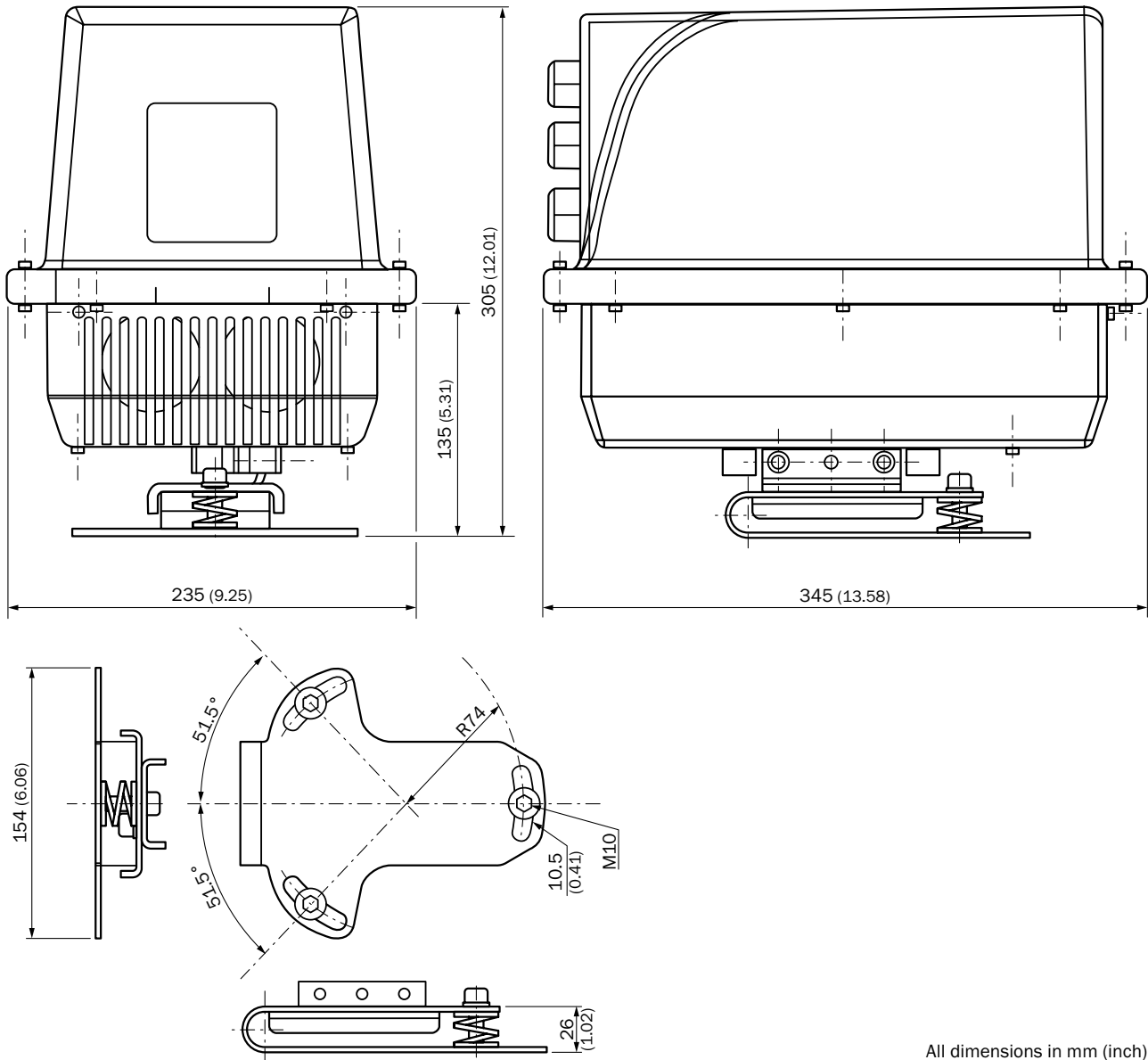
Description	Alignment bracket
Type	BEF-AH-DX100
Part no.	2058653
Material:	Zinc-plated steel sheet

### 15.3.2 Deflector mirror for mounting at alignment bracket

Description	Deflector mirror for deflecting the light beam by 90°. Can only be mounted at alignment bracket BEF-AH-DX100.
Type	BEF-BEF-DX100
Part no.	2068395
Material:	Zinc-plated steel sheet

**Accessories**

**15.4 Other accessories**



All dimensions in mm (inch)

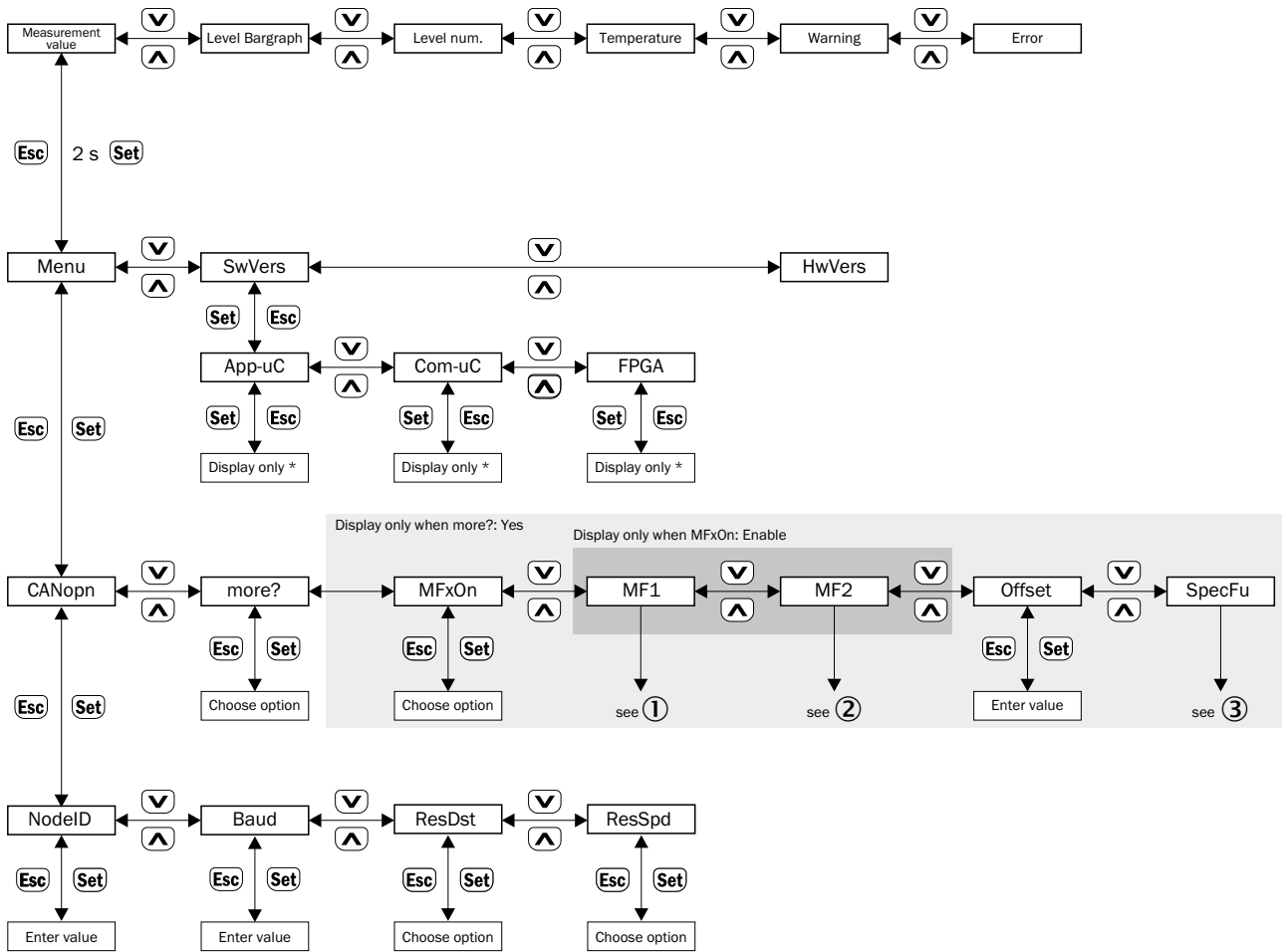
Fig. 41: Cooling casing

Description	Cooling casing
Type	TPCC-Dx100
Part no.	6048328
Material	Glass-fiber reinforced plastic (GFK)
Operating ambience temperature	-20 ... +75 °C (short-term +80 °C)
Supply voltage	24 V DC ± 20 %
Current consumption	15 A at 24 V DC
Enclosure rating	IP 54

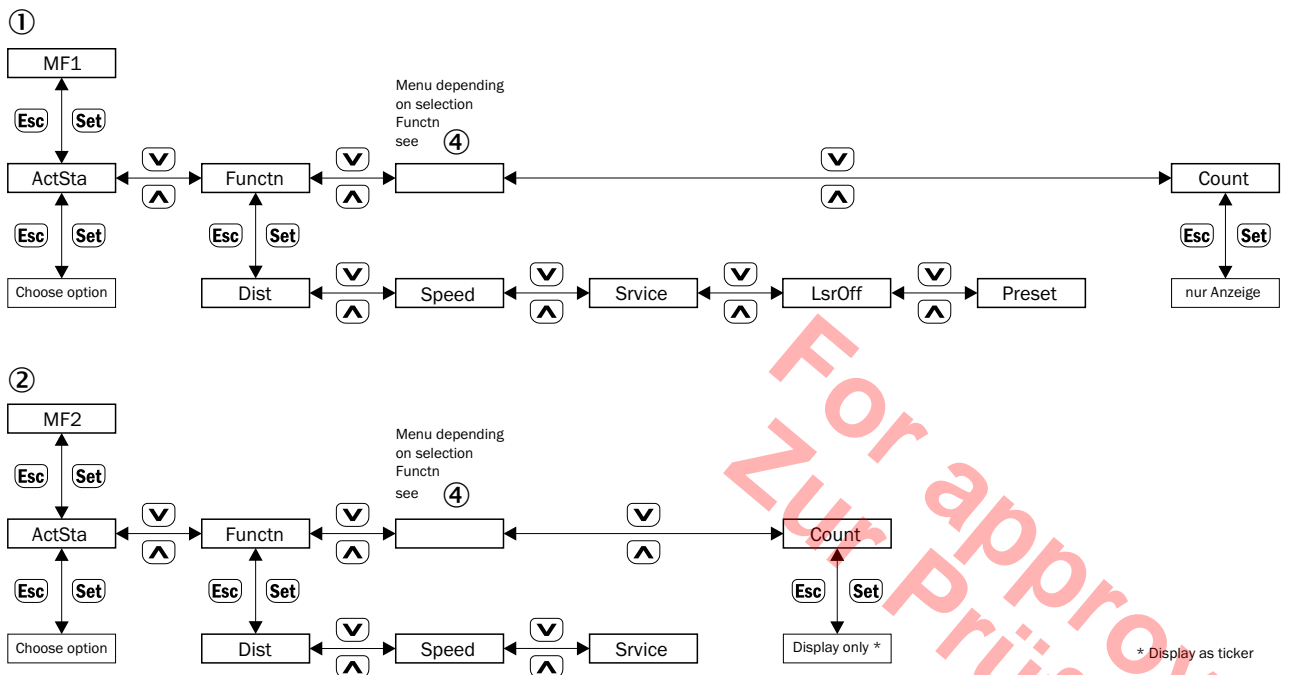
For approval  
Zur Prüfung



## 16 Menu structure

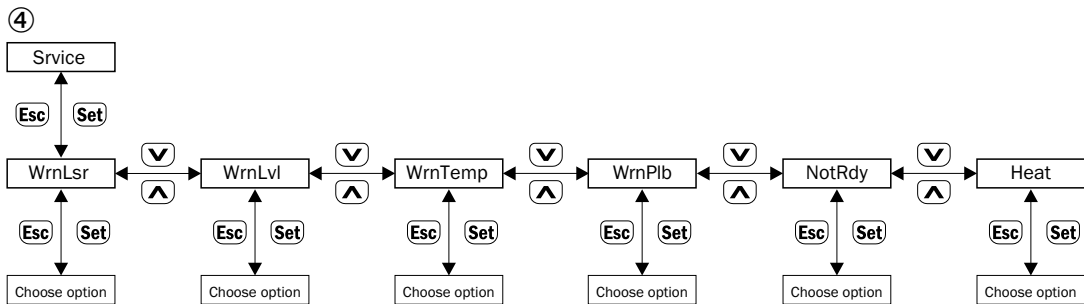
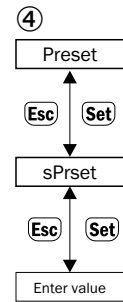
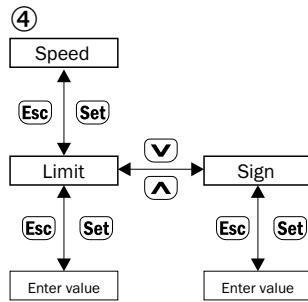
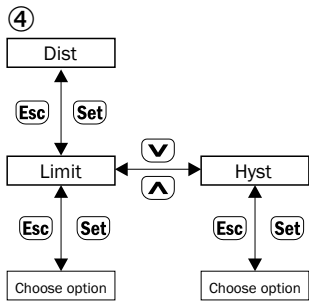
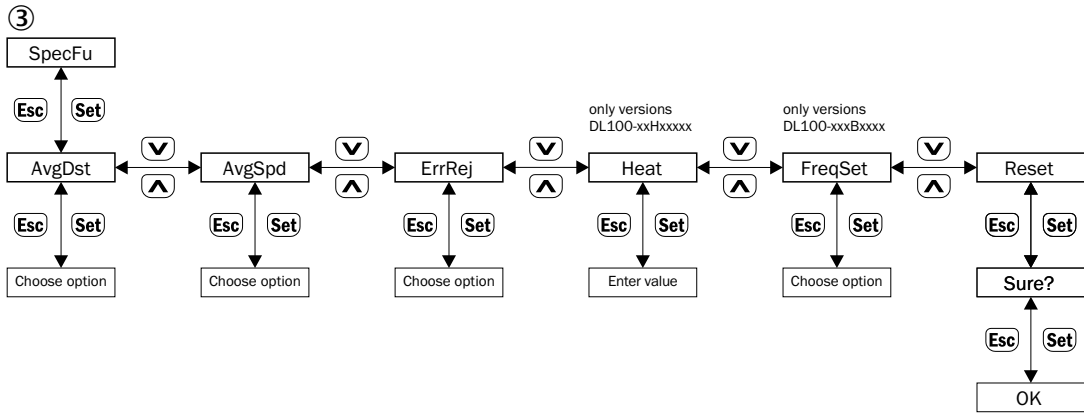


\* Display as ticker



\* Display as ticker

## Menu structure



For approval  
Zur Prüfung

## Index

### Symbole

11-bit CAN-ID Setup .....	80
---------------------------	----

### A

Abbreviations	
CANopen®- .....	72
Accessories.....	130
Alignment bracket .....	135
Cables with cable socket .....	134
Connecting systems .....	134
Connection cables.....	134
Cooling casing.....	136
Miscellaneous.....	136
Reflectors .....	130
Terminator.....	134
Address assignment (Node-ID) .....	74
Align	
Distance measuring device and reflector .....	32
Via alignment bracket .....	35
Alignment bracket	
Mounting.....	33
Ambient conditions .....	128

### B

Baud rate	
Setting.....	76
Setting via display.....	76
Setting via LSS.....	77
Setting via SOPAS ET.....	76
Baud rates .....	74
Bus line	
Length .....	74

### C

Cables with cable socket	
Accessory .....	134
CAN-IDs .....	81
CANopen® .....	72
Basics.....	72
CAN-IDs .....	81
Installation notes.....	73
Preset .....	109
Services.....	81
Topology .....	73
Changes .....	17
CiA 301 .....	78
CiA 406 .....	78
Cleaning.....	120
COB (Communication Object Identifier).....	72
COB-ID.....	79
Communication profile CiA 301 .....	78

Communication segment	
Description.....	97
Connection cables	
Accessory .....	134
Connection diagram	
CANopen input.....	41
CANopen output .....	41
Ethernet.....	40
Supply voltage.....	40
Connection systems (accessories) .....	134
Constructive setup .....	129
Conversions .....	17
Customer service .....	14

### D

Damping	
Rated level .....	32
Warning threshold .....	32
Danger notes Laser irradiation.....	19
Delivery .....	14
Device profile CiA 406 .....	78, 107
Device selection .....	126
Dimensions.....	125
Alignment bracket .....	135
Distance measuring device .....	125
Display .....	24
Disposal .....	123
DLC (Data Length Code) .....	72
Dynamic mapping .....	115
Procedure.....	119

### E

EC Declaration of Conformity .....	15
EDS	
Download .....	78
EDS (Electronic Data Sheet).....	73
EEC (Emergency Error Code) .....	72
Electrical connection.....	36
Electricians .....	17
EMCY (Emergency Object) .....	72
EMCY messages	
Overview of general EMCY messages.....	89
Overview of manufacturer-specific EMCY messages .	90
Emergency messages (EMCY).....	89
Environmental protection .....	15
ER (Error Register).....	72
Error messages .....	122
Ethernet .....	58
Explanation of terms	
CANopen® .....	72

## Index

<b>F</b>		<b>O</b>	
Factory settings.....	57	Object	
Function .....	22	1A00h Transmit PDO Mapping Parameter 1.....	103
<b>G</b>		1A02h Transmit PDO Mapping Parameter 2.....	104
General .....	12	1A04h Transmit PDO Mapping Parameter 5.....	104
<b>I</b>		1A05h Transmit PDO Mapping Parameter 6.....	104
Identification.....	20	100Ah Manufacturer Software Version .....	98
Inputs.....	127	650Ah Module Identification .....	114
Instructed persons.....	17	650Bh Serial Number .....	114
Intended use .....	16	1000h Device Type.....	97
Interfaces.....	128	1001h Error Register .....	97
IP-address assignment.....	58	1003h Pre-defined Error Field .....	97
<b>K</b>		1005h COB-ID SYNC .....	98
Keys.....	24	1008h Manufacturer Device Name .....	98
<b>L</b>		1009h Manufacturer Hardware Version.....	98
Laser .....	126	1010h Store Parameter Field.....	98
Laser irradiation .....	19	1011h Restore Default Parameters.....	98
LEDs.....	23	1014h COB-ID EMCY.....	99
STA.....	119	1016h Heartbeat Consumer Entries .....	99
Status indicator CANopen®.....	119	1017h Producer Heartbeat Time .....	99
Status indicators.....	121	1018h Identity Object.....	100
Limitations of liability.....	14	1019h Synchronous Counter Overflow Value.....	100
LSS (Layer Setting Services) .....	72	1029h Error Behaviour .....	101
<b>M</b>		1200h Server SDO Parameter 1.....	101
Maintenance .....	120	1800h Transmit PDO Communication	
Manufacturer-specific segment .....	104	Parameter 1.....	102
Menu structure.....	137	1801h Transmit PDO Communication	
Minimum distance .....	29	Parameter 2.....	102
Mounting.....	27	1804h Transmit PDO Communication	
Alignment bracket and distance measuring		Parameter 5.....	102
device .....	33	1805h Transmit PDO Communication	
Distance measuring device .....	33	Parameter 6.....	103
Distance measuring device and adjacent data		2000h Distance .....	104
transmission photoelectric switch.....	31	2001h Velocity.....	105
Minimum distance.....	29, 30	2002h Time Stamp .....	105
Multiple distance measuring device .....	29	4000h Distance Resolution.....	105
Notes .....	27	4001h Velocity Resolution.....	105
Process.....	27	4002h Device Product Code .....	106
Reflector .....	28	4003h Software Versions .....	106
Mounting systems.....	135	4004h Device Temperature.....	106
MSEF (Manufacture Specific Error Field).....	72	4005h Laser Operating Hours.....	106
<b>N</b>		4006h Command .....	106
Network Management Commands.....	85	4007h Reset Preset.....	106
NMT (Network Management).....	72	6000h Operating Parameters .....	107
Node-ID.....	72, 74	6001h Measuring Units per Revolution.....	108
Setting via display.....	74	6002h Total Measuring Range in Measuring	
Setting via LSS.....	75	Units .....	108
Setting via SOPAS ET.....	74	6003h Preset Value .....	109
Non-intended use.....	16	6004h Position Value.....	110
		6005h Linear Encoder Measuring Step Settings	110
		6010h Preset Values for Multi-Sensor Devices ..	111
		6020h Position Values for Multi-Sensor Devices	111
		6030h Speed Value .....	111
		6200h Cyclic Timer .....	111
		6500h Operating Status .....	111

6501h Single-turn Resolution and Measuring Step .....	111	<b>R</b>	Reflective tape.....	133
6502h Number of Distinguishable Revolutions..	112	Reflector	Alignment.....	32
6503h Alarms.....	112	Mounting.....	28	
6504h Supported Alarms .....	112	Selection .....	28	
6505h Warnings.....	113	Reflectors.....	130	
6506h Supported Warnings.....	113	Accessories.....	130	
6507h Profile and Software Version.....	113	Repair.....	124	
6508h Operating Time.....	114	Reset.....	57	
6509h Offset Value .....	114	Return .....	123	
Object directory .....	78	RTR (Layer Setting Services) .....	72	
Overview.....	91			
Operating elements.....	23	<b>S</b>		
Operating instructions .....	12	Safety.....	16	
Operating modes.....	24	Electrical connection.....	36	
Operating staff		SDO .....	83	
Requirements .....	17	SDO (Service Data Object).....	72	
Operation .....	42	Services		
At measuring device.....	42	CANopen® .....	81	
Change value .....	43	Setup.....	21	
Choose option.....	42	Skilled persons.....	17	
Choose parameter.....	42	Requirements .....	17	
Via CANopen® .....	72	SOPAS ET		
Via Ethernet .....	58	Advanced device functions.....	69	
Operational safety.....	17, 19	Baud rate .....	64	
Outputs .....	128	Device information .....	59	
		Device name .....	60	
<b>P</b>		Diagnostic data.....	62	
Parameter description .....	43	Distance value.....	61	
CANopen® .....	45	Frequency.....	70	
Dist (MF1) .....	49	Function configuration .....	68	
Dist (MF2) .....	54	General settings .....	63	
HwVers .....	44	Hardware version.....	59	
Main menu.....	43	Heater.....	69	
MF1 .....	48	Measurement value resolution.....	64	
MF2 .....	54	Measurement values .....	61	
MFx On .....	47	Methods .....	71	
more .....	46	MF1 Function configuration.....	65	
Offset.....	55	MF1/MF2 activation.....	64	
SpecFu .....	55	MF1 Service configuration.....	67	
Speed (MF1) .....	50	MF1, Threshold.....	66	
Speed (MF2) .....	54	MF2, Threshold.....	68	
Srvice (MF1).....	51	Node-ID .....	64	
Srvice (MF2).....	54	Number of MF activation .....	68	
SwVers.....	44	Parameter default values .....	70	
PDO .....	83	Product code.....	59	
Asynchronous .....	86	Service configuration.....	68	
Synchronous .....	86	Software versions.....	59	
PDO (Process Data Object).....	72	Store parameter .....	70	
Performance data .....	127	Store user information.....	60	
Preset		User information.....	60	
CANopen® .....	109	Status indicator		
Description.....	52	Display via LED STA .....	119	
		Status indicators.....	23	

## Index

---

Storage.....	26
Supply .....	127
SYNC (Synchronisation Object) .....	72

### T

Technical Data.....	124
Telegram setup.....	79
Terminator	
Accessory .....	134
Topology .....	73
TPDOs .....	87
Transmission Type.....	86
TPDO overview .....	87
Transport.....	25
Transport inspection .....	25
Troubleshooting.....	121
Type code.....	126
Type label.....	20

### U

UL safety notes.....	11
----------------------	----

### W

Warning messages.....	122
Wiring notes.....	36

For approval  
Zur Prüfung

For approval  
Zur Prüfung

**Australia**

Phone +61 (3) 9457 0600  
1800 33 48 02 – tollfree  
E-Mail sales@sick.com.au

**Austria**

Phone +43 (0) 2236 62288-0  
E-Mail office@sick.at

**Belgium/Luxembourg**

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

**Brazil**

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

**Canada**

Phone +1 905.771.1444  
E-Mail cs.canada@sick.com

**Czech Republic**

Phone +420 234 719 500  
E-Mail sick@sick.cz

**Chile**

Phone +56 (2) 2274 7430  
E-Mail chile@sick.com

**China**

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

**Denmark**

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

**Finland**

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

**France**

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

**Germany**

Phone +49 (0) 2 11 53 010  
E-Mail info@sick.de

**Greece**

Phone +30 210 6825100  
E-Mail office@sick.com.gr

**Hong Kong**

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

**Hungary**

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

**India**

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

**Israel**

Phone +972 97110 11  
E-Mail info@sick-sensors.com

**Italy**

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

**Japan**

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

**Malaysia**

Phone +603-8080 7425  
E-Mail enquiry.my@sick.com

**Mexico**

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

**Netherlands**

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

**New Zealand**

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

**Norway**

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

**Poland**

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

**Romania**

Phone +40 356-17 11 20  
E-Mail office@sick.ro

**Russia**

Phone +7 495 283 09 90  
E-Mail info@sick.ru

**Singapore**

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

**Slovakia**

Phone +421 482 901 201  
E-Mail mail@sick-sk.sk

**Slovenia**

Phone +386 591 78849  
E-Mail office@sick.si

**South Africa**

Phone +27 10 060 0550  
E-Mail info@sickautomation.co.za

**South Korea**

Phone +82 2 786 6321/4  
E-Mail infokorea@sick.com

**Spain**

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

**Sweden**

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

**Switzerland**

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

**Taiwan**

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

**Thailand**

Phone +66 2 645 0009  
E-Mail marcom.th@sick.com

**Turkey**

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

**United Arab Emirates**

Phone +971 (0) 4 88 65 878  
E-Mail contact@sick.ae

**United Kingdom**

Phone +44 (0)17278 31121  
E-Mail info@sick.co.uk

**USA**

Phone +1 800.325.7425  
E-Mail info@sick.com

**Vietnam**

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

Detailed addresses and further locations at [www.sick.com](http://www.sick.com)

For approval  
Zur Prüfung  
**SICK**  
Sensor Intelligence.