

Original operating instructions

BCL 300/ and BCL 301/ Bar code readers



© 2021

Leuze electronic GmbH & Co. KG

In der Braike 1

D-73277 Owen / Germany

Phone: +49 7021 573-0

Fax: +49 7021 573-199

<http://www.leuze.com>

info@leuze.com

1	General information	8
1.1	Explanation of symbols	8
1.2	Declaration of Conformity	8
2	Safety	9
2.1	Intended use	9
2.2	Foreseeable misuse	9
2.3	Competent persons	10
2.4	Exemption of liability	10
2.5	Laser safety notices	10
3	Fast commissioning / operating principle	12
3.1	Mounting the BCL 300/\ BCL 301/	12
3.2	Device arrangement and selection of the mounting location	12
3.3	BCL 300/electrical connection	12
3.4	BCL 301/electrical connection	17
3.5	Starting the device	20
3.6	Bar code reading	22
4	Device description	23
4.1	About the bar code readers of the BCL 300/series	23
4.2	Characteristics of the bar code readers of the BCL 300/series	23
4.3	Device construction	25
4.4	Reading techniques	27
4.4.1	Line scanner (single line)	27
4.4.2	Line scanner with oscillating mirror	28
4.4.3	Raster scanner (raster line)	29
4.5	Stand-alone connection BCL 300/	29
4.6	Networking - Leuze multiNet plus BCL 301/	30
4.7	Leuze multiScan	31
4.8	Heating	31
4.9	External parameter memory	32
4.10	autoReflAct	32
4.11	Reference codes	32
4.12	autoConfig	32
5	Technical data	33
5.1	General specifications of the bar code readers	33
5.1.1	Line scanner / raster scanner	33
5.1.2	Oscillating-mirror scanner	34
5.1.3	Line / raster scanner with deflecting mirror	35
5.2	Heating models of the bar code readers	35
5.2.1	Line scanner / raster scanner with heating	36
5.2.2	Oscillating-mirror scanner with heating	36
5.2.3	Line scanner / raster scanner with deflecting mirror and heating	37
5.3	Dimensioned drawings	38
5.3.1	Dimensioned drawing of complete overview of the BCL 300/\ BCL 301/with MS 3xx / MK 3xx	38
5.3.2	Dimensioned drawing of complete overview of the BCL 300/\ BCL 301/with KB 301-3000	38
5.3.3	Dimensioned drawing of line scanner with / without heating	39
5.3.4	Dimensioned drawing of deflecting mirror scanner with / without heating	40
5.3.5	Dimensioned drawing of oscillating-mirror scanner with / without heating	41
5.3.6	Dimensioned drawings of MS 3xx / MK 3xx connection hoods	42

5.3.7	Dimensioned drawing of KB 301-3000 cable hood	44
5.3.8	Dimensioned drawing of MA 100 terminal box	45
5.4	Reading field curves / optical data	45
5.4.1	Bar code characteristics	45
5.4.2	Raster scanner	46
5.5	Reading field curves	47
5.5.1	High Density (N) - optics: BCL 300/\ BCL 301/S/R1 N 102 (H)	48
5.5.2	High Density (N) - optics: BCL 300/\ BCL 301/S/R1 N 100 (H)	48
5.5.3	Medium Density (M) - optics: BCL 300/\ BCL 301/S/R1 M 102 (H)	49
5.5.4	Medium Density (M) - optics: BCL 300/\ BCL 301/S/R1 M 100 (H)	49
5.5.5	Medium Density (M) - optics: BCL 300/\ BCL 301/O M 100 (H)	50
5.5.6	Low Density (F) - optics: BCL 300/\ BCL 301/S/R1 F 102 (H)	50
5.5.7	Low Density (F) - optics: BCL 300/\ BCL 301/S/R1 F 100 (H)	51
5.5.8	Low Density (F) - optics: BCL 300/\ BCL 301/O F 100 (H)	51
5.5.9	Ultra Low Density (L) - optics: BCL 300/\ BCL 301/S L 102 (H)	52
5.5.10	Ultra Low Density (L) - optics: BCL 300/\ BCL 301/S L 100 (H)	52
5.5.11	Ultra Low Density (L) - optics: BCL 300/\ BCL 301/O L 100 (H)	53
5.5.12	Ink Jet (J) - optics: BCL 300/\ BCL 301/R1 J 100	54
6	Installation and mounting	55
6.1	Storage, transportation	55
6.2	Mounting the BCL 300/\ BCL 301/	55
6.2.1	Mounting via M4 x 5 screws	56
6.2.2	Mounting devices BT 56 and BT 56-1	57
6.2.3	BT 59 mounting device	58
6.2.4	BT 300 - 1, BT 300 W mounting devices	59
6.3	Device arrangement	60
6.3.1	Selecting a mounting location	60
6.3.2	Avoiding total reflection – Line scanner	60
6.3.3	Avoiding total reflection – deflecting mirror scanner	61
6.3.4	Avoiding total reflection – oscillating-mirror scanner	61
6.3.5	Mounting location	61
6.3.6	Devices with integrated heating	62
6.3.7	Possible read angles between BCL 300/\ BCL 301/and bar code	62
6.4	Cleaning	62
7	Electrical connection	63
7.1	Safety notices for the electrical connection	64
7.2	BCL 300/electrical connection	66
7.2.1	MS 300 connector hood with 2 integrated M12 connectors	66
7.2.2	MK 300 terminal hood with spring-cage terminals	67
7.2.3	MA 100 terminal box and corresponding KB 301-3000 cable hood	68
7.2.4	KB 301-3000 cable hood	69
7.2.5	Stand-alone operation BCL 300/	69
7.3	BCL 301/electrical connection	70
7.3.1	MS 301 connector hood with 3 integrated M12 connectors	70
7.3.2	MK 301 terminal hood with spring-cage terminals	70
7.3.3	MA 100 terminal box and corresponding KB 301-3000 cable hood	72
7.3.4	Network operation BCL 301/in the Leuze multiNet plus	72
7.4	Detailed description of the connections	74
7.4.1	PWR / SW IN/OUT - Voltage supply and switching input/output 1 and 2	74
7.4.2	SERVICE – USB interface (Mini-B type)	76
7.4.3	HOST / BUS IN for BCL 300/	76
7.4.4	HOST / BUS IN for BCL 301/	78
7.4.5	BUS OUT for the BCL 301/	79
7.5	Leuze multiNet plus	79
7.5.1	Wiring the multiNet plus	80
7.5.2	The BCL 301/as network slave	81

7.6	Cable lengths and shielding.	81
8	Display elements and display.	82
8.1	BCL 300/\ BCL 301/LED indicators	82
8.2	BCL 300/\ BCL 301/display	84
9	Leuze webConfig tool.	86
9.1	Connecting the SERVICE USB interface.	86
9.2	Installing the required software	87
9.2.1	System requirements.	87
9.2.2	Installing the USB driver	87
9.3	Starting the webConfig tool	87
9.4	Short description of the webConfig tool.	88
9.4.1	Module overview in the Configuration menu	89
10	Commissioning and configuration	90
10.1	BCL 300/.	91
10.1.1	Measures to be performed prior to the initial commissioning	91
10.1.2	Starting the device.	91
10.2	BCL 301/- multiNet plus Slave	92
10.2.1	Measures to be performed prior to the initial commissioning	92
10.2.2	Starting the device.	92
10.3	Additional settings for the BCL 300/and the BCL 301/.	93
10.3.1	Decoding and processing the read data	93
10.3.2	Control of the decoding	94
10.3.3	Control of the switching outputs.	94
10.4	Transmitting configuration data	95
10.4.1	Via the webConfig tool.	95
10.4.2	Replacing a defective BCL 300/\ BCL 301/.	95
11	Online commands	96
11.1	Overview of commands and parameters.	96
11.1.1	General online commands.	96
11.1.2	Online commands for system control	102
11.1.3	Online commands for configuring the switching inputs/outputs.	102
11.1.4	Online commands for the parameter set operations	105
12	Diagnostics and troubleshooting	109
12.1	General causes of errors	109
12.2	Interface errors	109
12.3	Service and support.	110
13	Type overview and accessories	111
13.1	Part number code	111
13.2	BCL 300/.	112
13.3	BCL 301/.	113
13.4	Connection hood / terminal box accessories.	114
13.5	Accessory – Terminating resistor.	114
13.6	Accessories – Connectors	114
13.7	Accessories – USB cable.	114
13.8	Accessories – Mounting device	115
13.9	Accessory - Reflector for AutoReflAct	115

14	Maintenance	116
14.1	General maintenance information	116
14.2	Repairs, servicing	116
14.3	Disassembling, packing, disposing	116
15	Appendix	117
15.1	ASCII character set	117
15.2	Bar code samples	121
15.2.1	Module 0.3	121
15.2.2	Module 0.5	122

Figure 2.1:	Laser apertures, laser warning signs.....	11
Figure 3.1:	BCL 300/- MS 300 hood with integrated M12 connectors	13
Figure 3.2:	BCL 300/- MK 300 terminal hood with spring-loaded terminals.....	14
Figure 3.3:	Cable fabrication for MK 300 terminal hood	14
Figure 3.4:	BCL 300/- MA 100 terminal box with KB 301-3000 cable hood.....	15
Figure 3.5:	BCL 300/- KB 301-3000 cable hood	16
Figure 3.6:	BCL 301/- MS 301 hood with integrated M12 connectors	17
Figure 3.7:	BCL 301/- MK 301 terminal hood with spring-loaded terminals.....	18
Figure 3.8:	Cable fabrication for MK 301 terminal hood	18
Figure 3.9:	BCL 301/- MA 100 terminal box with KB 301-3000 cable hood.....	19
Figure 4.1:	Line scanner, line scanner with deflecting mirror and oscillating-mirror scanner	23
Figure 4.2:	Possible bar code orientation	24
Figure 4.3:	BCL 300/\ BCL 301/device construction - line scanner.....	25
Figure 4.4:	Device construction BCL 300/\ BCL 301/- Line scanner with deflecting mirror.....	25
Figure 4.5:	BCL 300/\ BCL 301/device construction - oscillating-mirror scanner	26
Figure 4.6:	Device construction MS 300/MS 301 hood with integrated connectors.....	26
Figure 4.7:	Device construction MK 300/MK 301 hood with integrated connectors.....	26
Figure 4.8:	KB 301/3000 cable hood device construction.....	27
Figure 4.9:	MA 100 terminal box device construction	27
Figure 4.10:	Deflection principle for the line scanner.....	28
Figure 4.11:	Deflection principle for the line scanner with oscillating mirror add-on	28
Figure 4.12:	Deflection principle for the raster scanner	29
Figure 4.13:	Stand-alone connection BCL 300/.....	30
Figure 4.14:	Networking possibilities using the multiNet plus	30
Figure 4.15:	Scanner arrangement with the multiScan function	31
Figure 4.16:	Reflector arrangement for autoRefIAct	32
Table 5.1:	Specifications of the BCL 301/and BCL 300/line/raster scanners without heating	33
Table 5.2:	Specifications of the BCL 301/and BCL 300/oscillating-mirror scanners without heating.....	34
Table 5.3:	Specifications of the BCL 301/and BCL 300/deflection-mirror scanners without heating	35
Table 5.4:	Specifications of the BCL 301/and BCL 300/line/raster scanners with heating	36
Table 5.5:	Specifications of the BCL 301/and BCL 300/oscillating-mirror scanners with heating.....	36
Table 5.6:	Specifications of the BCL 301/and BCL 300/deflection-mirror scanners with heating	37
Figure 5.1:	Dimensioned drawing of complete overview of the BCL 300/\ BCL 301/with MS 3xx / MK 3xx ..	38
Figure 5.2:	Dimensioned drawing of complete overview of the BCL 300/\ BCL 301/with KB 301-3000	38
Figure 5.3:	Dimensioned drawing of BCL 300/\ BCL 301/S...102 line scanner	39
Figure 5.4:	Dimensioned drawing of BCL 300/\ BCL 301/S...100 with deflecting mirror	40
Figure 5.5:	Dimensioned drawing of BCL 300/\ BCL 301/O...100 oscillating-mirror scanner	41
Figure 5.6:	Dimensioned drawing of MS 3xx connector hood	42
Figure 5.7:	Dimensioned drawing of MK 3xx terminal hood	43
Figure 5.8:	Dimensioned drawing of KB 301-3000 cable hood.....	44
Figure 5.9:	Dimensioned drawing of MA 100 terminal box	45
Figure 5.10:	The most important characteristics of a bar code.....	45
Table 5.7:	Raster line cover dependent on the distance	46
Figure 5.11:	Zero position of the reading distance.....	47
Table 5.8:	Reading conditions	47
Figure 5.12:	"High Density" reading field curve for line scanner without deflecting mirror.....	48
Figure 5.13:	"High Density" reading field curve for line scanner with deflecting mirror.....	48
Figure 5.14:	"Medium Density" reading field curve for line scanner without deflecting mirror	49
Figure 5.15:	"Medium Density" reading field curve for line scanner with deflecting mirror	49
Figure 5.16:	"Medium Density" reading field curve for oscillating-mirror scanners.....	50
Figure 5.17:	Lateral "Medium Density" reading field curve for oscillating-mirror scanners.....	50
Figure 5.18:	"Low Density" reading field curve for line scanner without deflecting mirror	50




Figure 5.19:	"Low Density" reading field curve for line scanner with deflecting mirror	51
Figure 5.20:	"Low Density" reading field curve for oscillating-mirror scanners	51
Figure 5.21:	Lateral "Low Density" reading field curve for oscillating-mirror scanners	51
Figure 5.22:	"Ultra Low Density" reading field curve for line scanner without deflecting mirror	52
Figure 5.23:	"Ultra Low Density" reading field curve for line scanner with deflecting mirror	52
Figure 5.24:	"Ultra Low Density" reading field curve for oscillating-mirror scanners	53
Figure 5.25:	Lateral "Ultra Low Density" reading field curve for oscillating-mirror scanners	53
Figure 5.26:	"Ink Jet" reading field curve for line scanner with deflecting mirror	54
Figure 6.1:	Device name plate BCL 300/-	55
Figure 6.2:	Fastening options using M4x5 threaded holes	56
Figure 6.3:	Mounting devices BT 56 and BT 56-1	57
Figure 6.4:	Mounting example of BCL 300/- \ BCL 301/- with BT 56	58
Figure 6.5:	BT 59 mounting device	58
Figure 6.6:	BT 300 - 1, BT 300 W mounting devices	59
Figure 6.7:	Total reflection – line scanner	60
Figure 6.8:	Total reflection – line scanner	61
Figure 6.9:	Total reflection – BCL 300/- \ BCL 301/- with oscillating-mirror scanner	61
Figure 6.10:	Reading angle for the line scanner	62
Figure 7.1:	Location of the electrical connections	64
Figure 7.2:	BCL 300/- MS 300 hood with integrated M12 connectors	66
Figure 7.3:	BCL 300/- MK 300 terminal hood with spring-loaded terminals	67
Figure 7.4:	Cable fabrication for MK 300 terminal hood	67
Figure 7.5:	BCL 300/- MA 100 terminal box with KB 301-3000 cable hood	68
Figure 7.6:	BCL 300/- KB 301-3000 cable hood	69
Figure 7.7:	BCL 301/- MS 301 hood with integrated M12 connectors	70
Figure 7.8:	BCL 301/- MK 301 terminal hood with spring-loaded terminals	71
Figure 7.9:	Cable fabrication for MK 301 terminal hood	71
Figure 7.10:	BCL 301/- MA 100 terminal box with KB 301-3000 cable hood	72
Table 7.1:	PWR / SW IN/OUT pin assignment	74
Figure 7.11:	Switching input connection diagram SWIO_1 and SWIO_2	75
Figure 7.12:	Switching output connection diagram SWIO_1 / SWIO_2	75
Table 7.2:	SERVICE pin assignment – Mini-B type USB interface	76
Table 7.3:	Pin assignment HOST / BUS IN for BCL 300/-	76
Figure 7.13:	BCL 300/- Pin assignments - HOST / BUS IN as RS 232	77
Figure 7.14:	BCL 300/- Pin assignments - HOST / BUS IN as RS 422	77
Table 7.4:	Pin assignment HOST / BUS IN for BCL 301/-	78
Table 7.5:	Pin assignment BUS OUT for BCL 301/-	79
Figure 7.15:	Leuze multiNet plus system topology	79
Figure 7.16:	Leuze multiNet plus system topology	80
Table 7.6:	Cable lengths and shielding	81
Figure 8.1:	BCL 300/- \ BCL 301/- LED indicators	82
Figure 8.2:	BCL 300/- \ BCL 301/- Display	84
Figure 9.1:	Connecting the SERVICE USB interface	86
Figure 9.2:	The start page of the webConfig tool	88
Figure 9.3:	Module overview in the webConfig tool	89
Figure 10.1:	Storing configuration data in the webConfig tool	95
Table 12.1:	General causes of errors	109
Table 12.2:	Interface error	109
Table 13.1:	BCL 300/- \ BCL 301/- part number code	111
Table 13.2:	BCL 300/- type overview	112
Table 13.3:	BCL 301/- type overview	113
Table 13.4:	Connection hoods / terminal boxes for the BCL 300/- \ BCL 301/-	114

Table 13.5:	Terminating resistor for the BCL 301/.....	114
Table 13.6:	Connectors for the BCL 300/\ BCL 301/.....	114
Table 13.7:	Service cable for the BCL 300/\ BCL 301/.....	114
Table 13.8:	Mounting devices for the BCL 300/\ BCL 301/.....	115
Table 13.9:	Reflector for autoRefAct operation.....	115
Figure 15.1:	Bar code sample labels (module 0.3)	121
Figure 15.2:	Bar code sample labels (module 0.5)	122

1 General information

1.1 Explanation of symbols

The symbols used in this technical description are explained below.

⚠ ATTENTION!	
	This symbol precedes text messages which must strictly be observed. Failure to observe the provided instructions could lead to personal injury or damage to equipment.
⚠ ATTENTION LASER!	
	This symbol warns of possible danger caused by hazardous laser radiation.
NOTE	
	This symbol indicates text passages containing important information.

1.2 Declaration of Conformity

The bar code readers of the BCL 300/series have been developed and manufactured in accordance with the applicable European standards and directives.

The manufacturer of the product, Leuze electronic GmbH & Co. KG in D-73277 Owen, possesses a certified quality assurance system in accordance with ISO 9001.



2 Safety

The bar code readers of the BCL 3xx/series were developed, manufactured and tested in accordance with the applicable safety standards. They correspond to the state of the art.



2.1 Intended use


Bar code readers of the BCL 3xx/series are conceived as stationary, high-speed scanners with integrated decoder for all current bar codes used for automatic object detection.



Areas of application

The bar code readers of the BCL 3xx/series are especially designed for the following areas of application:

- Storage and conveying technologies, in particular for object identification on fast-moving conveyor belts
- Pallet transport systems
- Automobile sector
- Omnidirectional reading

 CAUTION!	
	<p>Observe intended use!</p> <p>⚠ Only operate the device in accordance with its intended use. The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not complying with its intended use.</p> <p>Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use.</p> <p>⚠ Read the technical description before commissioning the device. Knowledge of this technical description is an element of proper use.</p>

NOTE	
	<p>Comply with conditions and regulations!</p> <p>⚠ Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.</p>


 ATTENTION!	
	<p>For UL applications, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).</p>

2.2 Foreseeable misuse

Any use other than that defined under "Intended use" or which goes beyond that use is considered improper use.

In particular, use of the device is not permitted in the following cases:

- in rooms with explosive atmospheres
- as stand-alone safety component in accordance with the machinery directive ¹⁾
- for medical purposes

NOTE	
	<p>Do not modify or otherwise interfere with the device!</p> <p>⚠ Do not carry out modifications or otherwise interfere with the device.</p> <p>The device must not be tampered with and must not be changed in any way.</p> <p>The device must not be opened. There are no user-serviceable parts inside.</p> <p>Repairs must only be performed by Leuze electronic GmbH + Co. KG.</p>

¹⁾ Use as safety-related component within the safety function is possible, if the component combination is designed correspondingly by the machine manufacturer.

2.3 Competent persons

Connection, mounting, commissioning and adjustment of the device must only be carried out by competent persons.

Prerequisites for competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the technical description of the device.
- They have been instructed by the responsible person on the mounting and operation of the device.

Certified electricians

Electrical work must be carried out by a certified electrician.

Due to their technical training, knowledge and experience as well as their familiarity with relevant standards and regulations, certified electricians are able to perform work on electrical systems and independently detect possible dangers.


In Germany, certified electricians must fulfill the requirements of accident-prevention regulations DGUV V3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Exemption of liability

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- The device is not being used properly.
- Reasonably foreseeable misuse is not taken into account.
- Mounting and electrical connection are not properly performed.
- Changes (e.g., constructional) are made to the device.

2.5 Laser safety notices

⚠ ATTENTION, LASER RADIATION – CLASS 1 LASER PRODUCT	
	The device satisfies the requirements of IEC/EN 60825-1:2014 safety regulations for a product of laser class 1 and complies with 21 CFR 1040.10 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
	↪ Observe the applicable statutory and local laser protection regulations.
	↪ The device must not be tampered with and must not be changed in any way.
	There are no user-serviceable parts inside the device.
	Repairs must only be performed by Leuze electronic GmbH + Co. KG.
CAUTION: Opening the device can lead to dangerous exposure to radiation!	

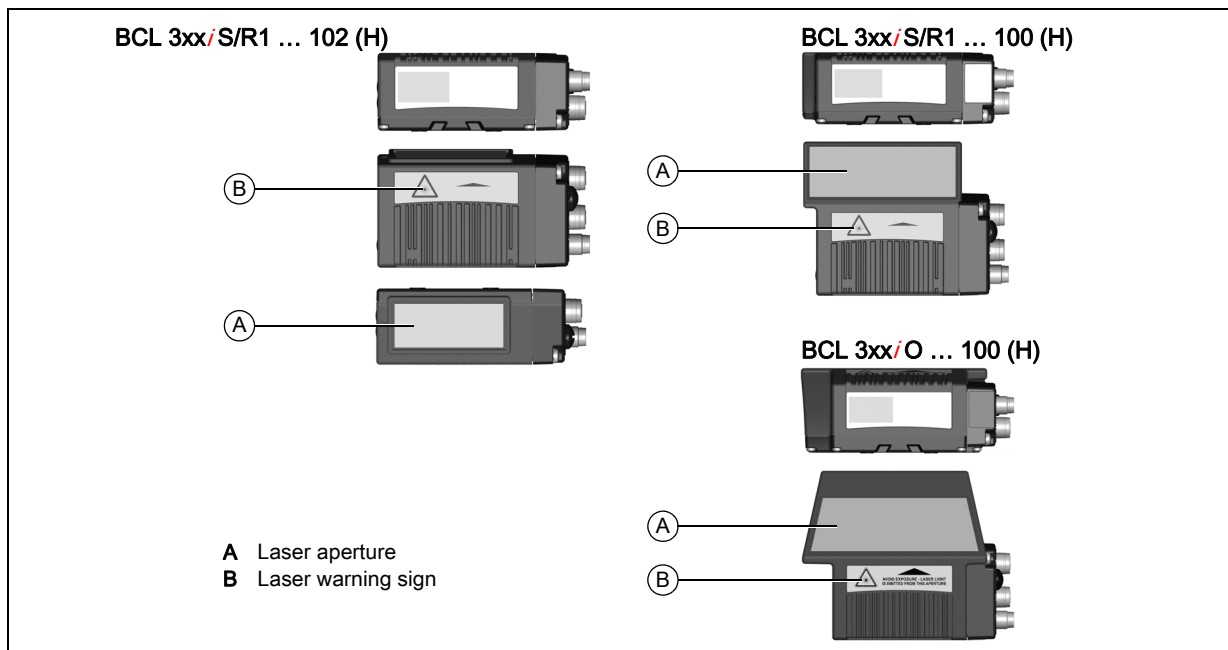


Figure 2.1: Laser apertures, laser warning signs

3 Fast commissioning / operating principle

Below you will find a short description for the initial commissioning of the BCL 300/\ BCL 301/. Detailed explanations for all listed points can be found throughout this technical description.

3.1 Mounting the BCL 300/\ BCL 301/

The BCL 300/\ BCL 301/ bar code readers can be mounted in two different ways:


- Via four M4x6 screws on the device bottom.
- Via a BT 56 mounting device in the fastening groove on the housing bottom.

3.2 Device arrangement and selection of the mounting location

In order to select the right mounting location, several factors must be considered:

- Size, orientation, and position tolerance of the bar codes on the objects to be scanned.
- The reading field of the BCL 300/\ BCL 301/ in relation to the bar code module width.
- The resulting minimum and maximum reading distance from the respective reading field.
- The permissible cable lengths between the BCL 300/\ BCL 301/ and the host system depending on which interface is used.
- The correct time for data output. The BCL 300/\ BCL 301/ should be positioned in such a way that, taking into consideration the time required for data processing and the conveyor belt speed, there is sufficient time to e.g. initiate sorting operations on the basis of the read data.
- The display and control panel should be very visible and accessible.
- For configuring and commissioning with the webConfig tool, the USB interface should be easily accessible.

For specific information, please refer to Chapter 6 and Chapter 7.

NOTE	
	The beam of the BCL 300/\ BCL 301/ exits:
	<ul style="list-style-type: none"> - Parallel to the housing base in the case of the line scanner - At 105 degrees from the housing base in the case of the deflecting mirror - Perpendicular to the housing base in the case of the oscillating mirror <p>In each case, the housing base is the black area in Figure 6.2. The best read results are obtained when:</p> <ul style="list-style-type: none"> • The BCL 300/\ BCL 301/ is mounted in such a way that the scanning beam is incident on the bar code at an angle of inclination greater than $\pm 10^\circ \dots 15^\circ$ to vertical. • The reading distance lies in the middle area of the reading field. • The bar code labels are of good print quality and have good contrast ratios. • You do not use high-gloss labels. • There is no direct sunlight.

3.3 BCL 300/\ electrical connection

For the electrical connection of the BCL 300/, 4 connection variants are available.

The **voltage supply** (18 ... 30VDC) is connected acc. to the connection type selected.

2 freely programmable switching inputs/outputs for individual adaptation to the respective application are also available here. Detailed information on this topic can be found in Chapter 7.4.1 and Chapter 7.4.3.

MS 300 connector hood with 2 integrated M12 connectors

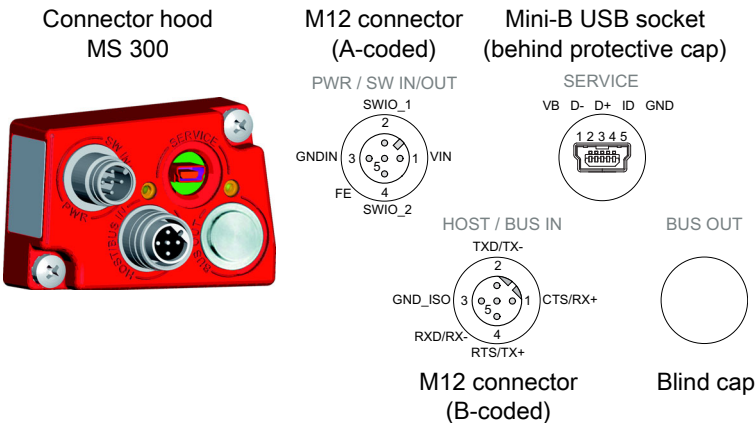




Figure 3.1: BCL 300/- MS 300 hood with integrated M12 connectors

NOTE	
	The shielding connection is done via the M12 connector housing.

NOTE	
	The integrated parameter memory for the simple replacement of the BCL 300/- is located in the MS 300.

MK 300 terminal hood with spring-cage terminals

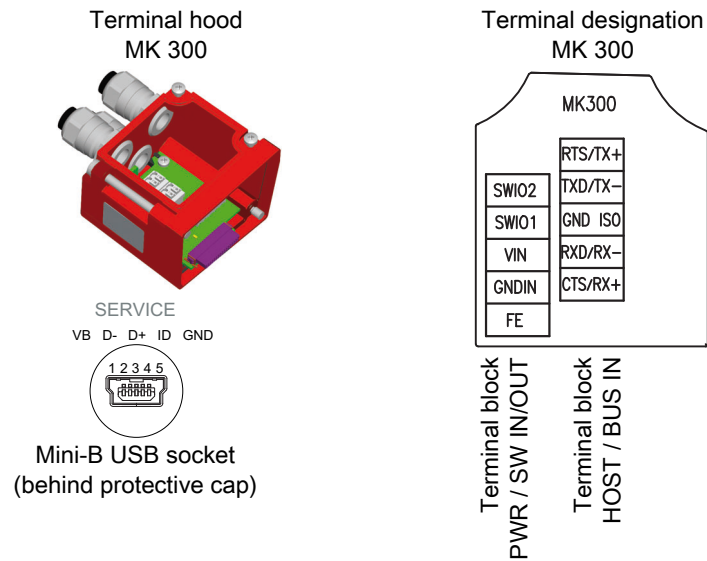



Figure 3.2: BCL 300/- MK 300 terminal hood with spring-loaded terminals

NOTE	
	The integrated parameter memory for the simple replacement of the BCL 300/- is located in the MK 300.

Cable fabrication and shielding connection

Remove approx. 78 mm of the connection cable sheathing. 15 mm of sheath of the shielded line must be freely accessible.

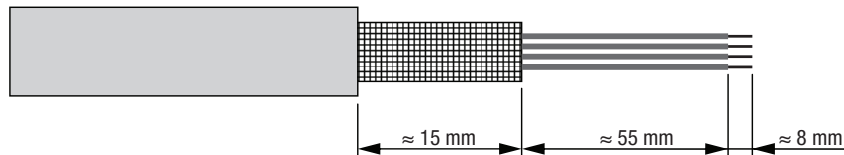


Figure 3.3: Cable fabrication for MK 300 terminal hood

The shield is automatically contacted when the cable is lead into the metal screw fitting and fastened when the cord grip is closed. Then lead the individual wires into the terminals according to the diagram. Wire end sleeves are not necessary.

MA 100 terminal box and corresponding KB 301-3000 cable hood

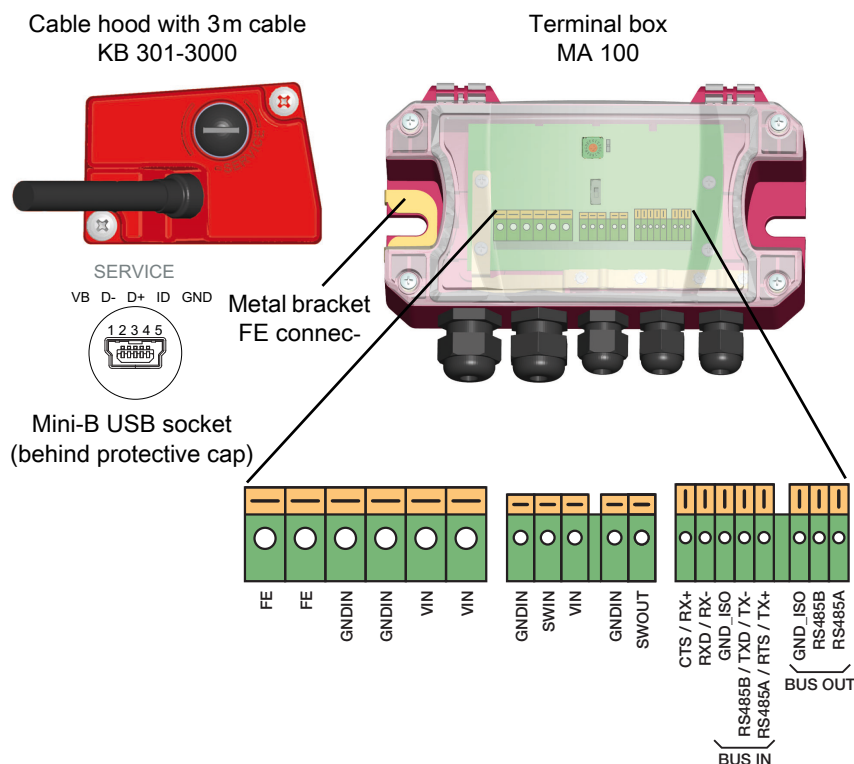


Figure 3.4: BCL 300/- MA 100 terminal box with KB 301-3000 cable hood

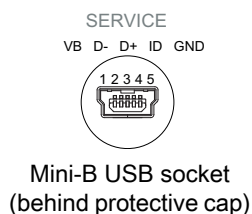
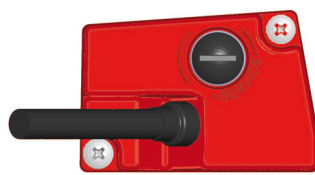
NOTE



The left side of the housing of the MA 100 features a metal bracket for connecting functional earth FE to the installation surface (e.g. metallic equipment).
The MA 100 contains a shielding terminal for the shielding connection of the KB 301-3000.

KB 301-3000 cable hood

Cable hood with 3m cable
KB 301-3000

**Assignment**

Core color	Signal
White	FE
White - black	GNDIN
Black	VIN
White - green	SWIO2
Gray	SWIO1
White - yellow	RXD / RX-
White - red	TXD / TX-
Yellow	CTS / RX+
Red	RTS / TX+
Violet	GND_RS232/422
White - brown	Reserve
Brown	Reserve
White - orange	Reserve
Orange	Reserve
Green	Reserve
Blue	Reserve

Figure 3.5: BCL 300/- KB 301-3000 cable hood

NOTE

A contact surface for the shielding connection is located on the cable end of the KB 301-3000.

Stand-alone operation BCL 300/-

During stand-alone operation of the BCL 300/-, the host interface of the superior system is connected to HOST/BUS IN. Please make certain that the correct interface is used on the superior system. The standard setting of the BCL 300/- for the host interface is RS 232.

3.4 BCL 301 / electrical connection

For the electrical connection of the BCL 301 /, 3 connection variants are available.

The **voltage supply** (18 ... 30VDC) is connected acc. to the connection type selected.

2 freely programmable switching inputs/outputs for individual adaptation to the respective application are also available here. Detailed information on this topic can be found in Chapter 7.4.1 and Chapter 7.4.3.

MS 301 connector hood with 3 integrated M12 connectors

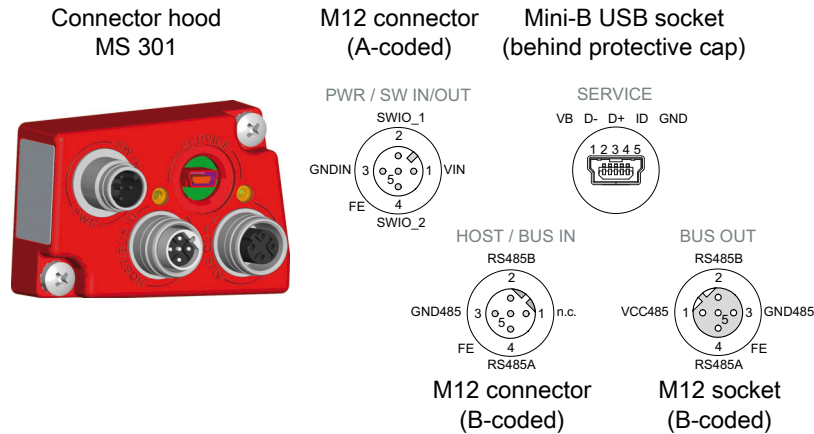





Figure 3.6: BCL 301 /- MS 301 hood with integrated M12 connectors

NOTE	
	The shielding connection is done via the M12 connector housing.
NOTE	
	The integrated parameter memory for the simple replacement of the BCL 301 / is located in the MS 301.
NOTE	
	<p>The bus is looped through the MS 301, i.e. the bus is not interrupted when the BCL 301 / is removed from the MS 301.</p> <p>The bus is terminated at BUS OUT via an external mounted terminating resistor (see chapter 13.5 "Accessory – Terminating resistor").</p>

MK 301 terminal hood with spring-cage terminals

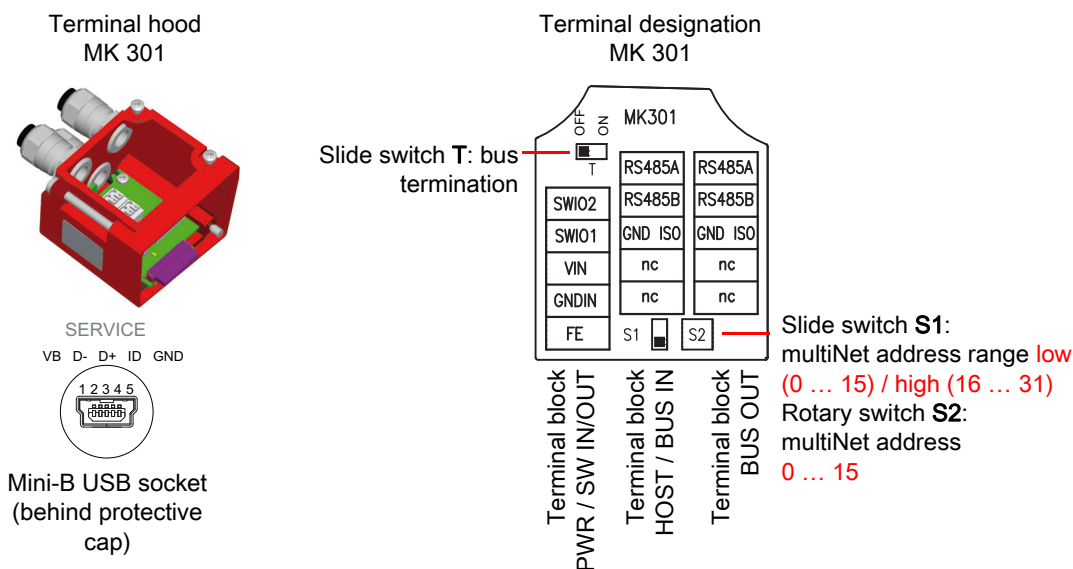


Figure 3.7: BCL 301/- MK 301 terminal hood with spring-loaded terminals

NOTE



The integrated parameter memory for the simple replacement of the BCL 301/- is located in the MK 301.

NOTE



The bus is looped through the MK 301, i.e. the bus is not interrupted when the BCL 301/- is removed from the MK 301. The bus is terminated via slide switch T in the MK 301. If the termination is activated (slide switch T in the ON position), the downstream bus is disconnected.

Cable fabrication and shielding connection

Remove approx. 78 mm of the connection cable sheathing. 15 mm of sheath of the shielded line must be freely accessible.

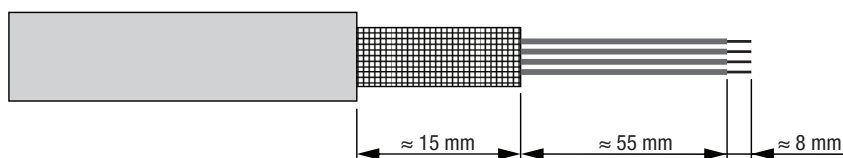


Figure 3.8: Cable fabrication for MK 301 terminal hood

The shield is automatically contacted when the cable is lead into the metal screw fitting and fastened when the cord grip is closed. Then lead the individual wires into the terminals according to the diagram. Wire end sleeves are not necessary.

MA 100 terminal box and corresponding KB 301-3000 cable hood

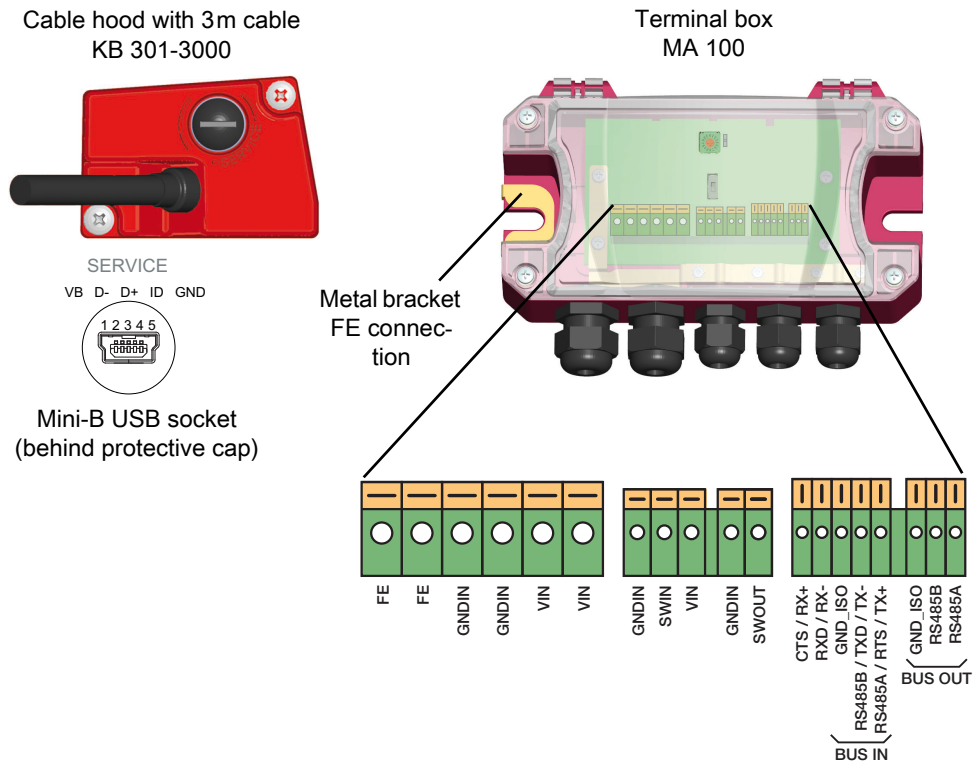


Figure 3.9: BCL 301/- MA 100 terminal box with KB 301-3000 cable hood

NOTE



The left side of the housing of the MA 100 features a metal bracket for connecting functional earth FE to the installation surface (e.g. metallic equipment).
The MA 100 contains a shielding terminal for the shielding connection of the KB 301-3000.

NOTE



The bus is looped through the MA 100, i.e. the bus is not interrupted when the BCL 301/- is removed from the KB 301-3000. The bus is terminated via slide switch **T** in the MA 100. If the termination is activated (slide switch **T** in the **ON** position), the downstream bus is disconnected.

NOTE



Due to the lack of the address switch, the KB 301-3000 cable hood connection variant is not possible on the BCL 301/- **without** the MA 100 terminal box, in contrast to the BCL 300/-.

Network operation BCL 301/- in the Leuze multiNet plus

In Leuze multiNet plus network operation, the incoming bus is connected to **BUS IN** and the outgoing bus to **BUS OUT**. If the network address of the BCL 301/- is not 0, the device starts up in multiNet slave mode and attempts to make contact with a multiNet master.

If **BUS OUT** is not used for the continuing connection to the next participant, **BUS OUT** must be terminated with a terminating resistor. For this reason, a terminator plug is available for the MS 301 (see chapter 13.5 "Accessory – Terminating resistor"); in the MA 100 and the MK 301, termination is activated by a switch. The device address is set in multiNet via the slide or rotary switch provided for this in the MA 100, MK 301 or MS 301.

3.5 Starting the device

🔌 Connect the +18 ... 30VDC supply voltage (typ. +24VDC); the BCL 300/**/** BCL 301/**/** starts up.
The **PWR** and **NET** LEDs display the device status.

PWR LED



green, flashing

Device ok, initialization phase



Green, continuous light

Power On, device OK



green, briefly off - on

Good read, successful reading



**green, briefly off -
briefly red - on**

No read, reading not successful



Orange, continuous light

Service mode



red, flashing

Warning set



Red, continuous light

Error, device error

NET LED



flashes green

Initialization



Green, continuous light

Bus operation ok



flashes red

Communication error



Red, continuous light

Bus error

If a display is available, the following information appears successively during startup:

- Startup
- Device designation e.g. BCL 301i SM 102 D
- Reading Result

If Reading Result is displayed, the device is ready.

Stand-alone operation BCL 300/**/**

After voltage (18 ... 30VDC) has been connected to the switching input, a read process is activated. In the standard setting, all common code types for decoding are released; only the **2/5 Interleaved** code type is limited to 10 digits of code content.

If a code is lead through the reading field, the code content is decoded and output via the connected interface.

The standard protocol for this is: **9600 Baud, 8 data bits, no parity, 1 stop bit.**

MultiNet operation BCL 301/

If the BCL 301/ detects an address larger than 0 after connecting the supply voltage, it registers itself with the **multiNet** master via the **multiNet**. If the device is detected in the network, the **NET** LED turns green and the BCL 301/ is ready.

By connecting voltage (18 ... 30VDC) on the switching input, a read process is activated. In the standard setting, all common code types for decoding are released; only the **2/5 Interleaved** code type is limited to 10 digits of code content.

If a code is lead through the reading field, the code content is decoded and passed to the master via the **multiNet**.

NOTE

The configuration of the device can be changed or the functions can be tested via the USB service interface. To do this, connecting the supply voltage to the device and establishing a USB connection between the BCL and PC is sufficient.

At www.leuze.com, you can find a USB driver for **webConfig** under **Download -> identify -> Stationary bar code readers** BCL 300/ \ BCL 301/. Install this USB driver and please follow the instructions when doing so. Then, you can open the connection to the BCL through your Internet browser and perform the desired settings or tests.

3.6 Bar code reading

To test, you can use the following bar code in the 2/5 Interleaved format. The bar code module here is 0.5:



Provided your BCL 300/**/** BCL 301/**/** model has a display, the read information appears on this display. The **PWR** LED goes off briefly and then turns green again. Simultaneously, the read information is forwarded to the superior system (PLC/PC).

Please check the incoming data of the bar code information there.

Alternatively, you can use a switching input for read activation (switching signal of a photoelectric sensor or 24VDC switching signal).

4 Device description

4.1 About the bar code readers of the BCL 300/i series

Bar code readers of the BCL 300/i series are high-speed scanners with integrated decoder for all commonly used bar codes, e.g. 2/5 Interleaved, Code 39, Code 128, EAN 8/13 etc., as well as codes from the GS1 DataBar family.

Bar code readers of the BCL 300/i series are available in various optics models as well as line scanners, line scanners with deflecting mirrors and also optionally as heated models.

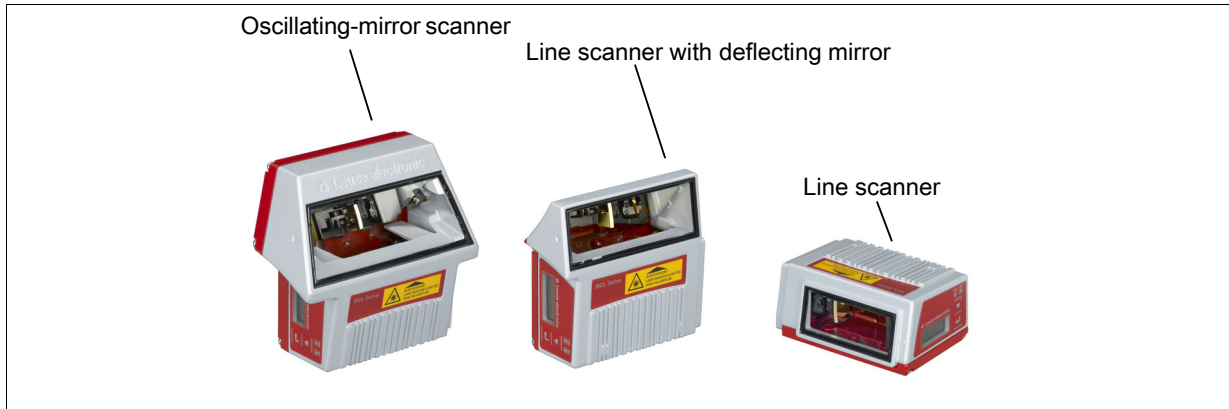


Figure 4.1: Line scanner, line scanner with deflecting mirror and oscillating-mirror scanner

The many possible configurations of the device allow it to be adapted to a multitude of reading tasks. Due to the large reading distance combined with the great depth of field, a large opening angle and a very compact construction, the device is ideally suited for the conveyor and storage technology market.

The interfaces (**RS 232**, **RS 485** and **RS 422**) integrated in the various device models and the fieldbus systems (**PROFIBUS DP**, **PROFINET-IO**, **Ethernet TCP/IP UDP**, **Ethernet/IP** and **EtherCAT**) offer optimum connection to the superior host system.

4.2 Characteristics of the bar code readers of the BCL 300/i series

Performance characteristics:

- Integrated fieldbus connectivity = / -> Plug-and-Play fieldbus coupling and easy networking
- Numerous interface variants facilitate connection to the superior systems
 - RS 232, RS 422
 - RS 485 and multiNet plus slave

Alternatively, various fieldbus systems, such as

- PROFIBUS DP
- PROFINET-IO
- Ethernet TCP/IP UDP
- EtherNet/IP
- EtherCAT

- Integrated code reconstruction technology (**CRT**) enables the identification of soiled or damaged bar codes
- Maximum depth of field and reading distances from 30 mm to 700 mm
- Large optical opening angle and, thus, large reading field width
- High scanning rate with 1000 scans/s for fast reading tasks
- On request with display to easily detect and activate functions and status messages.
- Integrated USB service interface, Mini-B type
- Adjustment of all device parameters with a web browser
- Easy alignment and diagnostics functions
- Up to four possible connection technologies
- Two freely programmable switching inputs/outputs for the activation or signaling of states
- Automatic monitoring of the read quality with **autoControl**
- Automatic recognition and setting of the bar code type using **autoConfig**
- Reference code comparison
- Optional heating models to -35 °C
- Heavy-duty housing of degree of protection IP 65

NOTE



For information on technical data and characteristics, refer to Chapter 5.

General information

The integrated fieldbus connectivity = / contained in the bar code readers of the BCL 300 / series facilitates the use of identification systems which function without connection unit or gateways. The integrated fieldbus interface considerably simplifies handling. The Plug-and-Play concept enables easy networking and very simple commissioning: Directly connect the respective fieldbus and all configuration is performed with no additional software.

For decoding bar codes, the bar code readers of the BCL 300 / series make available the proven **CRT decoder** with code reconstruction technology:

The proven code reconstruction technology (**CRT**) enables bar code readers of the BCL 300 / series to read bar codes with a small bar height, as well as bar codes with a damaged or soiled print image.

With the aid of the **CRT decoder**, bar codes can also be read without problem in other demanding situations, such as with a large tilt angle (azimuth angle or even twist angle).

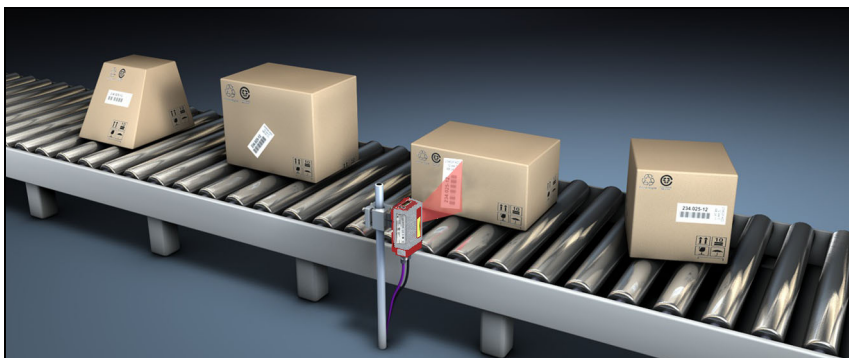


Figure 4.2: Possible bar code orientation

The BCL 300 / \ BCL 301 / can be operated and configured using the integrated webConfig tool via the USB service interface; alternatively, the bar code readers can be adjusted using configuration commands via the host/service interface.

The BCL 300 / \ BCL 301 / needs a suitable activation to start a read process as soon as an object is in the reading field. This opens a time window ("reading gate") in the BCL 300 / \ BCL 301 / for the read process during which the bar code reader has time to detect and decode a bar code.

In the basic setting, triggering takes place through an external reading cycle signal. Alternative activation options include online commands via the host interface and the **autoRefIAct** function.

Through the read operation, the BCL 300/\ BCL 301/ collects additional useful pieces of data for diagnostics which can also be transmitted to the host. The quality of the read operation can be inspected using the **alignment mode** which is integrated in the webConfig tool.

An optional, multi-language display with buttons is used to operate the BCL 300/\ BCL 301/ as well as for visualization purposes. Two LEDs provide additional optical information on the current operating state of the device.

The two freely configurable switching inputs/outputs **SWIO1** and **SWIO2** can be assigned various functions and control e.g. activation of the BCL 300/\ BCL 301/ or external devices, such as a PLC.

System, warning and error messages provide assistance in setup/troubleshooting during commissioning and read operation.

4.3 Device construction

BCL 300/\ BCL 301/ Bar code reader

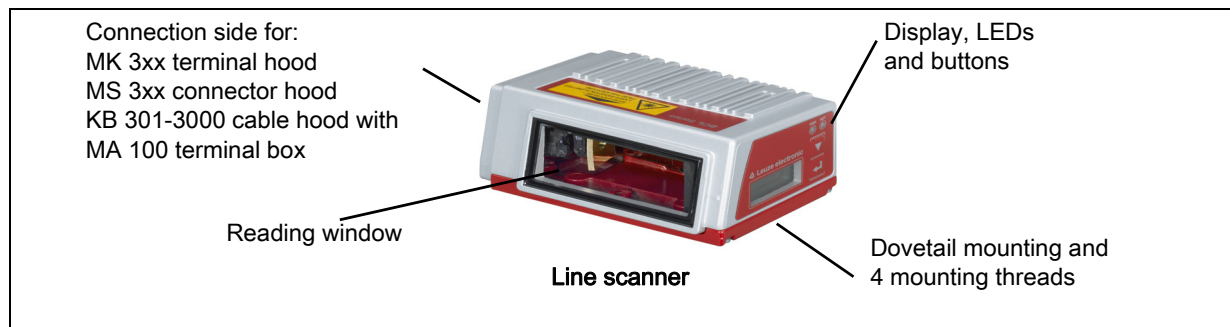


Figure 4.3: BCL 300/\ BCL 301/ device construction - line scanner

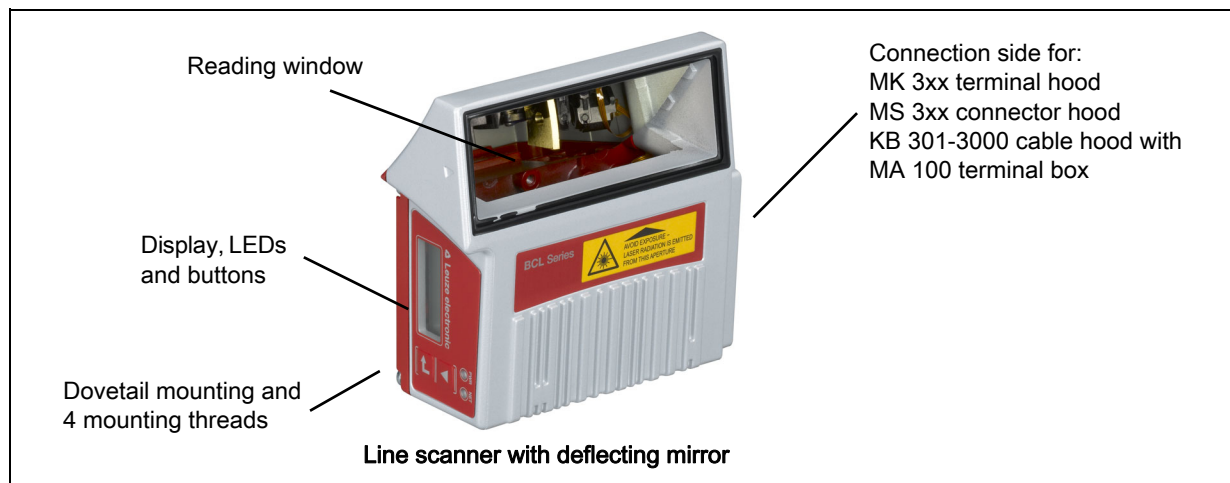


Figure 4.4: Device construction BCL 300/\ BCL 301/- Line scanner with deflecting mirror

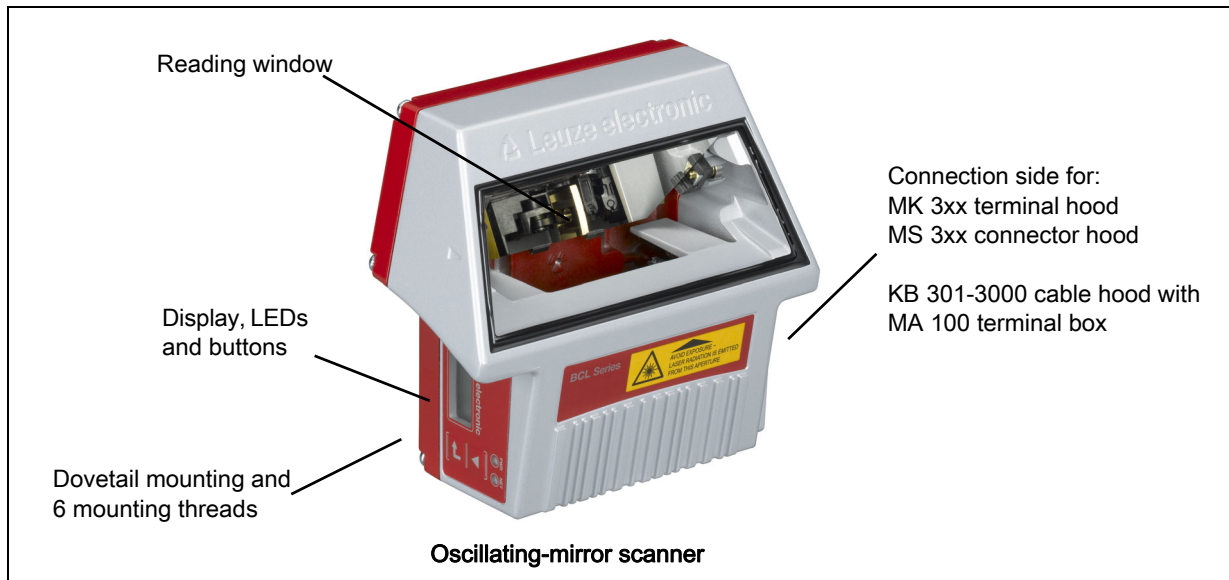


Figure 4.5: BCL 300 / BCL 301 device construction - oscillating-mirror scanner

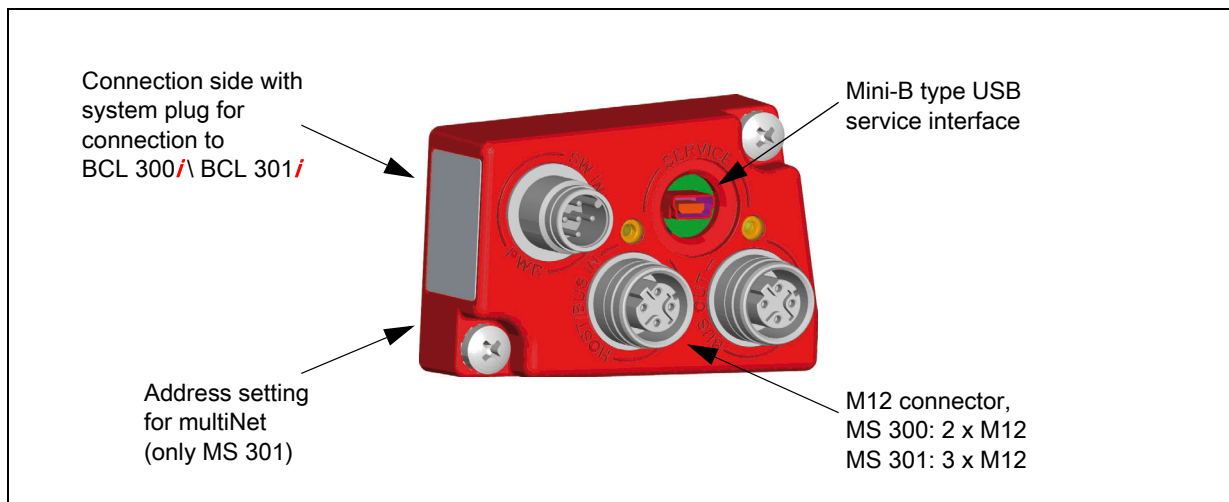
MS 300/MS 301 hood with integrated connectors with parameter memory

Figure 4.6: Device construction MS 300/MS 301 hood with integrated connectors

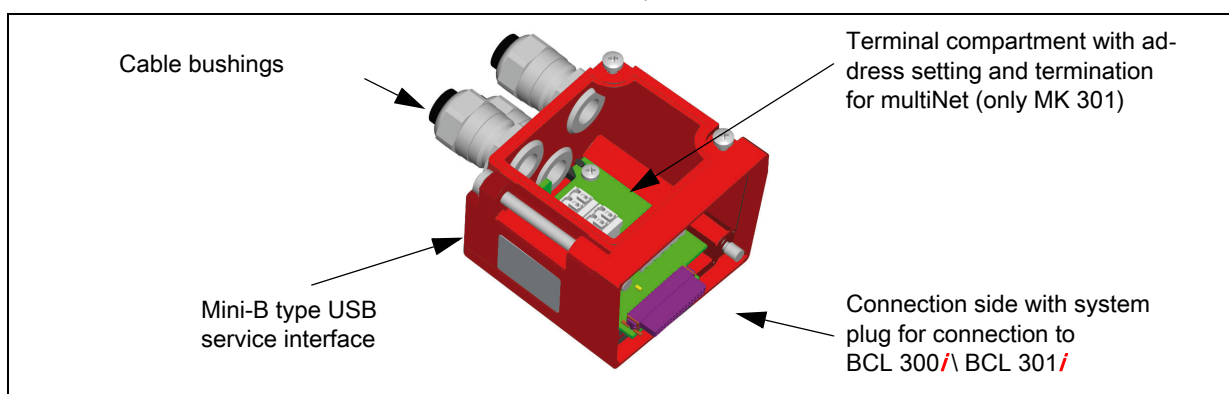
MK 300/MK 301 terminal hood with parameter memory

Figure 4.7: Device construction MK 300/MK 301 hood with integrated connectors

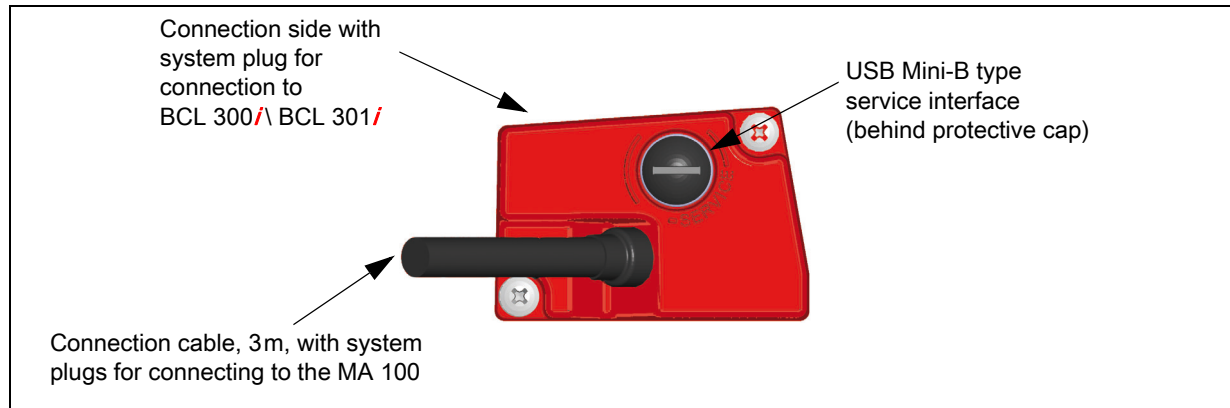
KB 301/3000 cable hood with 3m cable

Figure 4.8: KB 301/3000 cable hood device construction

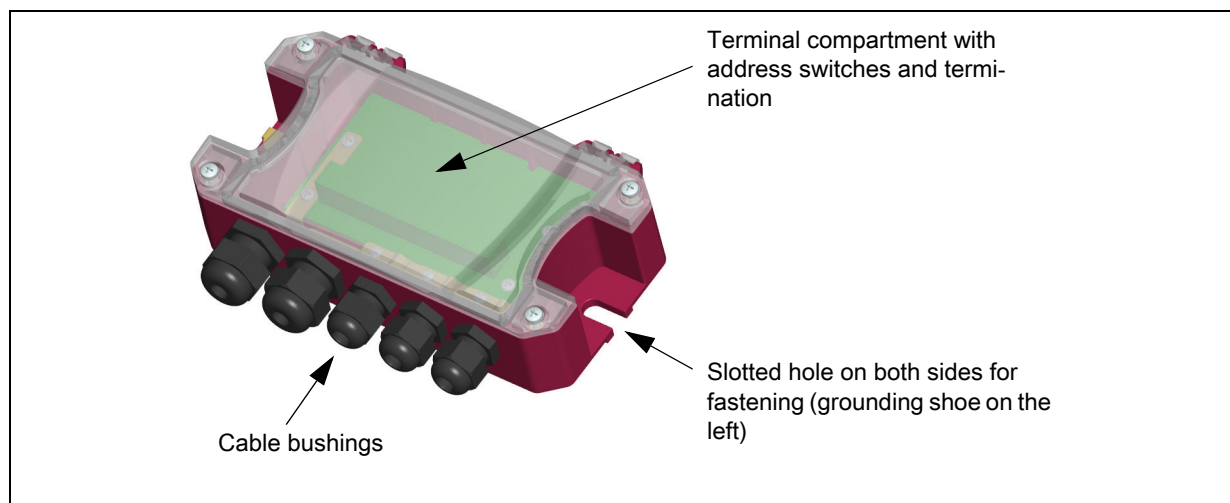
MA 100 terminal box

Figure 4.9: MA 100 terminal box device construction

4.4 Reading techniques**4.4.1 Line scanner (single line)**

A line (scan line) scans the label. Due to the opt. opening angle, the reading field width is dependent on the read distance. Through the movement of the object, the entire bar code is automatically transported through the scan line.

The integrated code reconstruction technology permits twisting of the bar code (tilt angle) within certain limits. These are dependent on the transport speed, the scanning rate of the scanner and the bar code properties.

Areas of application of the line scanner

The line scanner is used:

- when the bars of the bar code are printed in the conveying direction ('ladder arrangement').
- with bar codes having very short bar lengths.
- when the ladder code is turned out of the vertical position (tilt angle).
- when the reading distance is large.



Figure 4.10: Deflection principle for the line scanner

4.4.2 Line scanner with oscillating mirror

The oscillating mirror deflects the scan line additionally to both sides across the scan direction at a randomly adjustable oscillation frequency. In this way, the BCL 300/[BCL 301](#) can also scan larger areas or spaces for bar codes. The reading field height (and the scan line length useful for evaluation) depends on the reading distance due to the optical opening angle of the oscillating mirror.

Areas of application of the line scanner with oscillating mirror

For line scanners with oscillating mirror, oscillation frequency, start/stop position etc. are adjustable. It is used:

- when the position of the label is not fixed, e.g. on pallets – various labels can, thus, be detected at various positions.
- when the bars of the bar code are printed perpendicular to the conveying direction ("picket fence arrangement").
- when reading stationary objects.
- when a large reading field (reading window) has to be covered.

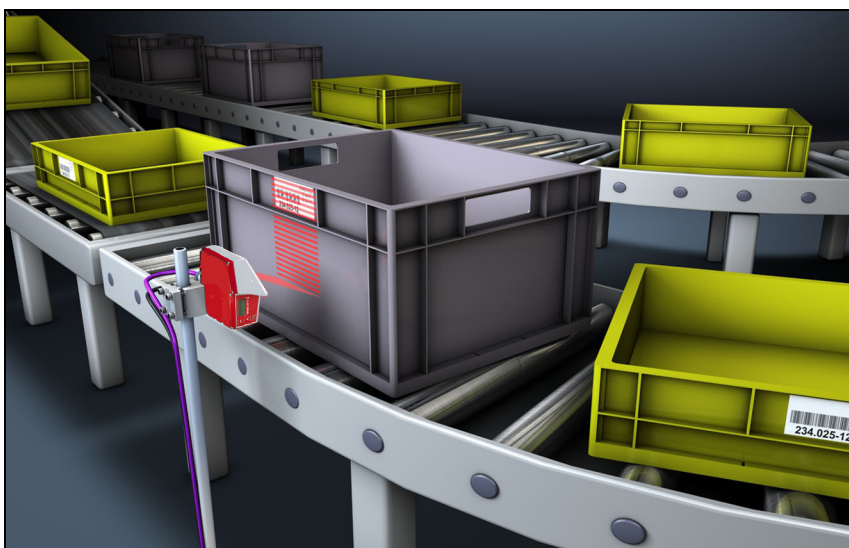


Figure 4.11: Deflection principle for the line scanner with oscillating mirror add-on

4.4.3 Raster scanner (raster line)

Multiple scan lines scan the label. Due to the optical opening angle, the reading field width is dependent on the read distance. Provided the code is located in the reading field, it can be read during standstill. If the code moves through the reading field, it is scanned by multiple scan lines.

The integrated code reconstruction technology permits twisting of the bar code (tilt angle) within certain limits. These are dependent on the transport speed, the scanning rate of the scanner and the bar code properties. In most cases, everywhere a line scanner is used, a raster scanner can be used.

Areas of application of the raster scanner:

The raster scanner is used:

- When the bars of the bar code are perpendicular to the conveying direction (picket fence arrangement)
- With bar codes with low height displacement
- With very glossy bar codes

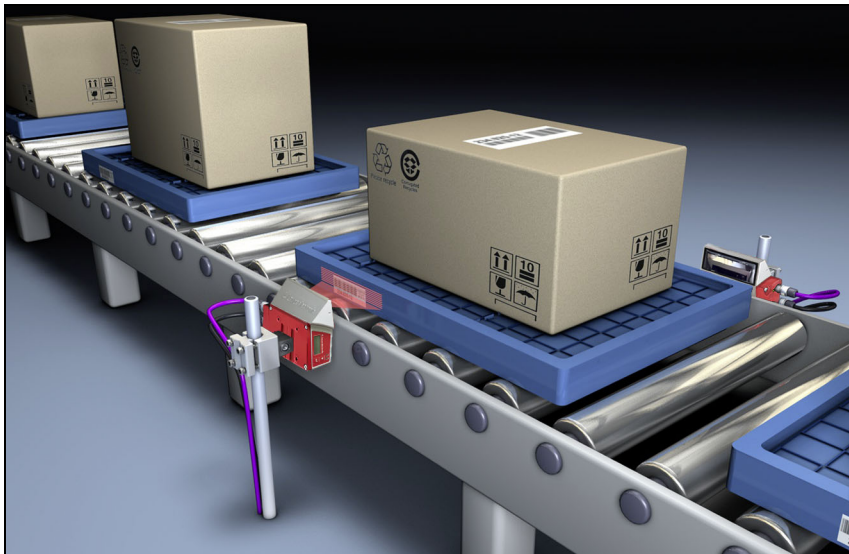


Figure 4.12: Deflection principle for the raster scanner

NOTE



With the raster scanner, there may not be two or more bar codes in the raster area of the BCL at the same time.

4.5 Stand-alone connection BCL 300/i

The BCL 300/i bar code reader is operated as a "stand-alone" single device.

For the electrical connection of the supply voltage, the interface and the switching inputs/outputs, either the MS 300 hood with integrated connectors, the MK 300 terminal hood or the KB 301-3000 cable hood together with the MA 100 terminal box are available.

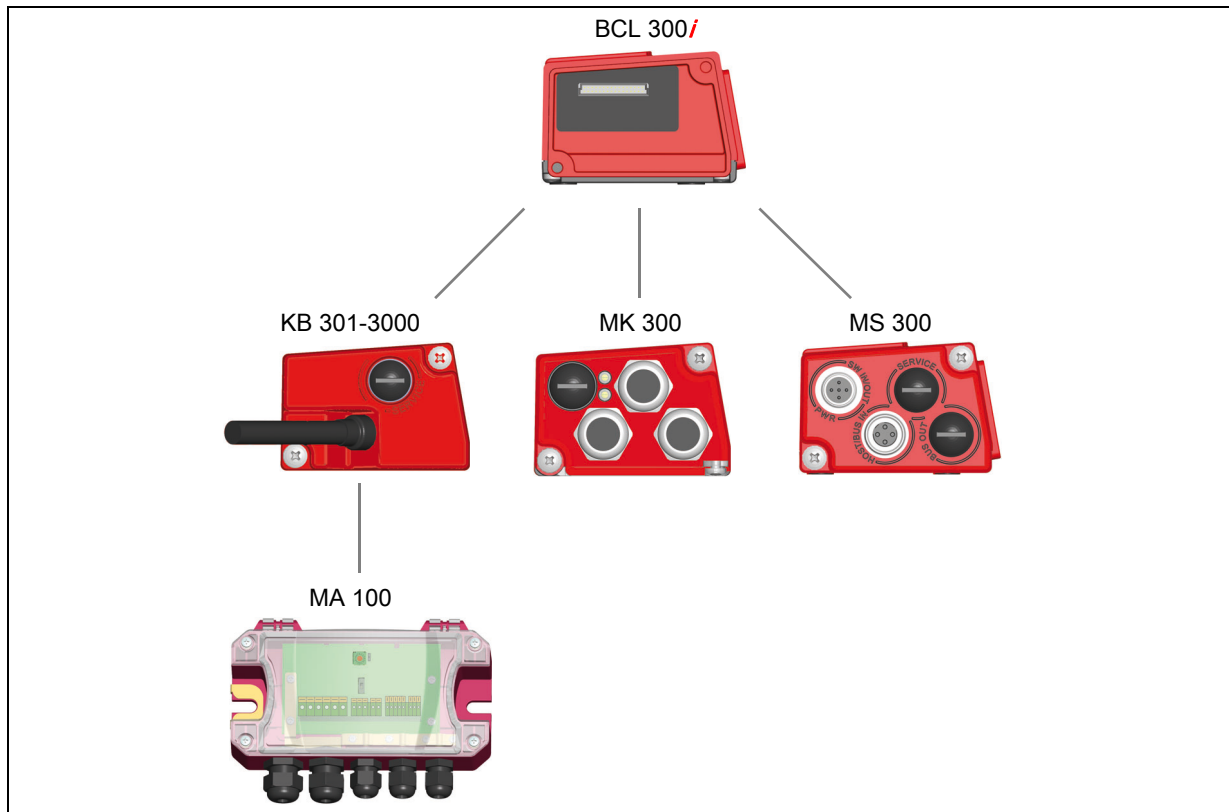


Figure 4.13: Stand-alone connection BCL 300/i

4.6 Networking - Leuze multiNet plus BCL 301/i

In the Leuze **multiNet plus** network, up to 31 BCL 301/i bar code readers can be networked together. The respective network devices transmit the read data when requested to by the MA 31 or BCL 500/i network master. For this purpose, each BCL 301/i is assigned its own station address, which is set using the address switch in the MS 301, MK 301 or MA 100.

The master then transmits the data of all network devices via its host interface to a superior PLC control system or a computer, i.e. it "collects" the scanner data in the network and transmits it to an interface on the host computer. This reduces interface costs (CPs) and time spent programming the software.

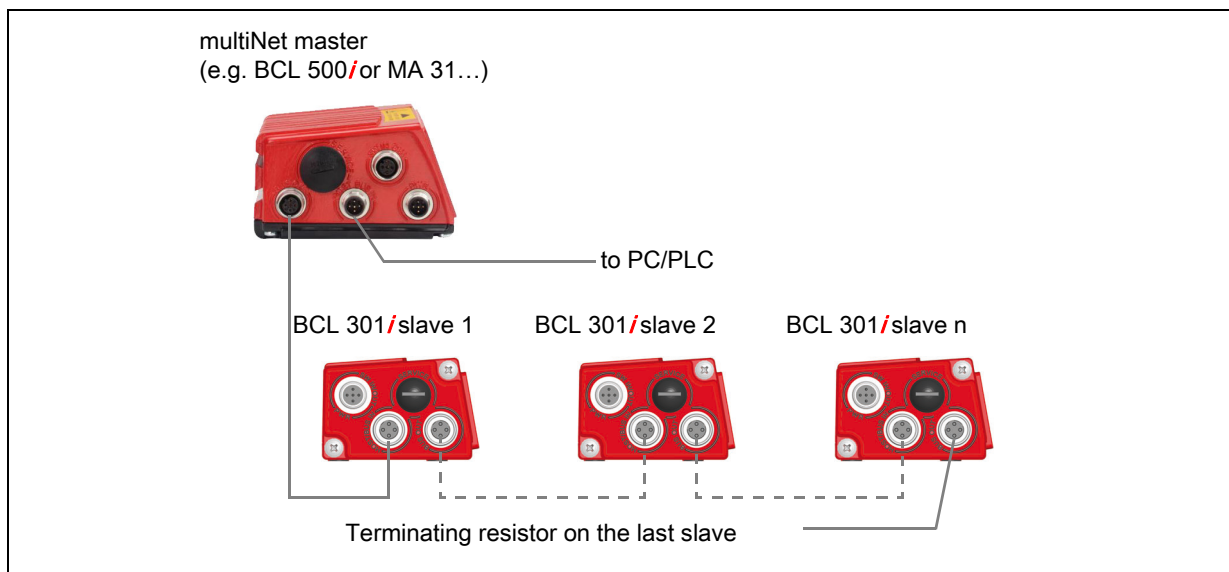


Figure 4.14: Networking possibilities using the multiNet plus

Two-wire RS 485

The **Leuze multiNet plus** is optimized for fast transmission of scanner data to a superior host computer. The multiNet plus consists physically of a two-wire RS 485 interface through which the

Leuze multiNet plus software protocol is controlled. This makes wiring the network easy and inexpensive as slaves are looped through to one another in parallel.

In principle, networking occurs via a parallel connection of the individual RS 485 interfaces of the respective bar code scanners. Shielded, twisted pair conductors should be used for the **Leuze multiNet plus**. This allows a total network length of up to 1200 m.

4.7 Leuze multiScan

The **multiScan** operating mode is based on **Leuze multiNet plus** and links individual bar code readings from multiple bar code scanners into a single decoding result. This is used, for example, on a packet conveyor system on which the label can be affixed on either the right or left side, thereby requiring two read stations. To prevent the host from having to always process two readings for a single packet, i.e. a decoding result and a No Read, a multiScan arrangement is used which transmits only one reading from the two read stations to the host; this single reading is transmitted by the multiScan master.

NOTE



Thus, from the perspective of the host, the scanner network appears to be just a single bar code reader!

For this purpose one **multiScan** master and one or more **multiScan** slaves are connected together via the RS 485 interface.

NOTE



The MA 31 or the BCL 500/i is available as a multiNet master.

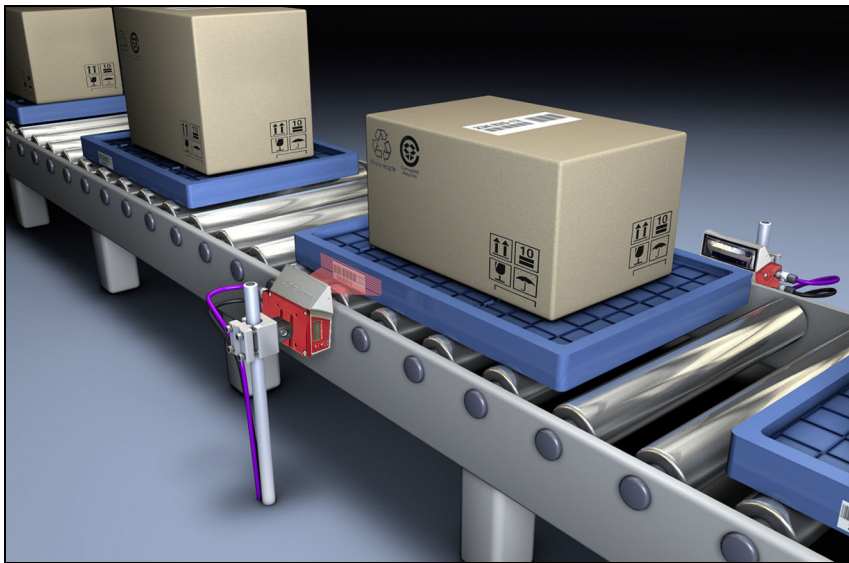


Figure 4.15: Scanner arrangement with the **multiScan** function

NOTE



*The **multiScan** function on the RS 485 interface is possible for minimum of 2 and a maximum of 32 devices!*

The protocol set on the RS 485 interface is the multiNet protocol. As a result, during **multiScan** operation on the RS 485 interface, the multiNet master also functions as the **multiScan** master and the multiNet slaves function as **multiScan** slaves (thus, all multiNet slave are included in **multiScan** operation).

4.8 Heating

For low-temperature applications to min. -35°C (e.g. in cold storage), the bar code readers of the BCL 300/i \ BCL 301/i series can optionally be permanently fitted with a built-in heating and these bar code readers purchased as separate device models.


4.9 External parameter memory

If the BCL 300/\ BCL 301/ is used together with an MS 300/MS 301 hood with integrated connectors or MK 300/MK 301 terminal hood, the device settings are also saved in an external parameter memory in the hood with integrated connectors or terminal hood.

If the BCL is replaced with a new device, the new device takes on the settings of the old BCL from the hood with integrated connectors or terminal hood. This makes renewed configuration of the BCL unnecessary when it is replaced.

4.10 autoReflAct

autoReflAct stands for **automatic Reflector Activation** and permits an activation without additional sensors. This is achieved by directing the scanner with reduced scanning beam towards a reflector mounted behind the conveyor path.

NOTE	
	Compatible reflectors are available on request.

As long as the scanner is targeted at the reflector, the reading gate remains closed. If, however, the reflector is blocked by an object such as a container with a bar code label, the scanner activates the read procedure, and the label on the container is read. When the path from the scanner to the reflector has cleared, the read procedure has completed and the scanning beam is reduced and again directed onto the reflector. The reading gate is closed.

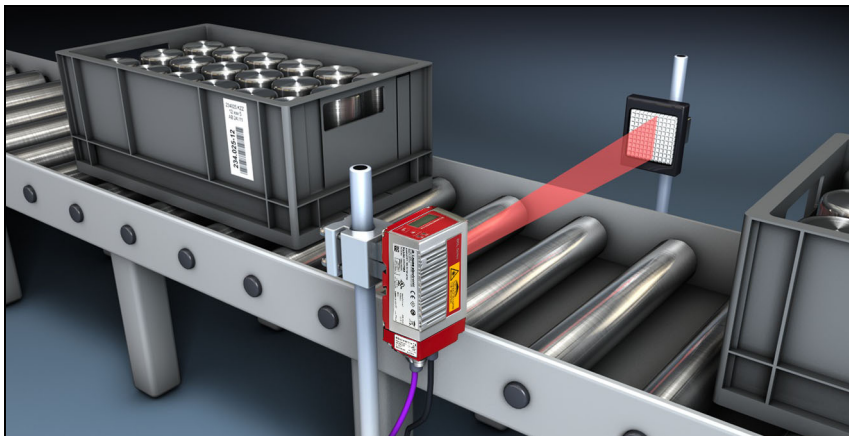


Figure 4.16: Reflector arrangement for autoReflAct

The **autoReflAct** function uses the scanning beam to simulate a photoelectric sensor and thus permits an activation without additional sensors.

4.11 Reference codes

The BCL 300/\ BCL 301/ offers the possibility of storing one or two reference codes.

It is possible to store the reference codes by means of teach-in (via SWIO_1 or SWIO_2), via the webConfig tool or via online commands.

The BCL 300/\ BCL 301/ can compare read bar codes with one and/or both reference codes and execute user-configurable functions depending on the comparison result.

4.12 autoConfig

With the autoConfig function, the BCL 300/\ BCL 301/ offers an extremely simple and convenient configuration option to users who only want to read one code type (symbology) with one number of digits at a time.

After starting the autoConfig function via the switching input or from a superior control, it is sufficient to position a bar code label with the desired code type and number of digits in the reading field of the BCL 300/\ BCL 301/.

Afterward, bar codes with the same code type and number of digits are recognized and decoded.

5 Technical data

5.1 General specifications of the bar code readers

5.1.1 Line scanner / raster scanner


Type	BCL 300/ Stand-alone	BCL 301/ multiNet plus slave
Design	Line scanner without heating	
Optical data		
Light source	Laser diode λ = 655 nm (red light)	
Max. output power (peak)	$\leq 1.8\text{mW}$	
Impulse duration	$\leq 150\mu\text{s}$	
Beam exit	At the front	
Scanning rate	1000 scans/s	
Beam deflection	Via rotating polygon wheel	
Useful opening angle	Max. 60°	
Optics models / resolution	High Density (N): 0.127 ... 0.20 mm Medium Density (M): 0.20 ... 0.5 mm Low Density (F): 0.30 ... 0.5 mm Ultra Low Density (L): 0.35 ... 0.8 mm Ink Jet (J): 0.50 ... 0.8 mm	
Reading distance	See reading field curves	
Laser class	1 acc. to IEC/EN 60825-1:2014 and 21 CFR 1040.10 with Laser Notice No. 56	
Bar code data		
Code types	2/5 Interleaved, Code 39, Code 128, EAN 128, EAN / UPC, Codabar, Code 93, GS1 DataBar, EAN Addendum	
Bar code contrast (PCS)	$\geq 60\%$	
Ambient light tolerance	2000 lx (on the bar code)	
Number of bar codes per scan	3	
Electrical data		
Interface type	1x RS 232/422	1x RS 485
Protocols	Leuze Standard	Leuze Standard, Leuze multiNet plus
Baud rate	4800 ... 115200 Baud	
Data formats	Data bits: 7.8 Parity: none, even, odd Stop bits: 1.2	
Service interface	USB 2.0 Mini-B type socket	
Switching input / switching output	2 switching inputs/outputs, freely programmable functions - Switching input: 18 ... 30 V DC depending on supply voltage, I max. = 8 mA - Switching output: 18 ... 30VDC depending on supply voltage, I max. = 60mA (short-circuit proof) Switching inputs/outputs protected against polarity reversal!	
Operating voltage	18 ... 30VDC (Class 2, protection class III)	
Power consumption	Max. 2.5W	
Operating and display elements		
Display (optional)	Monochromatic graphical display, 128 x 32 pixel, with background lighting	
Keyboard (optional)	2 keys	
LEDs	2 LEDs for power (PWR) and bus state (NET), two-colored (red/green)	
Mechanical data		
Degree of protection	IP 65 ¹⁾	
Weight	270 g (without connection hood)	
Dimensions (H x W x D)	44 x 95 x 68 mm (without connection hood)	
Housing	Diecast aluminum	

Table 5.1: Specifications of the BCL 301/ and BCL 300/ line/raster scanners without heating

Type	BCL 300 <i>/</i> Stand-alone	BCL 301 <i>/</i> multiNet plus slave
Design	Line scanner without heating	
Environmental data		
Operating temperature range	0 °C ... -40 °C	
Storage temperature range	-20°C ... +70°C	
Air humidity	Max. 90% rel. humidity, non-condensing	
Vibration	IEC 60068-2-6, test Fc	
Shock	IEC 60068-2-27, test Ea	
Continuous shock	IEC 60068-2-29, test Eb	
Electromagnetic compat- ibility	EN 55022; IEC 61000-6-2 (contains IEC 61000-4-2, -3, -4, -5 and -6) ²⁾	

Table 5.1: Specifications of the BCL 301/ and BCL 300/line/raster scanners without heating

- 1) Only with the MS 300/MS 301, MK 300/MK 301 or KB 301-3000 connection hood and screwed-on M12 connector or cable lead-throughs and mounted caps. Minimum tightening torque of the housing connecting screw of the connection hood is 1.4Nm!
- 2) This is a Class A product. In a domestic environment this product may cause radio interference, in which case the operator may be required to take adequate measures.

⚠ ATTENTION!	
	For UL applications, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).



The BCL 300/ BCL 301/bar code readers are designed in accordance with protection class III for supply by PELV (protective extra-low voltage with reliable disconnection).

5.1.2 Oscillating-mirror scanner

Technical data same as for line scanner without heating, however with the following differences:

Type	BCL 300 / Stand-alone	BCL 301 / multiNet plus slave
Design	Oscillating-mirror scanner without heating	
Optical data		
Beam exit	Lateral zero position at an angle of 90°	
Beam deflection	Via rotating polygon wheel (horizontal) and stepping motor with mirror (vertical)	
Oscillation frequency	0 ... 10 Hz (adjustable, max. frequency is dependent on set swivel angle)	
Max. swivel angle	±20° (adjustable)	
Reading field height	See reading field curves	
Electrical data		
Power consumption	Max. 4W	
Mechanical data		
Weight	580 g (without connection hood)	
Dimensions (H x W x D)	58 x 125 x 110 mm (without connection hood)	

Table 5.2: Specifications of the BCL 301/ and BCL 300/oscillating-mirror scanners without heating

5.1.3 Line / raster scanner with deflecting mirror

Technical data same as for line scanner without heating, however with the following differences:

Type	BCL 300 <i>/</i> Stand-alone	BCL 301 <i>/</i> multiNet plus slave
Design	Line scanner with deflecting mirror without heating	
Optical data		
Beam exit	Lateral zero position at an angle of 105°	
Beam deflection	Via rotating polygon wheel (horizontal) and deflecting mirror (vertical)	
Electrical data		
Power consumption	Max. 2.5W	
Mechanical data		
Weight	350 g (without connection hood)	
Dimensions (H x W x D)	44 x 103 x 96 mm (without connection hood)	

Table 5.3: Specifications of the BCL 301/ and BCL 300/ deflection-mirror scanners without heating

5.2 Heating models of the bar code readers

The BCL 300/ \ BCL 301/ bar code readers are optionally available as models with integrated heating. In this case, heating is permanently installed ex works. Self-installation on-site by the user is not possible!

Features

- Integrated heating (permanently installed)
- Extends the application range of the BCL 300/ \ BCL 301/ to -35 °C
- Supply voltage 24VDC ±20%
- Enabling the BCL 300/ \ BCL 301/ through an internal temperature switch (switch-on delay about 30 min for 24 V DC and minimum ambient temperature of -35 °C)
- Necessary conductor cross-section for the voltage supply: at least 0.75 mm²; the use of ready-made cables is, thus, not possible

Structure

The heating consists of two parts:


- The front cover heater
- The housing heater

Function

When the 24 V DC supply voltage is applied to the BCL 300/ \ BCL 301/, a temperature switch initially only connects the heating to electrical power (front cover heater and housing heater). During the heating phase (around 30 min), when the inside temperature rises above 15 °C, the temperature switch connects the BCL 300/ \ BCL 301/ to the supply voltage. This is followed by the self test and the changeover to read operation. The **PWR** LED lights up, showing overall readiness for operation.





When the inside temperature reaches approx. 18 °C, another temperature switch turns the housing heater off and, if necessary, back on again (if the inside temperature drops below 15 °C). This does not interrupt the read operation. The front cover heater remains activated until an inside temperature of 25 °C is reached. At temperatures above this, the front cover heater switches off and, with a switching hysteresis of 3 °C, back on again at an inside temperature below 22 °C.

Mounting location

NOTE	
	The mounting location is to be selected such that it does not expose the BCL 300/ \ BCL 301/ with heating directly to a cold air stream. To achieve an optimal heating effect, the BCL 300/ \ BCL 301/ should be mounted so that it is thermally isolated.

Electrical connection

The required wire cross section of the connection cable for the voltage supply must be at least 0.75 mm².

 ATTENTION!	
	The voltage supply must not be looped through from one device to the next.
 ATTENTION!	
	The BCL 300/ \ BCL 301/ with oscillating mirror and heating must not be connected to the MA 100!

Power consumption

The energy requirement depends on the model:

- the line/raster scanner with heating consumes a maximum of 27W power.
- the line scanner with oscillating mirror and heating consumes a maximum of 45W.
- the line/raster scanner with deflecting mirror and heating consumes a maximum of 27W power.

These values are based on operation with unconnected switching outputs.

5.2.1 Line scanner / raster scanner with heating

Technical data same as for line scanner without heating, however with the following differences:

Type	BCL 300/ Stand-alone	BCL 301/ multiNet plus slave
Design	Line scanner with heater	
Electrical data		
Operating voltage	24VDC ±20%	
Power consumption	Max. 17W	
Structure of the heating	Housing heating and separate heating of the optics glass	
Warmup time	Min. 30 min at +24 V DC and an ambient temperature of -35 °C	
Min. conductor cross section	Conductor cross section of at least 0.75mm² for the supply voltage supply line. Wiring through of the voltage supply to multiple heating devices is not permissible. Standard, M12 ready-made cable not usable (insufficient cable cross-section)	
Environmental data		
Operating temperature range	-35°C ... +40°C	
Storage temperature range	-20°C ... +70°C	

Table 5.4: Specifications of the BCL 301/ and BCL 300/ line/raster scanners with heating

5.2.2 Oscillating-mirror scanner with heating

Technical data same as for line scanner without heating, however with the following differences:

Type	BCL 300 <i>/</i> Stand-alone	BCL 301 <i>/</i> multiNet plus slave
Design	Oscillating-mirror scanner with heating	
Optical data		
Useful opening angle	Max. 60°	
Max. swivel angle	±20° (adjustable)	

Table 5.5: Specifications of the BCL 301/ and BCL 300/ oscillating-mirror scanners with heating

Type	BCL 300/ Stand-alone	BCL 301/ multiNet plus slave
Design	Oscillating-mirror scanner with heating	
Electrical data		
Operating voltage	24VDC ±20%	
Power consumption	Max. 26W	
Structure of the heating	Housing heating and separate heating of the optics glass	
Warmup time	Min. 30 min at +24 V DC and an ambient temperature of -35 °C	
Min. conductor cross section	Conductor cross section of at least 0.75mm² for the supply voltage supply line. Wiring through of the voltage supply to multiple heating devices is not permissible. Standard, M12 ready-made cable not usable (insufficient cable cross-section)	
Environmental data		
Operating temperature range	-35°C ... +40°C	
Storage temperature range	-20°C ... +70°C	

Table 5.5: Specifications of the BCL 301/ and BCL 300/ oscillating-mirror scanners with heating

5.2.3 Line scanner / raster scanner with deflecting mirror and heating

Technical data same as for line scanner without heating, however with the following differences:

Type	BCL 300/ Stand-alone	BCL 301/ multiNet plus slave
Design	Deflecting mirror scanner with heating	
Optical data		
Useful opening angle	Max. 60°	
Electrical data		
Operating voltage	24VDC ±20%	
Power consumption	Max. 19W	
Structure of the heating	Housing heating and separate heating of the optics glass	
Warmup time	Min. 30 min at +24 V DC and an ambient temperature of -35 °C	
Min. conductor cross section	Conductor cross section of at least 0.75mm² for the supply voltage supply line. Wiring through of the voltage supply to multiple heating devices is not permissible. Standard, M12 ready-made cable not usable (insufficient cable cross-section)	
Environmental data		
Operating temperature range	-35°C ... +40°C	
Storage temperature range	-20°C ... +70°C	

Table 5.6: Specifications of the BCL 301/ and BCL 300/ deflection-mirror scanners with heating

5.3 Dimensioned drawings

5.3.1 Dimensioned drawing of complete overview of the BCL 300 / BCL 301 / with MS 3xx / MK 3xx

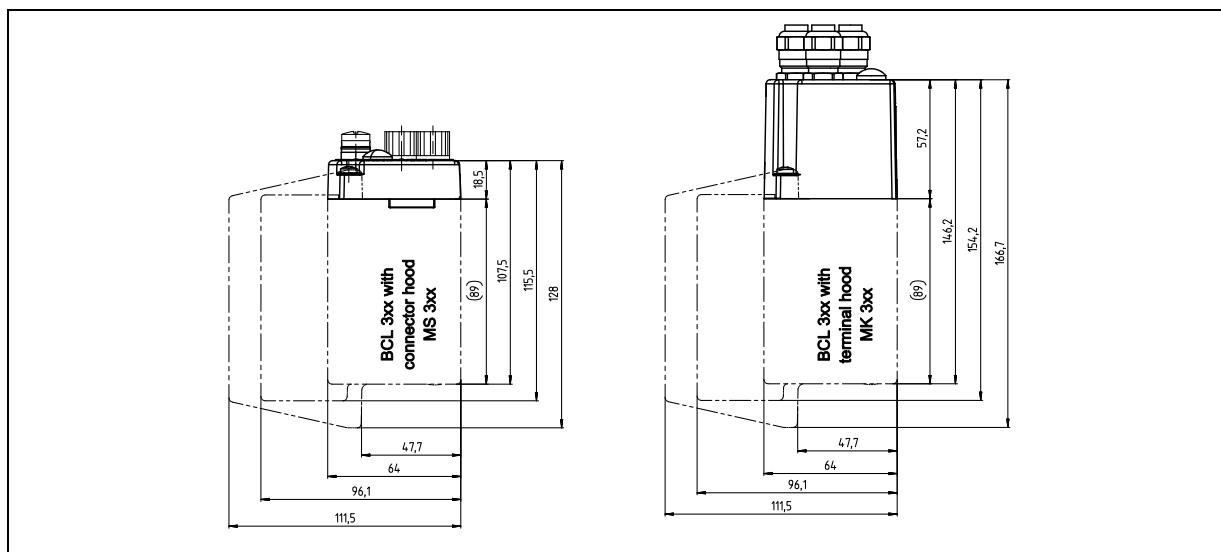


Figure 5.1: Dimensioned drawing of complete overview of the BCL 300 / BCL 301 / with MS 3xx / MK 3xx

5.3.2 Dimensioned drawing of complete overview of the BCL 300 / BCL 301 / with KB 301-3000

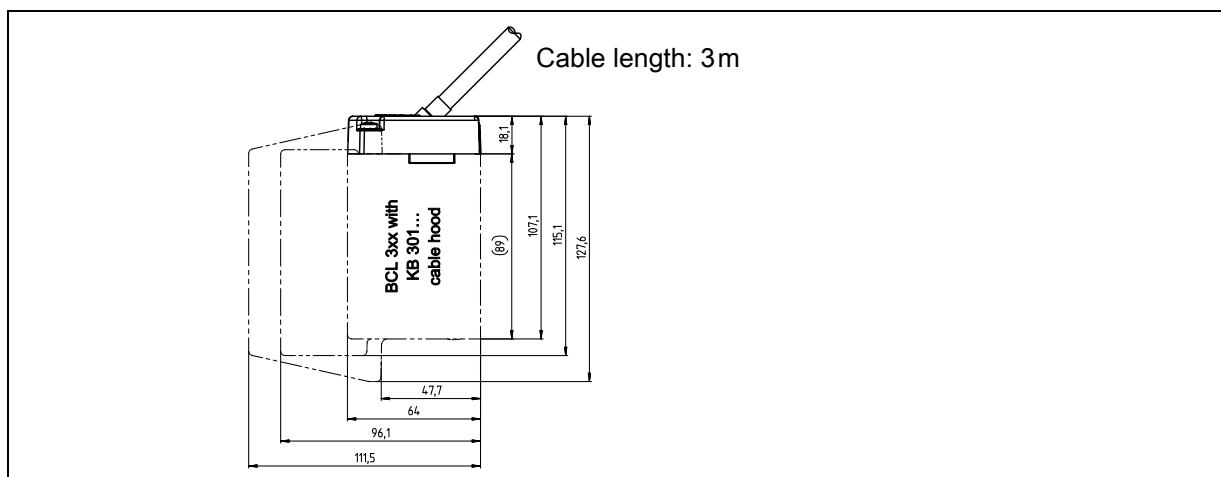


Figure 5.2: Dimensioned drawing of complete overview of the BCL 300 / BCL 301 / with KB 301-3000

5.3.3 Dimensioned drawing of line scanner with / without heating

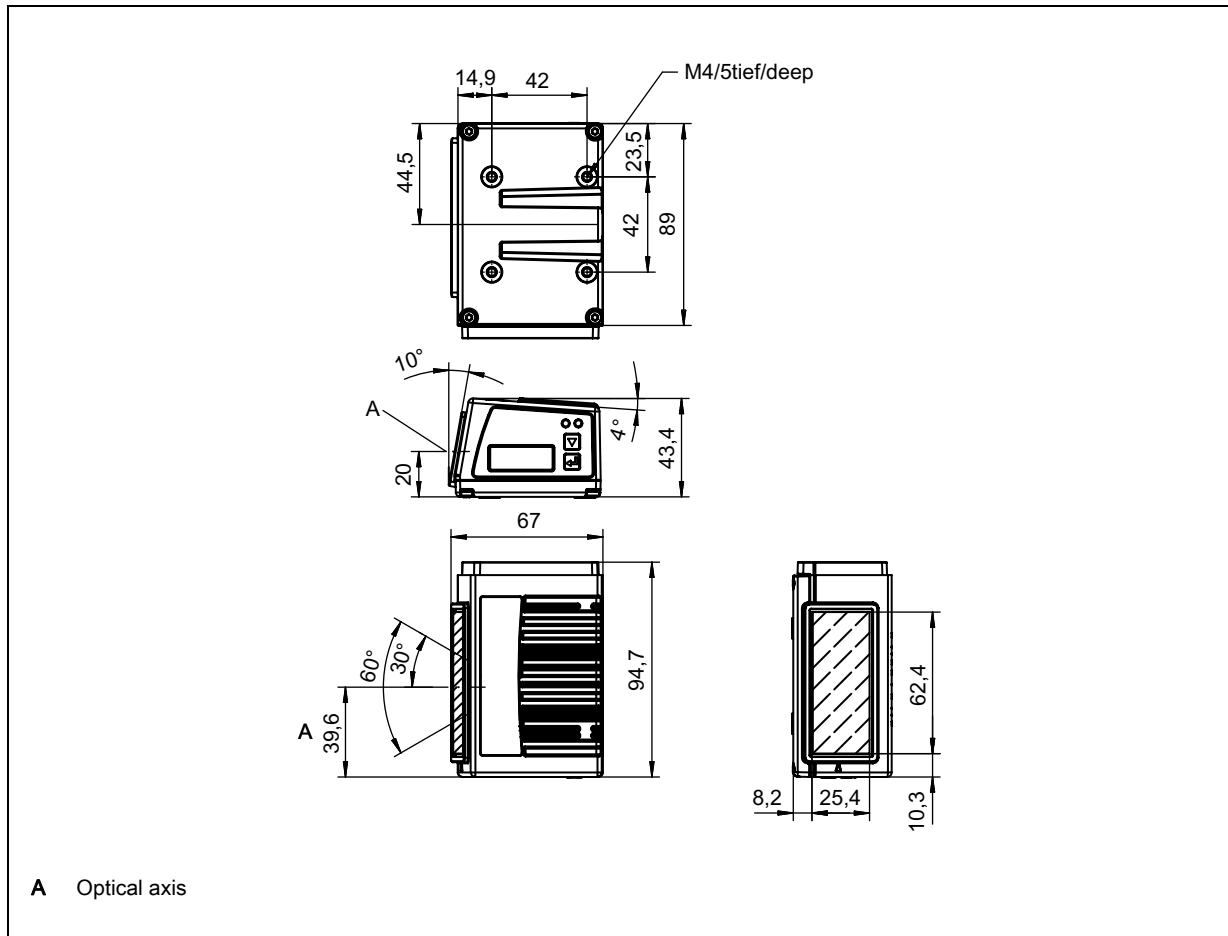


Figure 5.3: Dimensioned drawing of BCL 300 / BCL 301 / S...102 line scanner

5.3.4 Dimensioned drawing of deflecting mirror scanner with / without heating

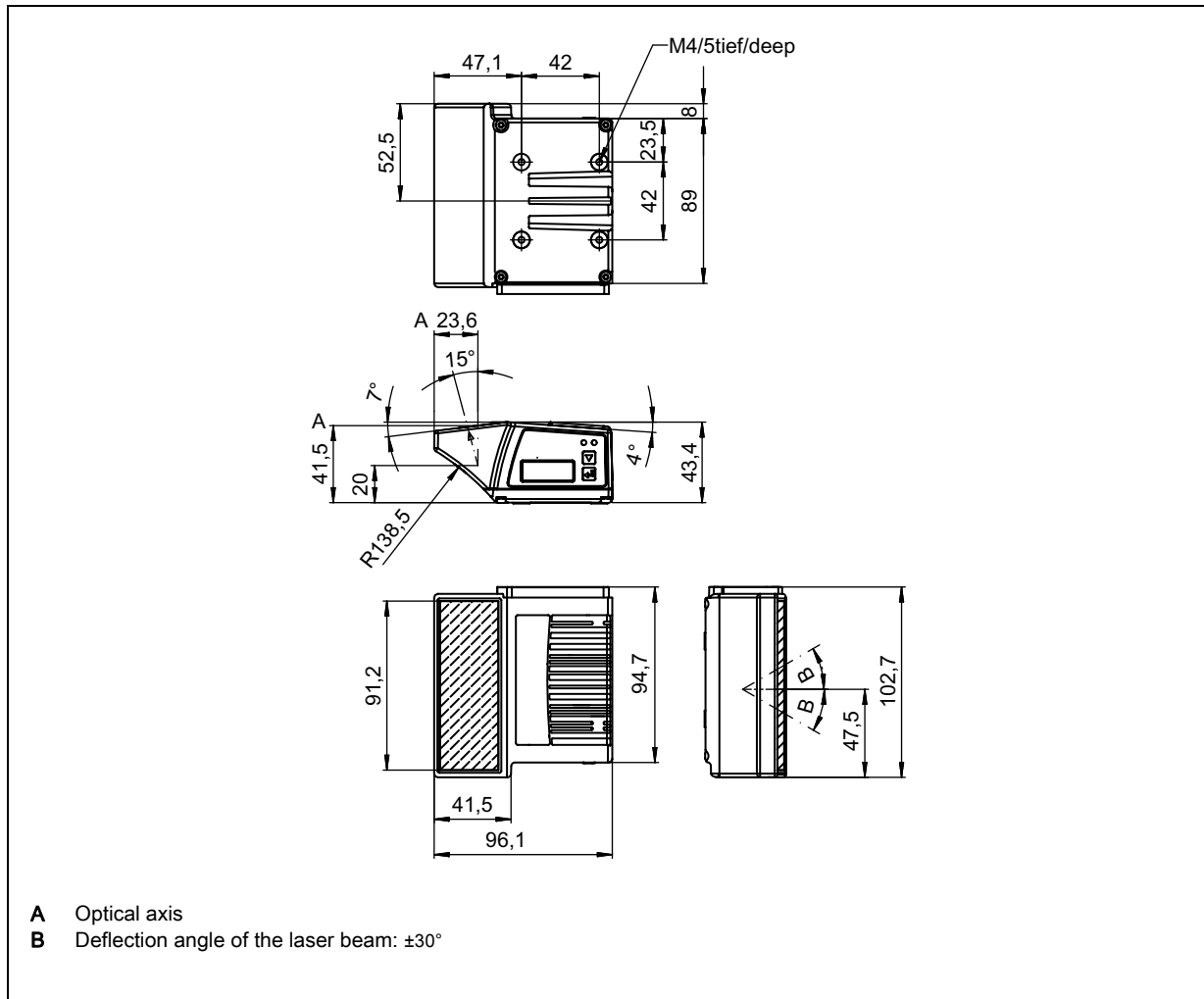


Figure 5.4: Dimensioned drawing of BCL 300/\ BCL 301/\S...100 with deflecting mirror

5.3.5 Dimensioned drawing of oscillating-mirror scanner with / without heating

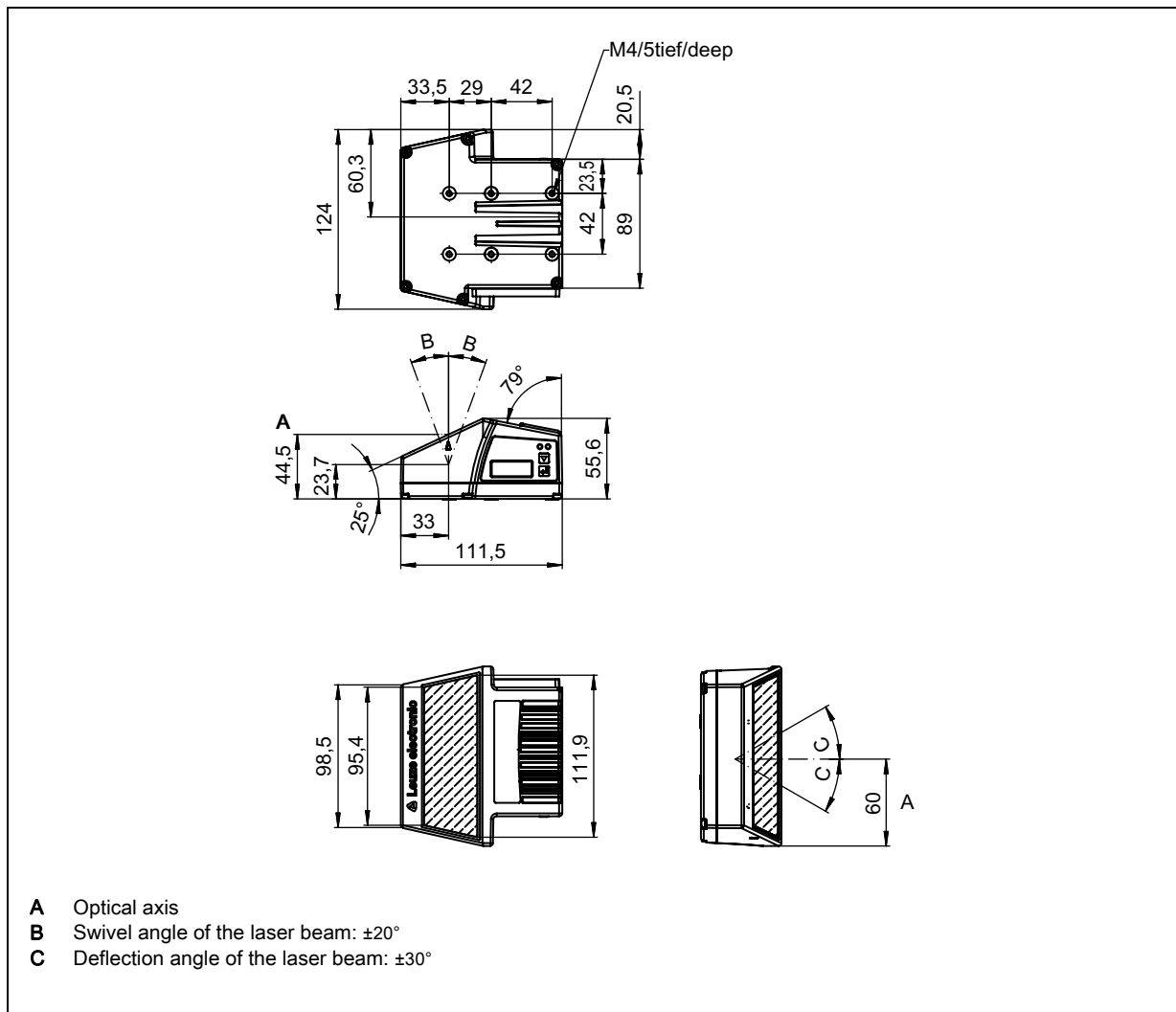


Figure 5.5: Dimensioned drawing of BCL 300/\ BCL 301/O...100 oscillating-mirror scanner

5.3.6 Dimensioned drawings of MS 3xx / MK 3xx connection hoods

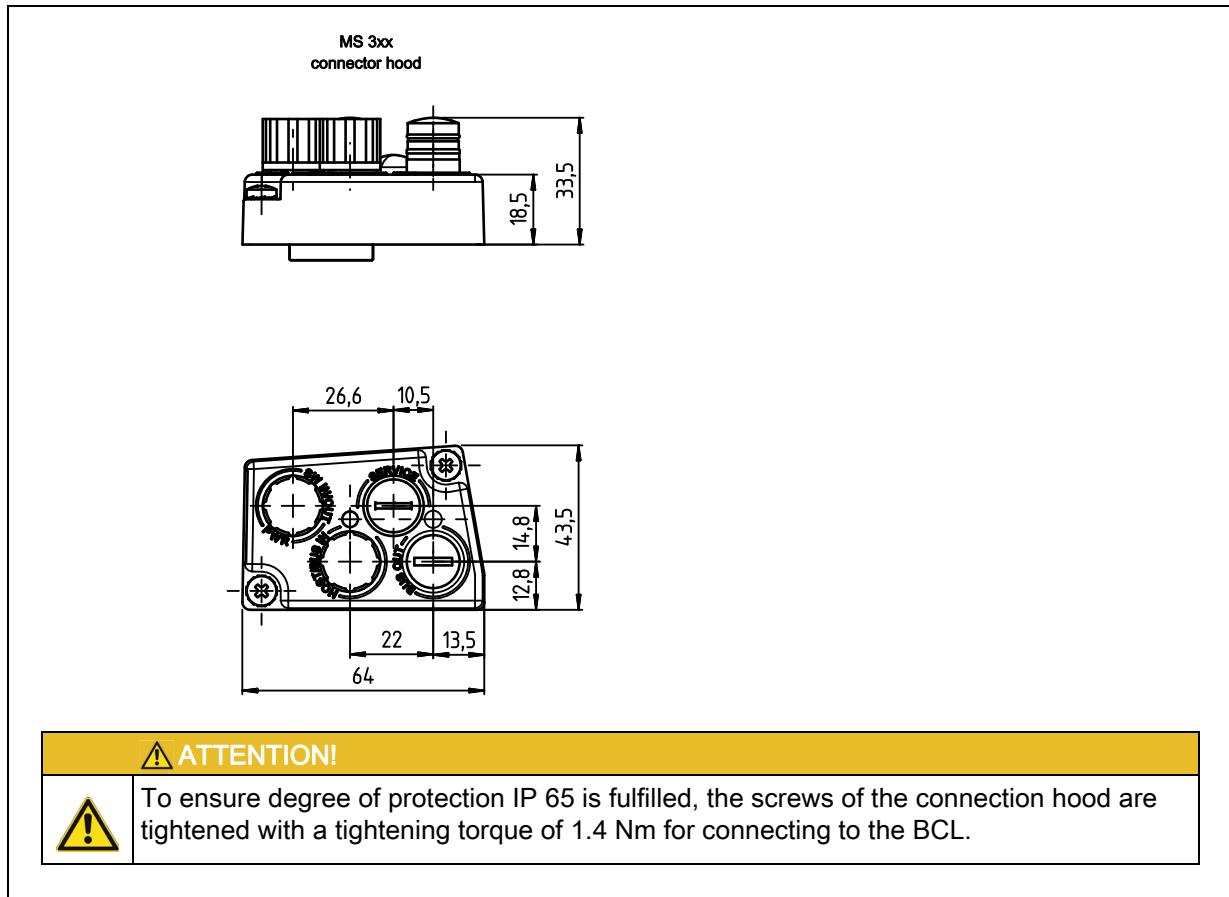


Figure 5.6: Dimensioned drawing of MS 3xx connector hood

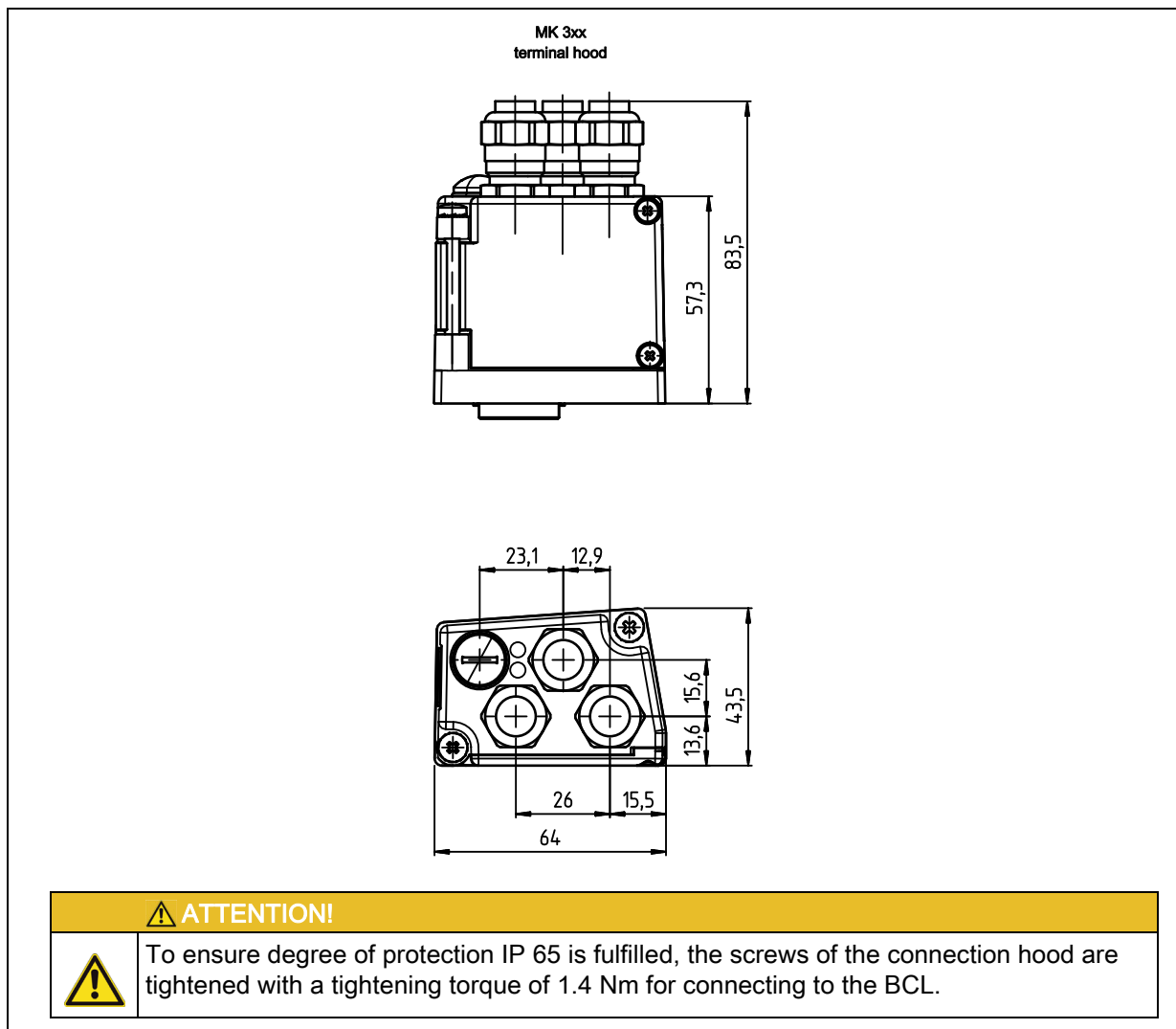


Figure 5.7: Dimensioned drawing of MK 3xx terminal hood

5.3.7 Dimensioned drawing of KB 301-3000 cable hood

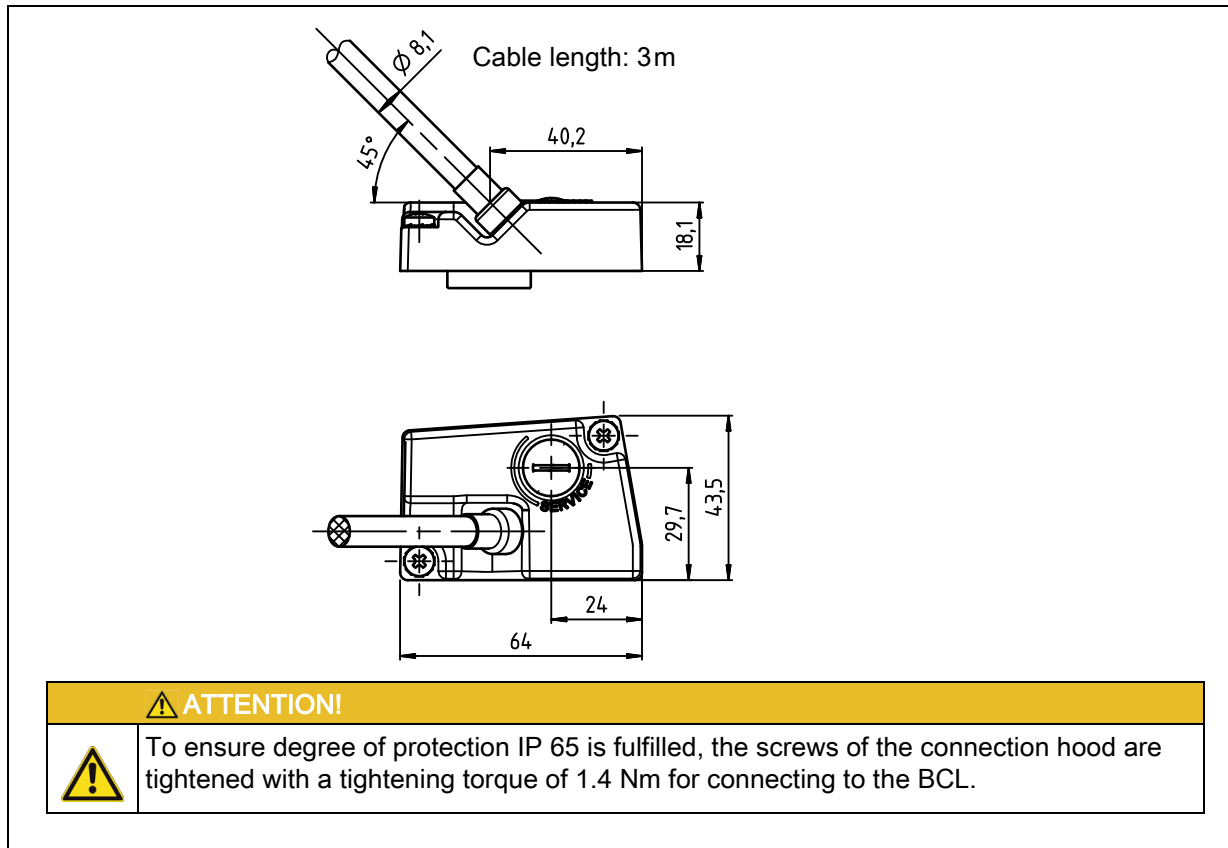


Figure 5.8: Dimensioned drawing of KB 301-3000 cable hood

5.3.8 Dimensioned drawing of MA 100 terminal box

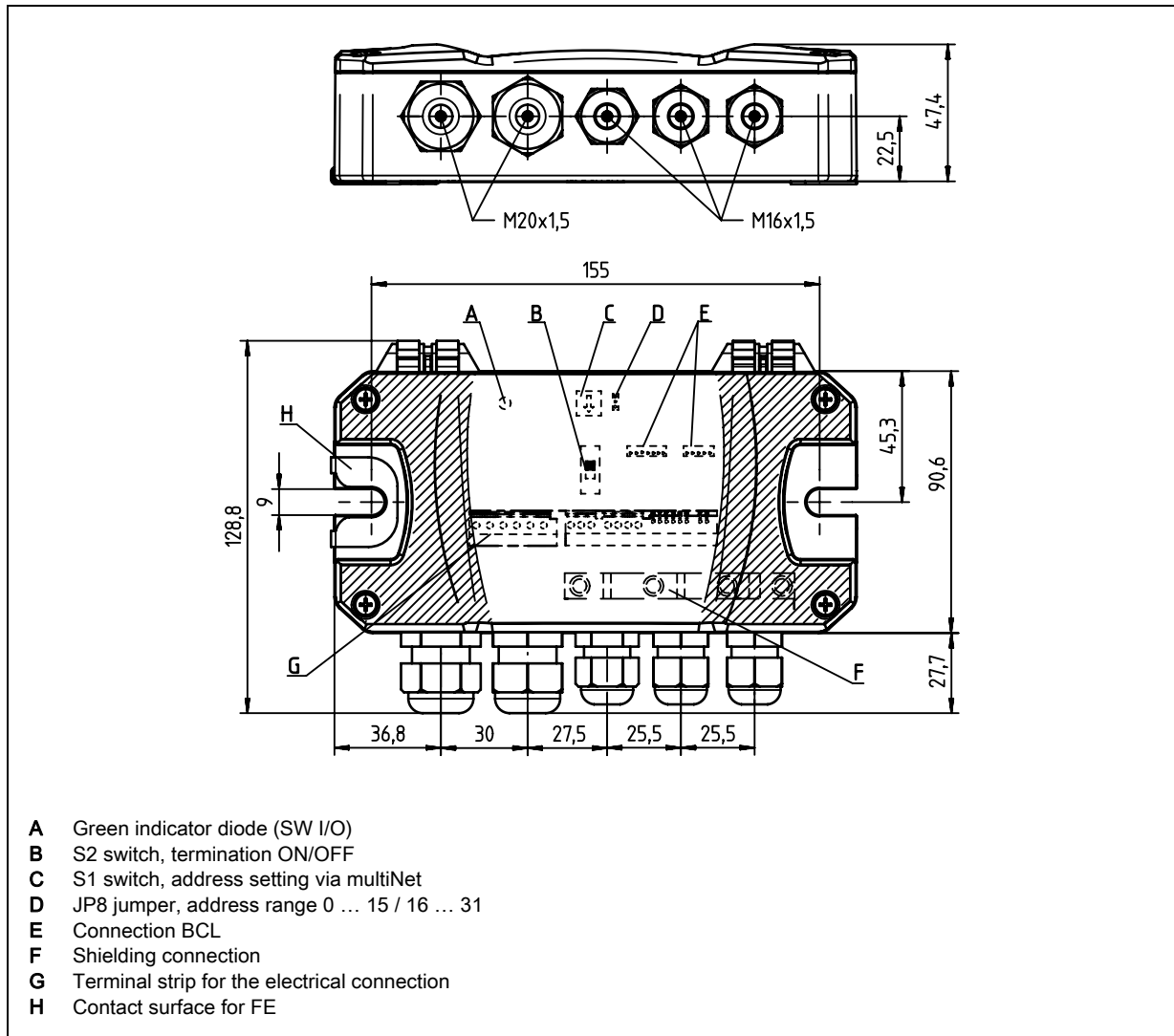


Figure 5.9: Dimensioned drawing of MA 100 terminal box

5.4 Reading field curves / optical data

5.4.1 Bar code characteristics

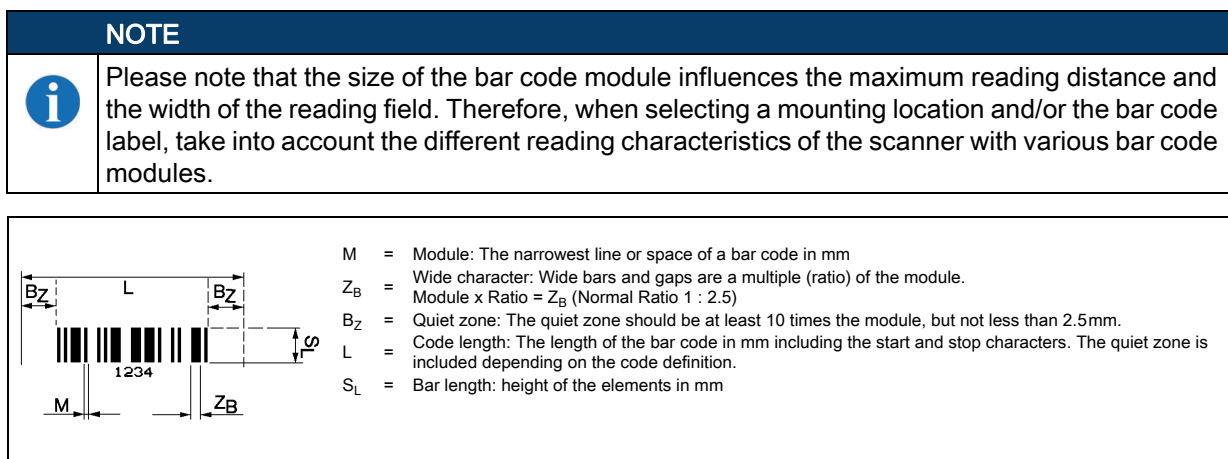


Figure 5.10: The most important characteristics of a bar code

The range in which the bar code can be read by the BCL 300/\ BCL 301/(the so-called reading field) depends on the quality of the printed bar code and its dimensions.

Therefore, above all, the module of a bar code is decisive for the size of the reading field.

NOTE



A rule of thumb: The smaller the module of the bar code is, the smaller the maximum reading distance and reading field width will be.

5.4.2 Raster scanner

A raster variant is also available in the BCL 300/series. The BCL 300/ as a raster scanner projects 8 scan lines which vary depending on the reading distance from the raster aperture.

		Distance [mm] starting at the zero position						
		50	100	200	300	400	450	700
Raster line cover [mm] all raster lines	Front scanner	8	14	24	35	45	50	77
	Deflecting mirror scanner	12	17	27	38	48	54	80

Table 5.7: Raster line cover dependent on the distance

NOTE



With the raster scanner, there may not be two or more bar codes in the raster area at the same time.

5.5 Reading field curves

NOTE



Please notice that the real reading fields are also influenced by factors such as labeling material, printing quality, reading angle, printing contrast etc., and may thus deviate from the reading fields specified here.

The reading field curves also apply for the device models with heating.

The zero position of the reading distance always refers to the front edge of the housing of the beam exit and is shown for the three housing types of the BCL 300/\ BCL 301/ in Figure 5.11.

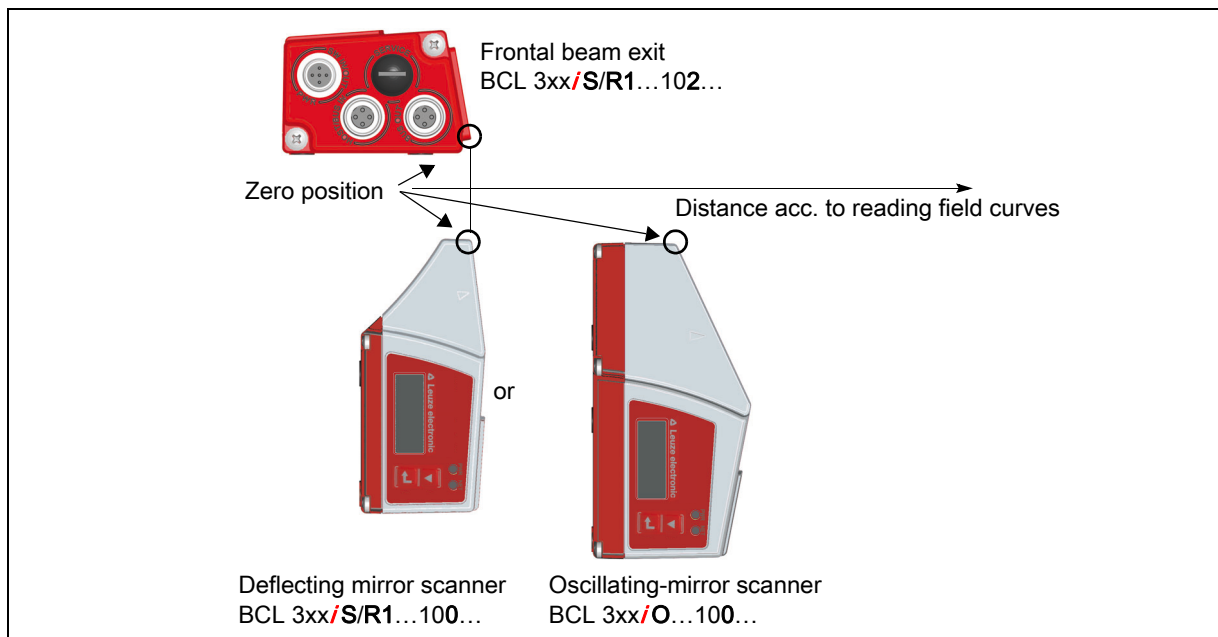


Figure 5.11: Zero position of the reading distance

Reading conditions for the reading field curves

Bar code type	2/5 Interleaved
Ratio	1:2.5
ANSI specification	Class A
Reading rate	> 75%

Table 5.8: Reading conditions

5.5.1 High Density (N) - optics: BCL 300/\ BCL 301/S/R1 N 102 (H)

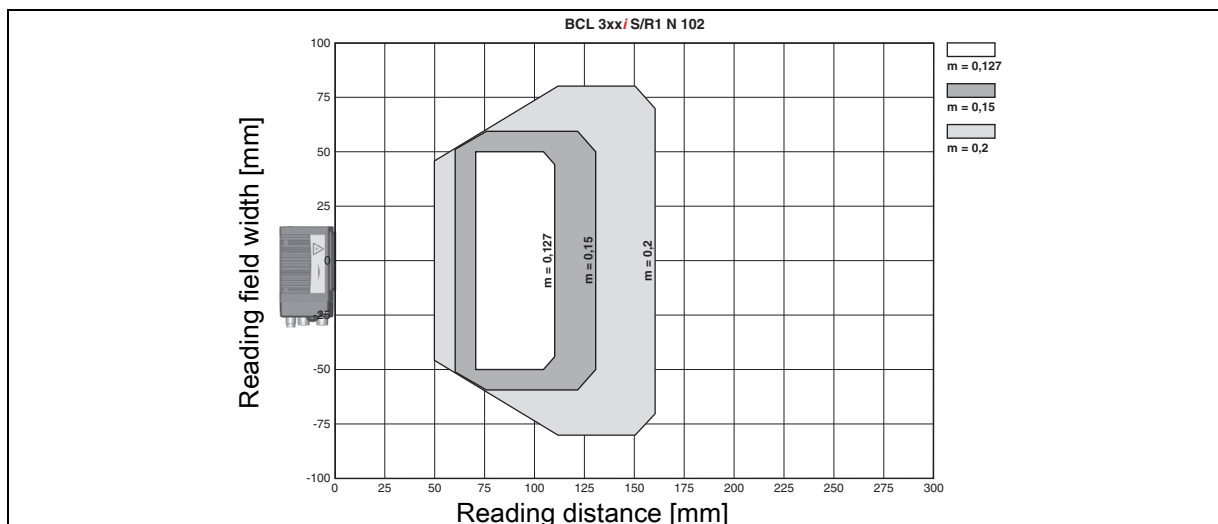


Figure 5.12: "High Density" reading field curve for line scanner without deflecting mirror

5.5.2 High Density (N) - optics: BCL 300/\ BCL 301/S/R1 N 100 (H)

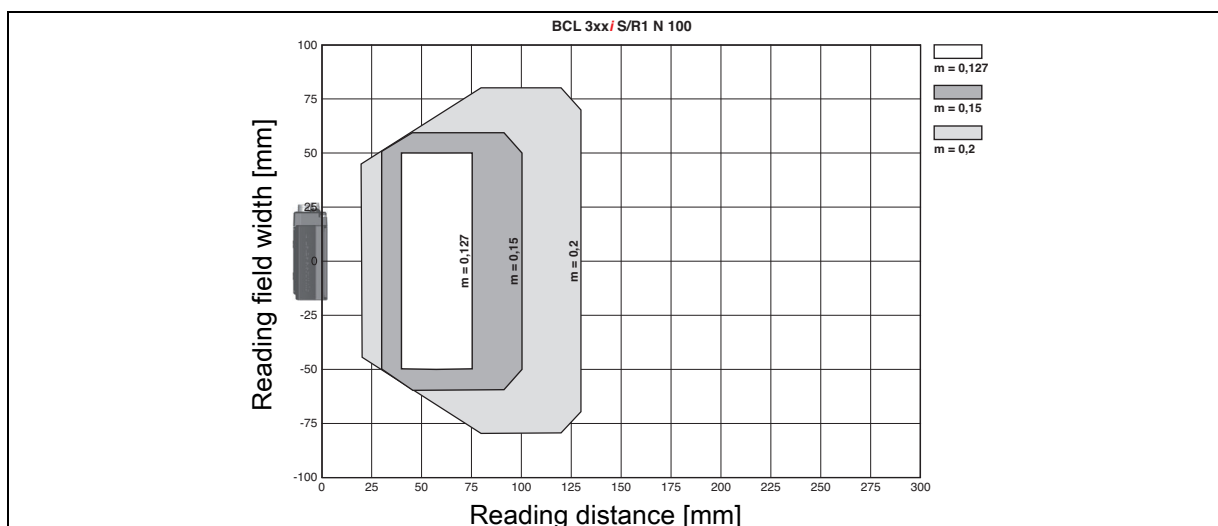


Figure 5.13: "High Density" reading field curve for line scanner with deflecting mirror

The reading field curve applies for the reading conditions stated in Table 5.8.

5.5.3 Medium Density (M) - optics: BCL 300/\ BCL 301/S/R1 M 102 (H)

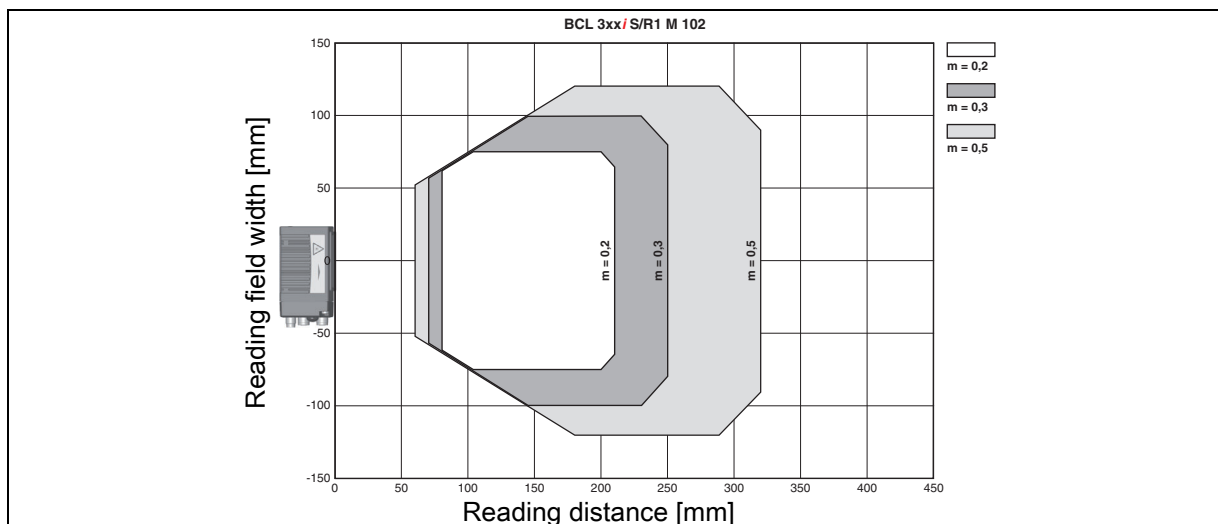


Figure 5.14: "Medium Density" reading field curve for line scanner without deflecting mirror

5.5.4 Medium Density (M) - optics: BCL 300/\ BCL 301/S/R1 M 100 (H)

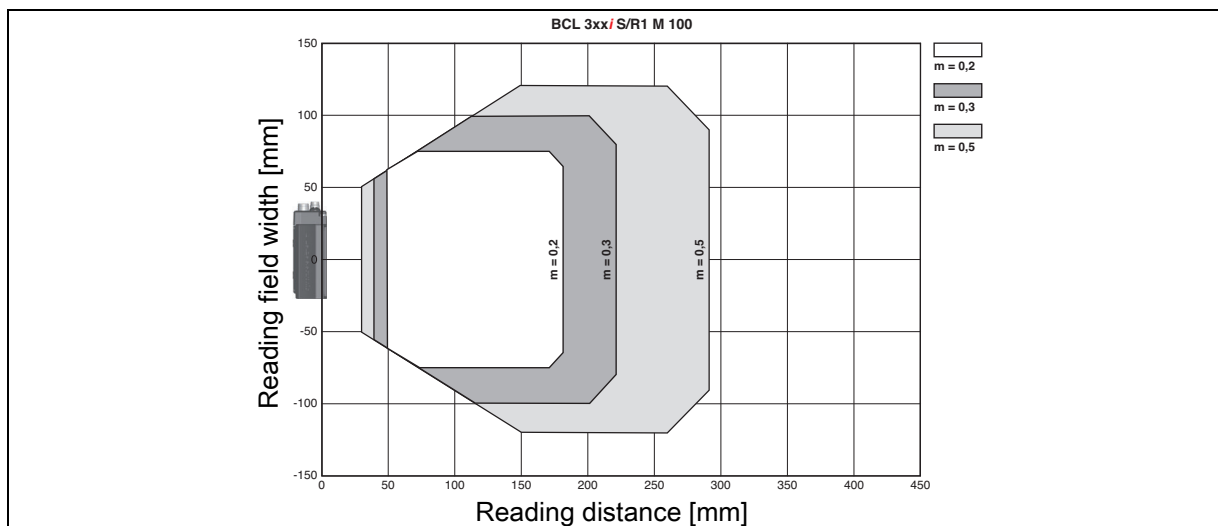


Figure 5.15: "Medium Density" reading field curve for line scanner with deflecting mirror

The reading field curves apply for the reading conditions stated in Table 5.8.

5.5.5 Medium Density (M) - optics: BCL 300/\ BCL 301/O M 100 (H)

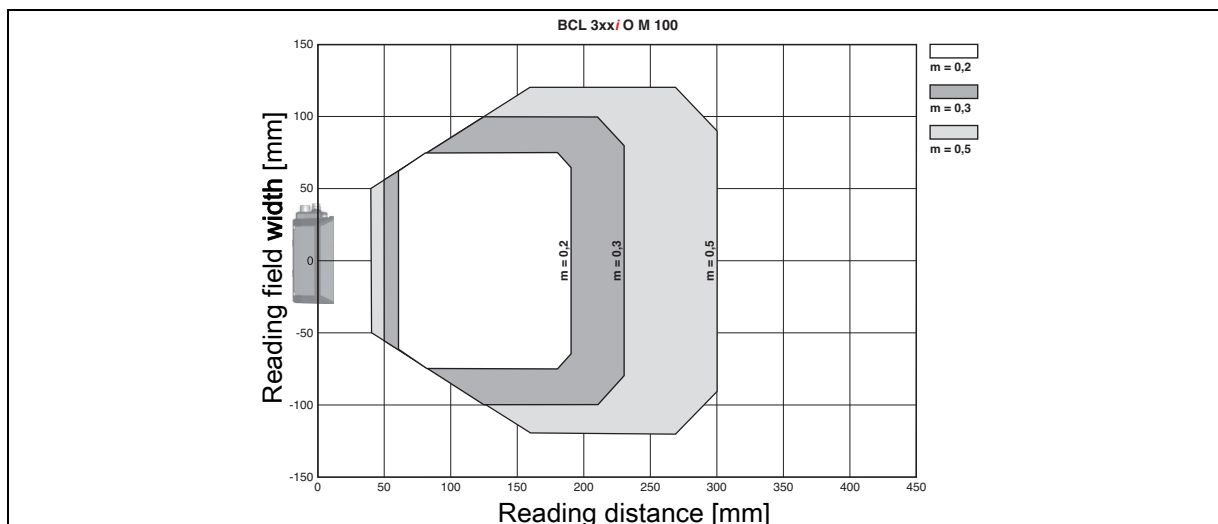


Figure 5.16: "Medium Density" reading field curve for oscillating-mirror scanners

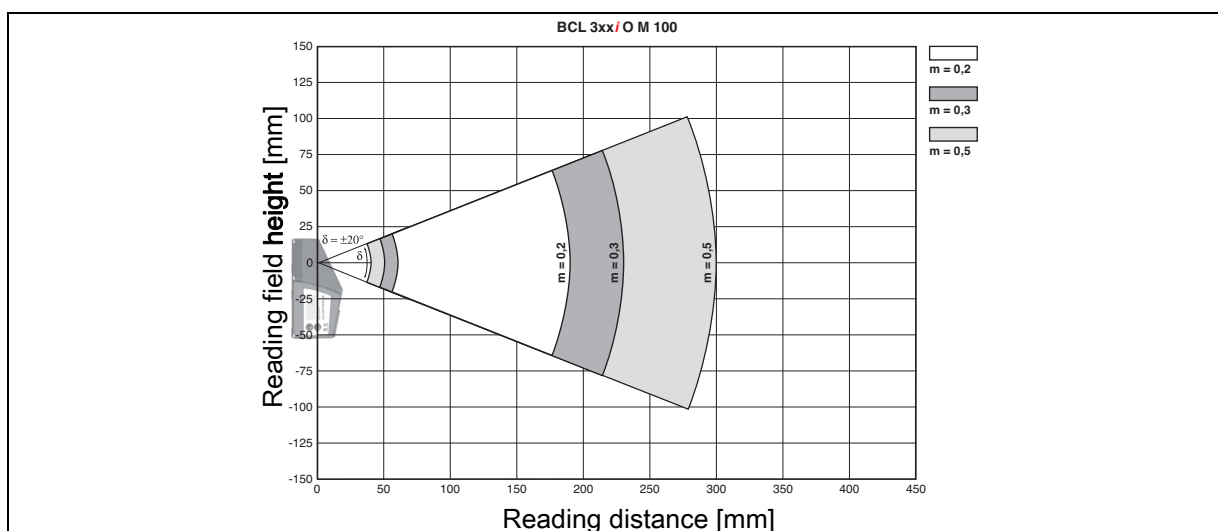


Figure 5.17: Lateral "Medium Density" reading field curve for oscillating-mirror scanners

The reading field curves apply for the reading conditions stated in Table 5.8.

5.5.6 Low Density (F) - optics: BCL 300/\ BCL 301/S/R1 F 102 (H)

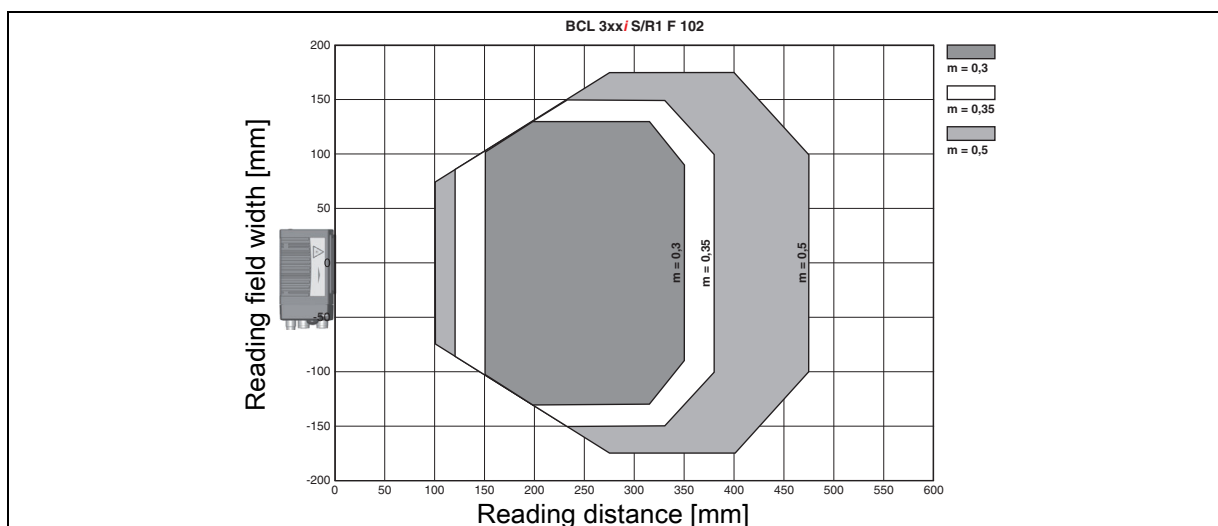


Figure 5.18: "Low Density" reading field curve for line scanner without deflecting mirror

5.5.7 Low Density (F) - optics: BCL 300/ BCL 301/ S/R1 F 100 (H)

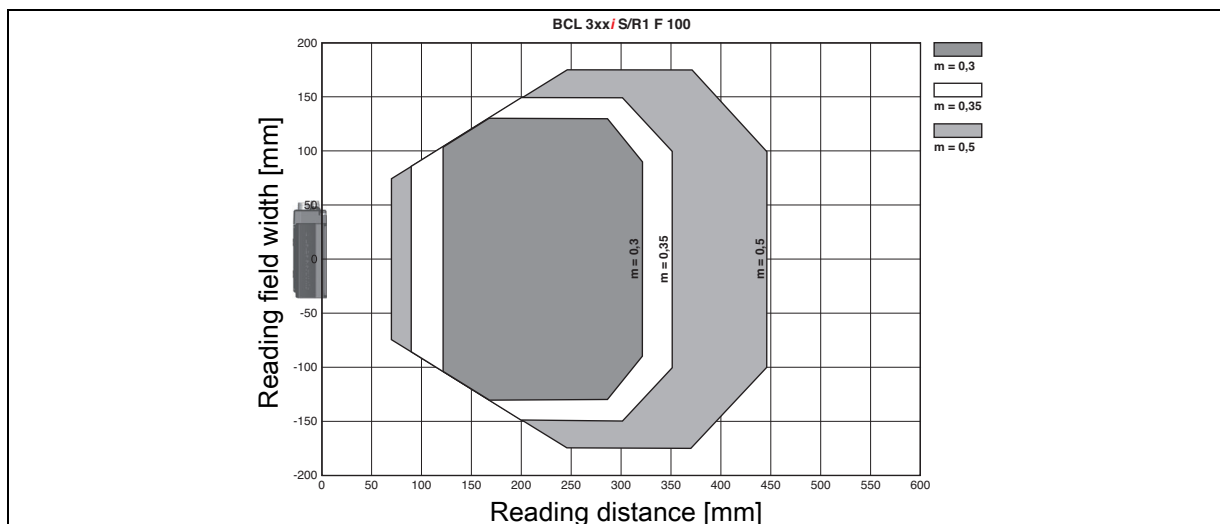


Figure 5.19: "Low Density" reading field curve for line scanner with deflecting mirror
The reading field curves apply for the reading conditions stated in Table 5.8.

5.5.8 Low Density (F) - optics: BCL 300/ BCL 301/ O F 100 (H)

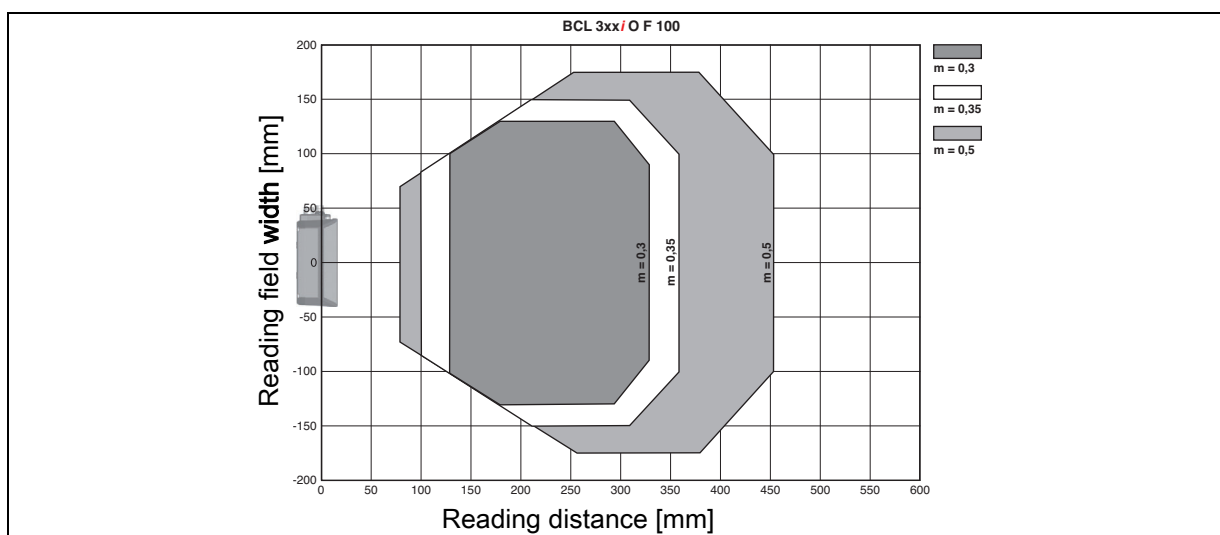


Figure 5.20: "Low Density" reading field curve for oscillating-mirror scanners

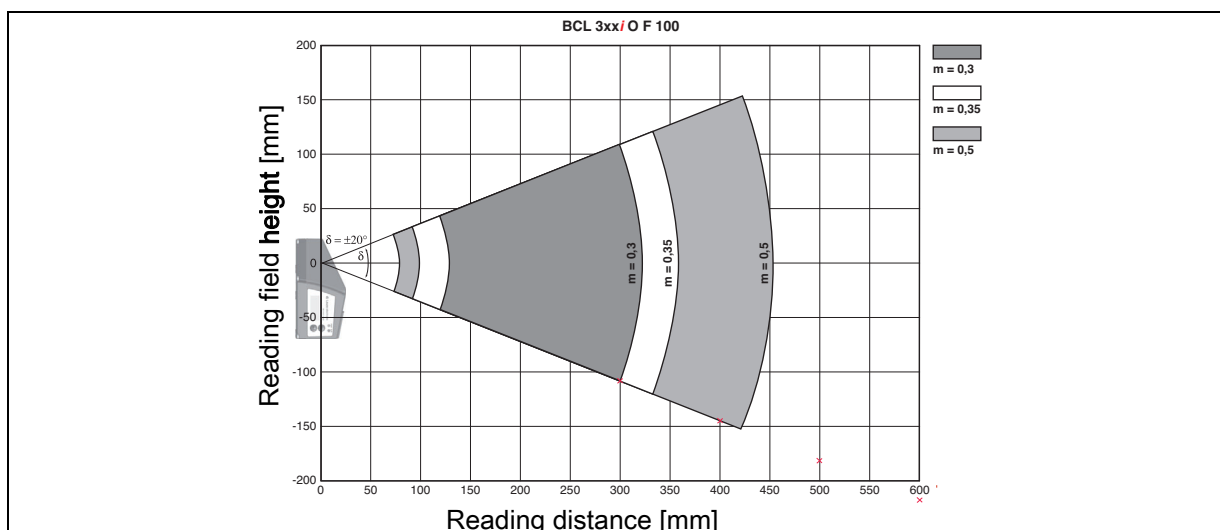


Figure 5.21: Lateral "Low Density" reading field curve for oscillating-mirror scanners

The reading field curves apply for the reading conditions stated in Table 5.8.

5.5.9 Ultra Low Density (L) - optics: BCL 300/\ BCL 301/S L 102 (H)

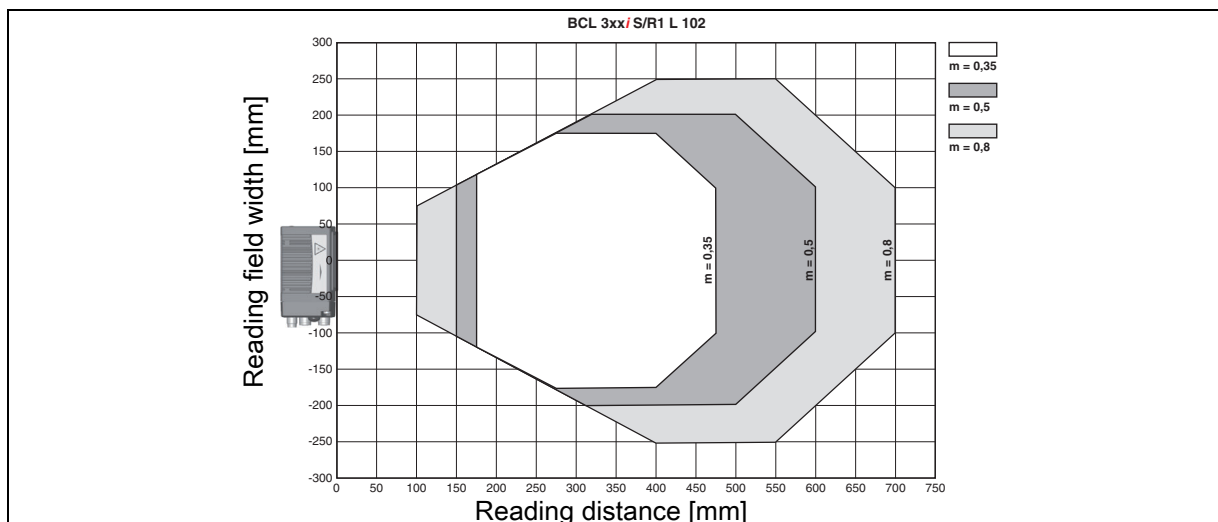


Figure 5.22: "Ultra Low Density" reading field curve for line scanner without deflecting mirror

5.5.10 Ultra Low Density (L) - optics: BCL 300/\ BCL 301/S L 100 (H)

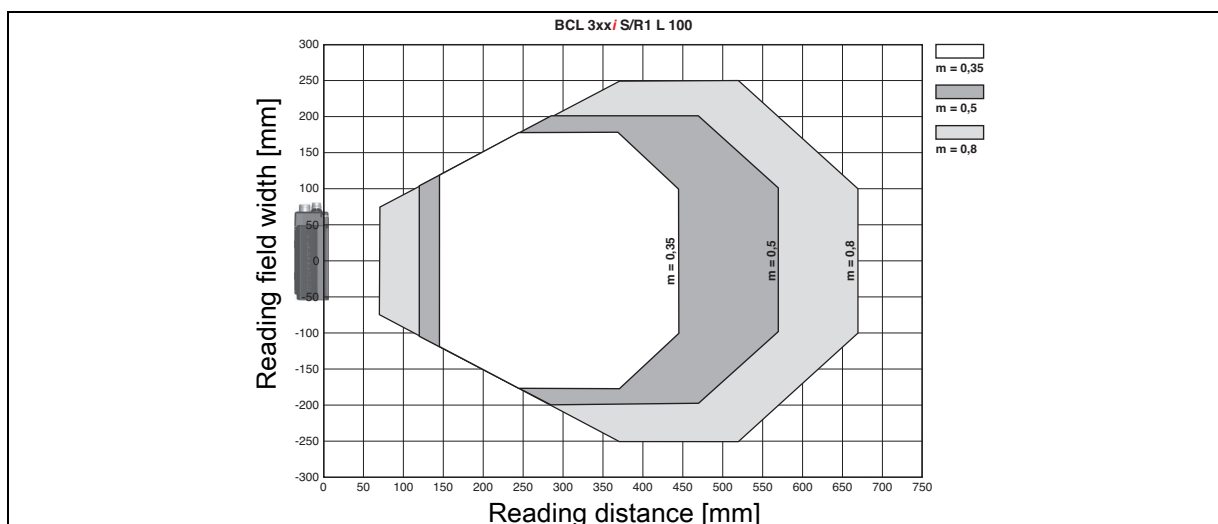


Figure 5.23: "Ultra Low Density" reading field curve for line scanner with deflecting mirror

The reading field curves apply for the reading conditions stated in Table 5.8.

5.5.11 Ultra Low Density (L) - optics: BCL 300/\ BCL 301/\ O L 100 (H)

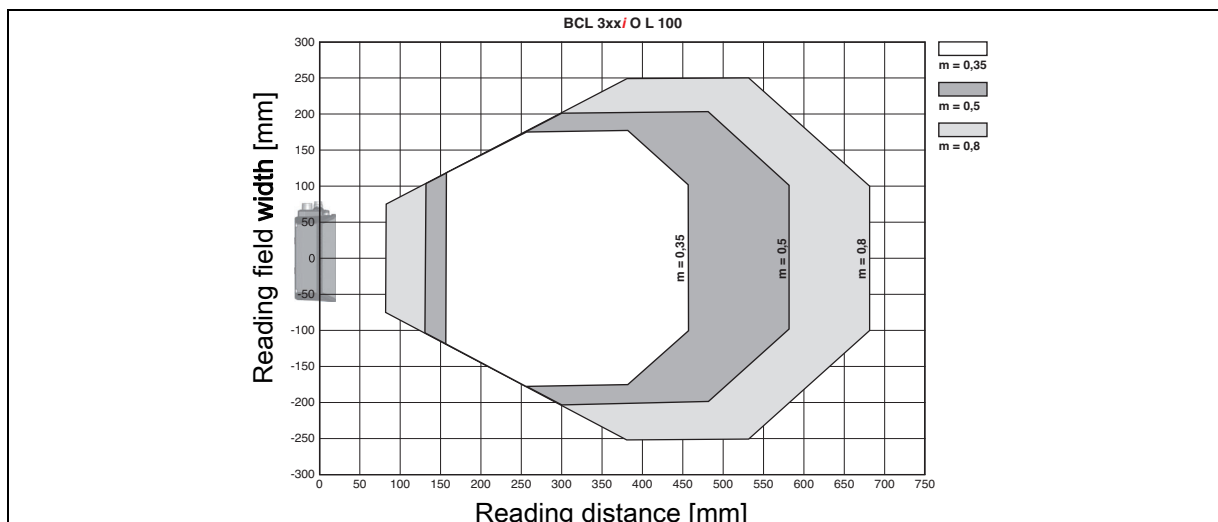


Figure 5.24: "Ultra Low Density" reading field curve for oscillating-mirror scanners

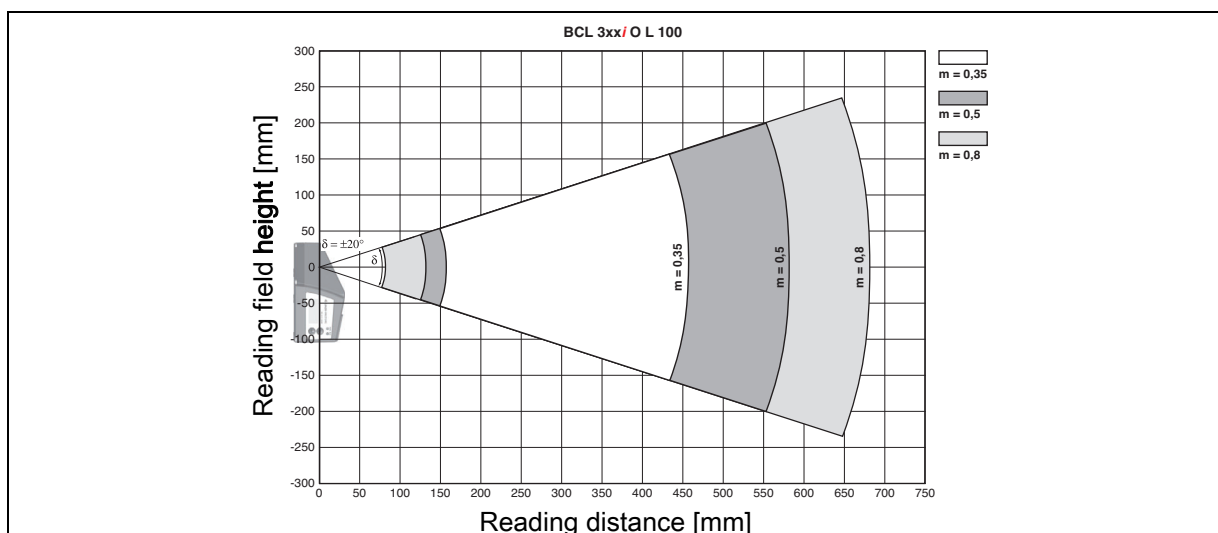


Figure 5.25: Lateral "Ultra Low Density" reading field curve for oscillating-mirror scanners

The reading field curves apply for the reading conditions stated in Table 5.8.

5.5.12 Ink Jet (J) - optics: BCL 300/\ BCL 301/\ R1 J 100

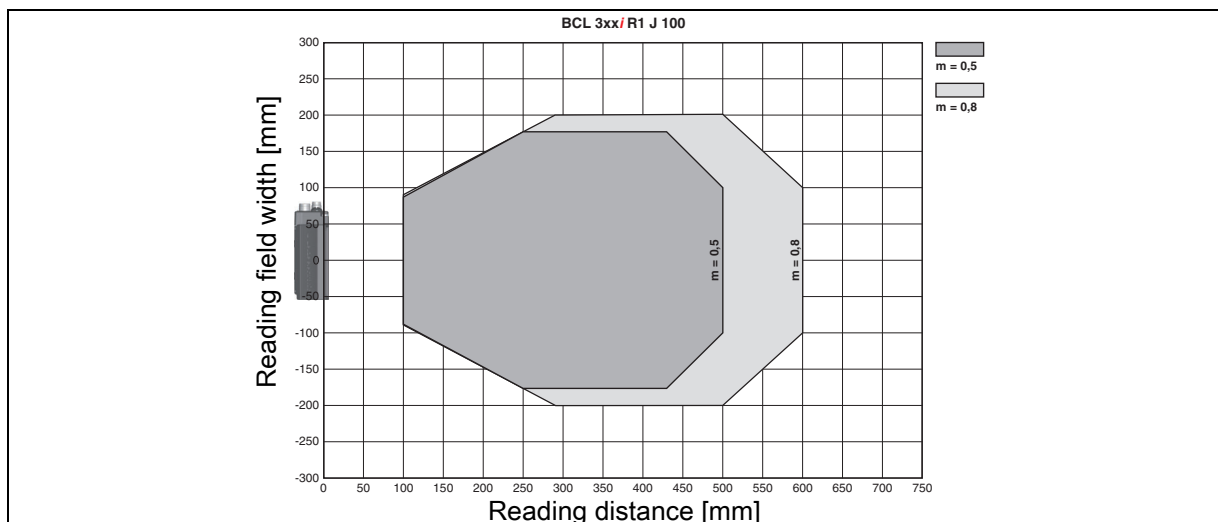


Figure 5.26: "Ink Jet" reading field curve for line scanner with deflecting mirror

NOTE




Please note that the real reading distances are also influenced by factors such as labeling material, printing quality, scanning angle, printing contrast, etc., and may thus deviate from the reading distances specified here.

Due to the shape of the optical laser spot, the CRT function may exhibit limitations (max. permissible tilt angle of $\pm 15^\circ$).

Low-contrast bar codes that are printed with inkjet should be sent to Leuze for examination.

6 Installation and mounting

6.1 Storage, transportation

⚠ ATTENTION!	
	<p>Package the device for transport and storage in such a way that is protected against shock and humidity. Optimum protection is achieved when using the original packaging. Ensure compliance with the approved environmental conditions listed in the specifications.</p>

Unpacking

- ✎ Check the packaging content for any damage. If damage is found, notify the post office or shipping agent as well as the supplier.
- ✎ Check the delivery contents using your order and the delivery papers:

- Delivered quantity
- Device type and model as indicated on the nameplate
- Brief manual

The name plate provides information as to what BCL type your device is. For specific information, please refer to Chapter 5.

Name plates of the bar code readers of the BCL 300/series

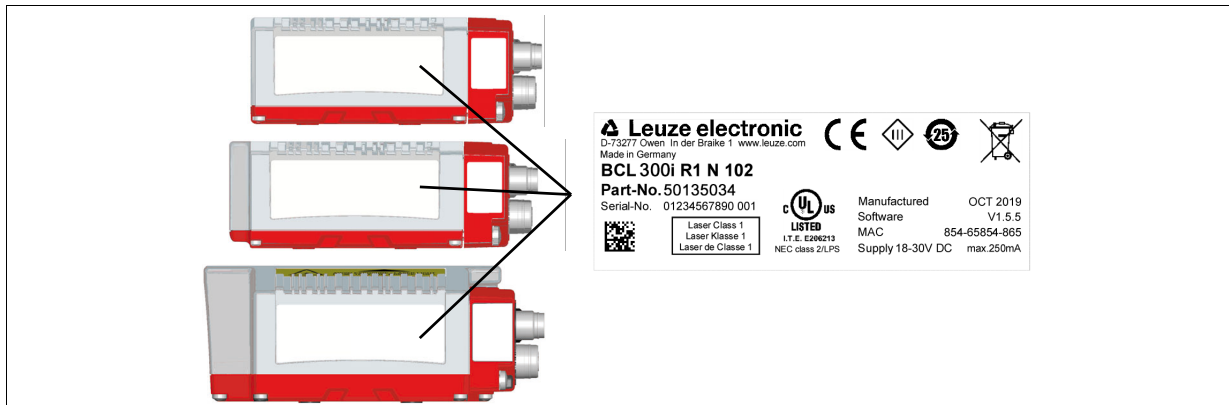



Figure 6.1: Device name plate BCL 300/

- ✎ Save the original packaging for later storage or shipping.

NOTE	
	<p>All BCL 300/ BCL 301/ are delivered with a protective cover on the connection side which must be removed before attaching a connection hood.</p>


If you have any questions concerning your shipment, please contact your supplier or your local Leuze sales office.

- ✎ Observe the applicable local regulations when disposing of the packaging materials.

6.2 Mounting the BCL 300/ BCL 301/

The BCL 300/ BCL 301/ bar code readers can be mounted in different ways:

- Via four or six M4x5 screws on the device bottom.
- Via a BT 56/BT 59 mounting device in the two fastening grooves on the device bottom.

⚠ ATTENTION!	
	<p>The BCL 300/ BCL 301/ does not fulfill degree of protection IP 65 until the connection hood has been screwed on. Minimum tightening torque of the housing connecting screw of the connection hood is 1.4Nm!</p>

6.2.1 Mounting via M4 x 5 screws

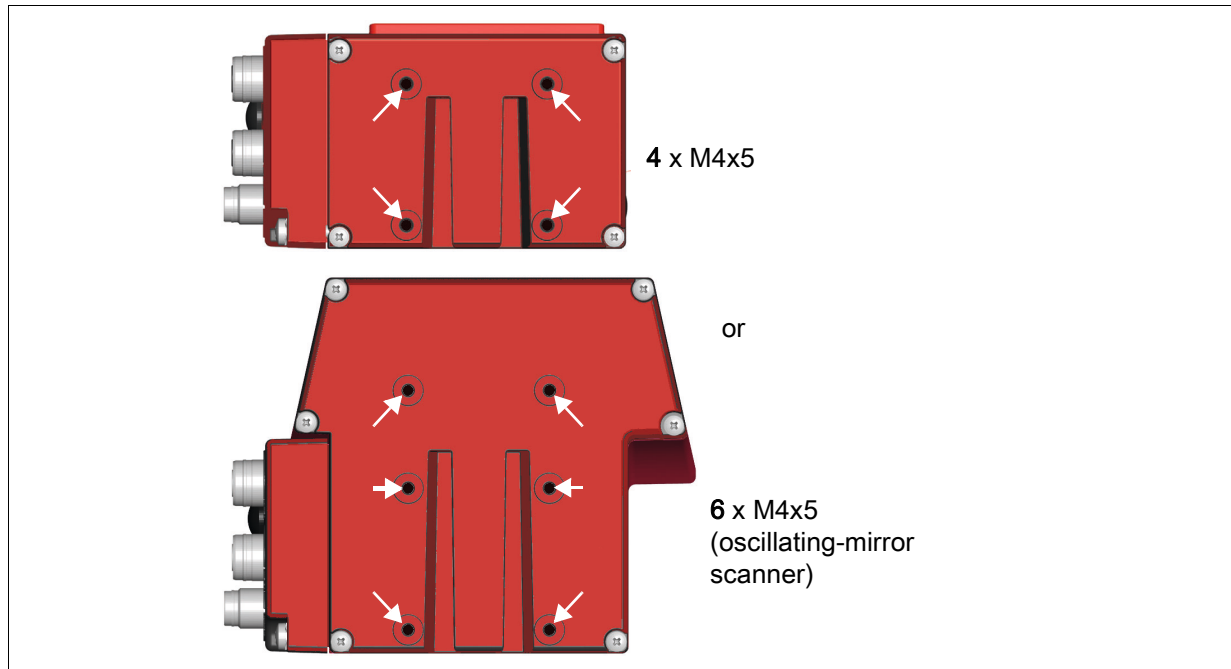


Figure 6.2: Fastening options using M4x5 threaded holes

6.2.2 Mounting devices BT 56 and BT 56-1

The BT 56 or BT 56-1 mounting device is available for mounting the BCL 300/i BCL 301/i using the fastening grooves. It is designed for rod mounting ($\varnothing 16$ mm to 20 mm), the BT 56-1 for rods from $\varnothing 12$ mm to 16 mm. For order guide, please refer to chapter "Type overview and accessories" on page 111.

Mounting devices BT 56 and BT 56-1

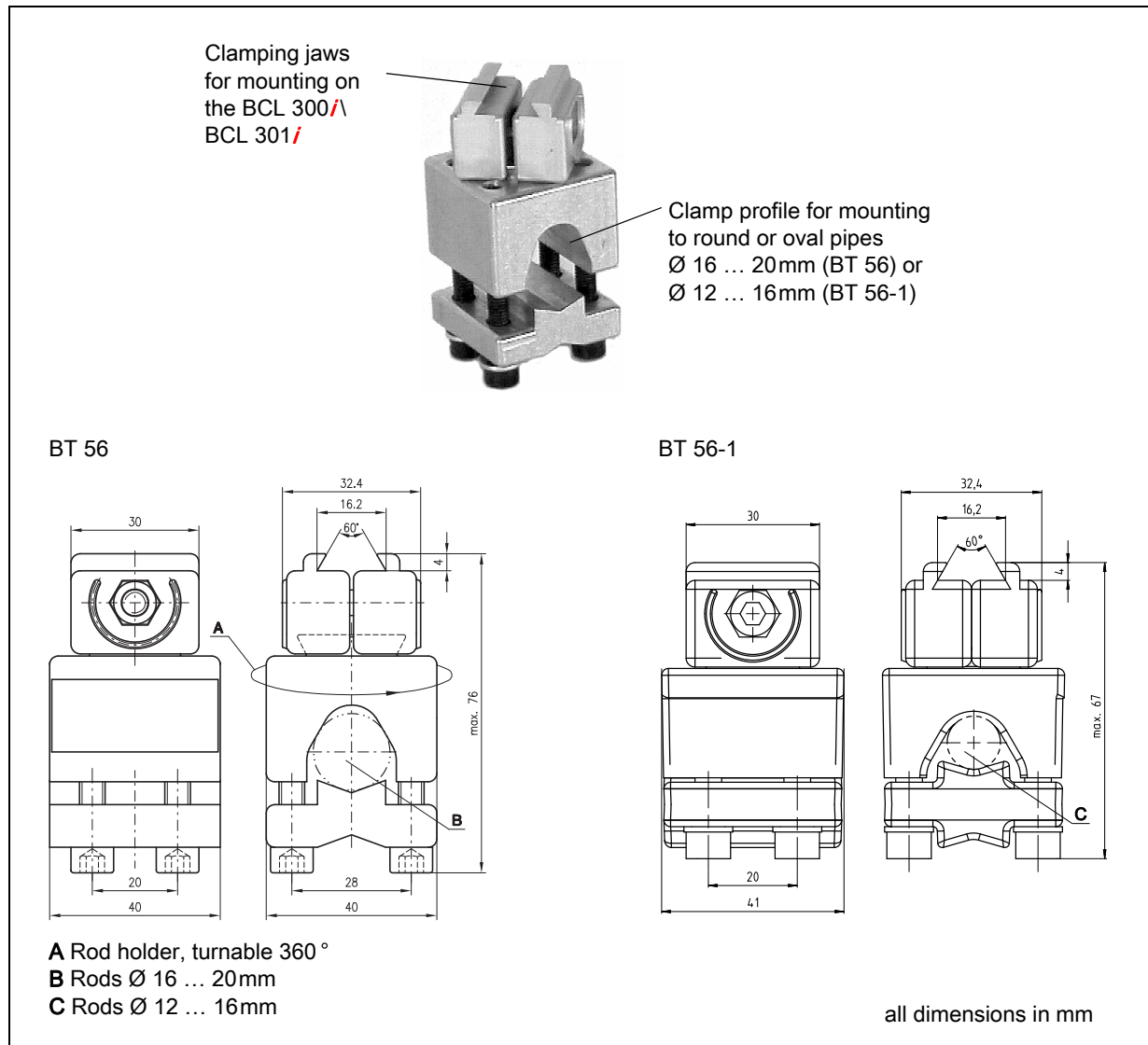


Figure 6.3: Mounting devices BT 56 and BT 56-1

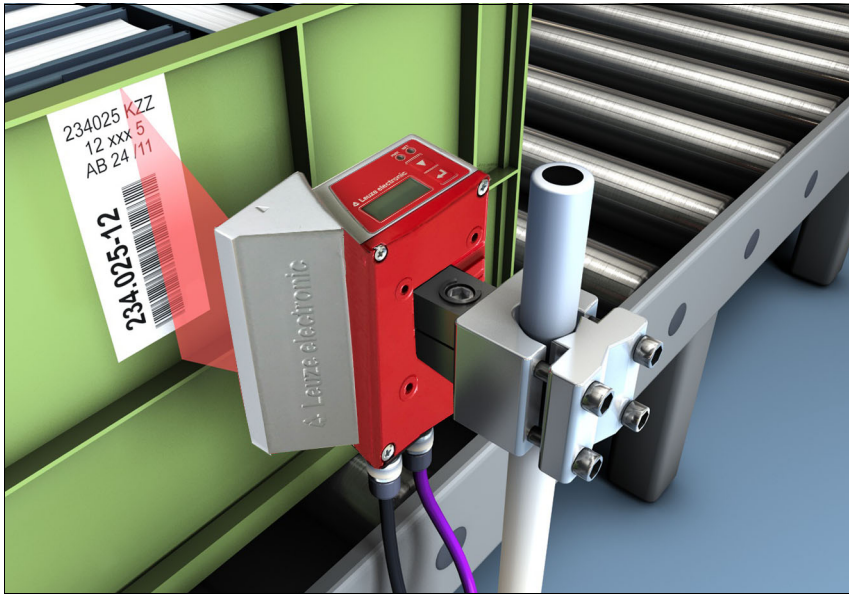


Figure 6.4: Mounting example of BCL 300 / BCL 301 with BT 56

6.2.3 BT 59 mounting device

The BT 59 mounting device offers you an additional fastening option. For order guide, please refer to chapter "Type overview and accessories" on page 111.

BT 59 mounting device

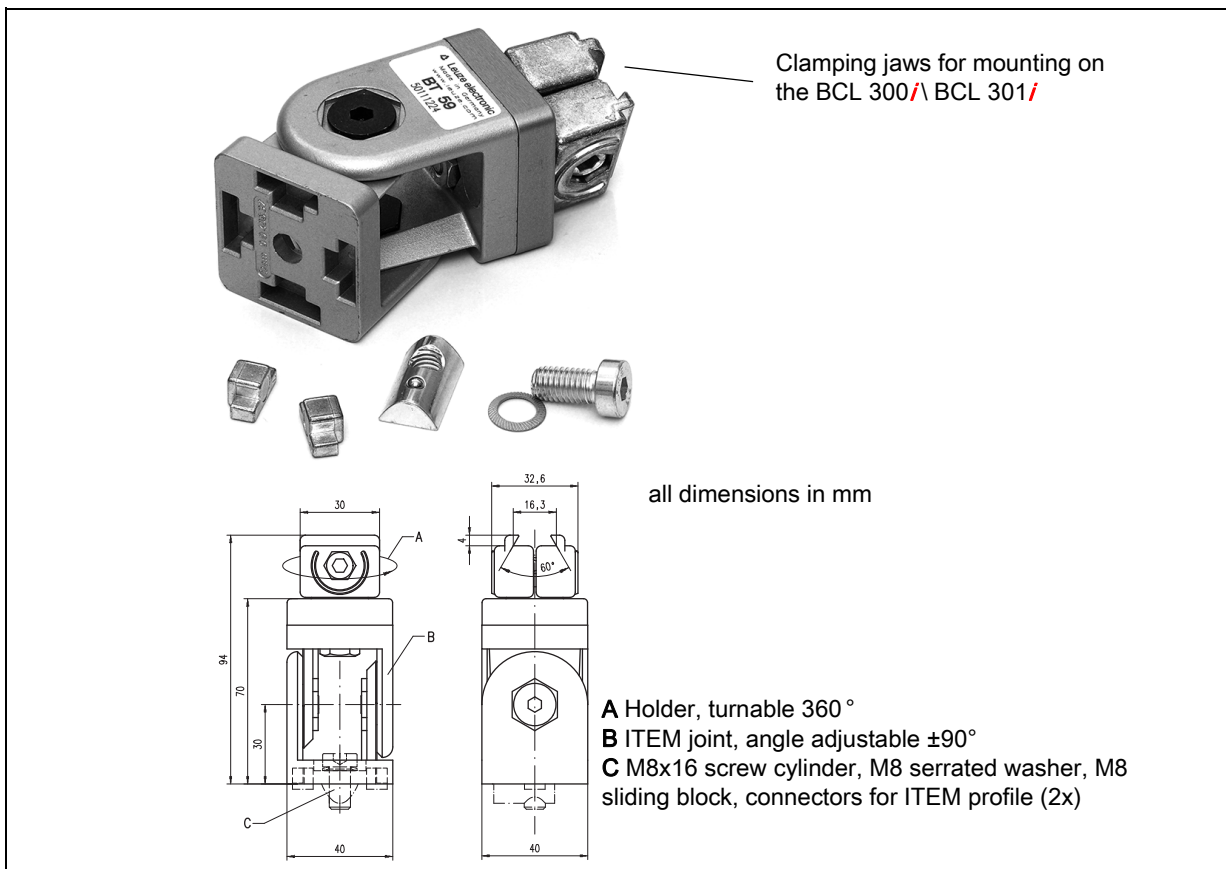


Figure 6.5: BT 59 mounting device

NOTE



When mounting, ensure that the scanning beam is not reflected directly back to the scanner by the label which is being read. For further information, see the notices in Chapter 6.3! Please refer to Chapter 5.4 for the permissible minimum and maximum distances between the BCL 300 / BCL 301 and the labels to be read.

6.2.4 BT 300 - 1, BT 300 W mounting devices

Mounting brackets BT 300 W and BT 300 - 1 offer you an additional mounting option. For ordering instructions, please refer to chapter "Type overview and accessories" on page 111.

BT 300 - 1, BT 300 W mounting devices

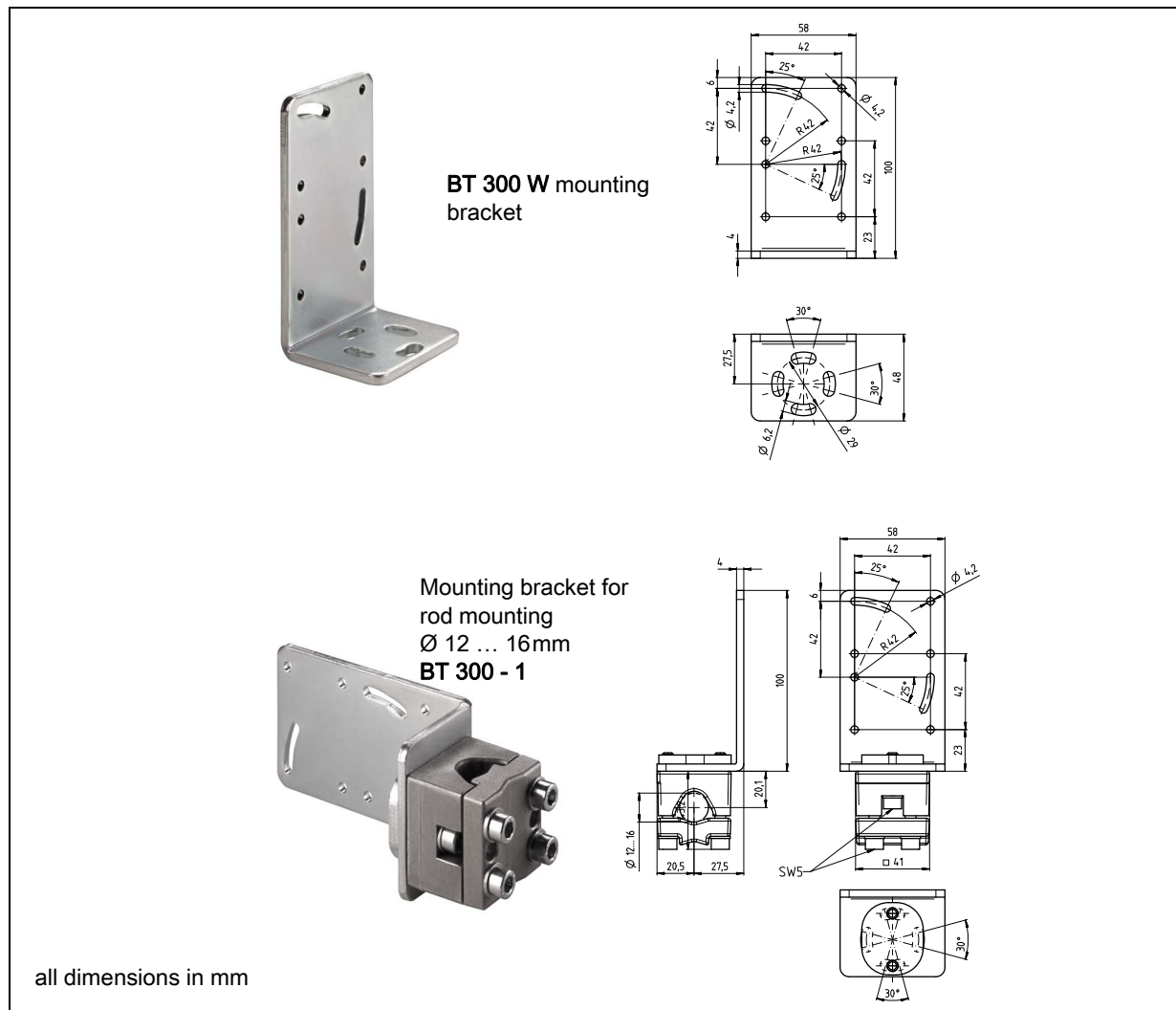


Figure 6.6: BT 300 - 1, BT 300 W mounting devices

NOTE



When mounting, ensure that the scanning beam is not reflected directly back to the scanner by the label which is being read. For further information, see the notices in Chapter 6.3! Please refer to Chapter 5.4 for the permissible minimum and maximum distances between the BCL 300/~~BCL 301~~ and the labels to be read.


6.3 Device arrangement

6.3.1 Selecting a mounting location

In order to select the right mounting location, several factors must be considered:

- Size, orientation, and position tolerance of the bar codes on the objects to be scanned.
- The reading field of the BCL 300/i BCL 301/i in relation to the bar code module width.
- The resulting minimum and maximum reading distance from the respective reading field (see chapter 5.4 "Reading field curves / optical data").
- The permissible cable lengths between the BCL 300/i BCL 301/i and the host system depending on which interface is used.
- The correct time for data output. The BCL 300/i BCL 301/i should be positioned in such a way that, taking into consideration the time required for data processing and the conveyor belt speed, there is sufficient time to e.g. initiate sorting operations on the basis of the read data.
- The display elements such as LEDs or the display should be highly visible.
- For configuring and commissioning with the webConfig tool, the USB interface should be easily accessible.

For specific information, please refer to Chapter 6 and Chapter 7.

NOTE	
	<p>The beam of the BCL 300/i BCL 301/i exits:</p> <ul style="list-style-type: none"> • Parallel to the housing base in the case of the line scanner • At 105 degrees from the housing base in the case of the deflecting mirror • Perpendicular to the housing base in the case of the oscillating mirror <p>In each case, the housing base is the black area in Figure 6.2. The best read results are obtained when:</p> <ul style="list-style-type: none"> • The BCL 300/i BCL 301/i is mounted in such a way that the scanning beam is incident on the bar code at an angle of inclination greater than $\pm 10^\circ \dots 15^\circ$ to vertical. • The reading distance lies in the middle area of the reading field. • The bar code labels are of good print quality and have good contrast ratios. • You do not use high-gloss labels. • There is no direct sunlight.

6.3.2 Avoiding total reflection – Line scanner

The bar code label must be positioned at an angle of inclination greater than $\pm 10^\circ \dots 15^\circ$ from vertical in order to avoid total reflection of the laser beam (see Figure 6.7)!

Total reflection occurs whenever the laser light of the bar code reader is directly incident on the surface of the bar code at an angle of 90° . The light directly reflected by the bar code may overload the bar code reader and thereby cause non-readings!

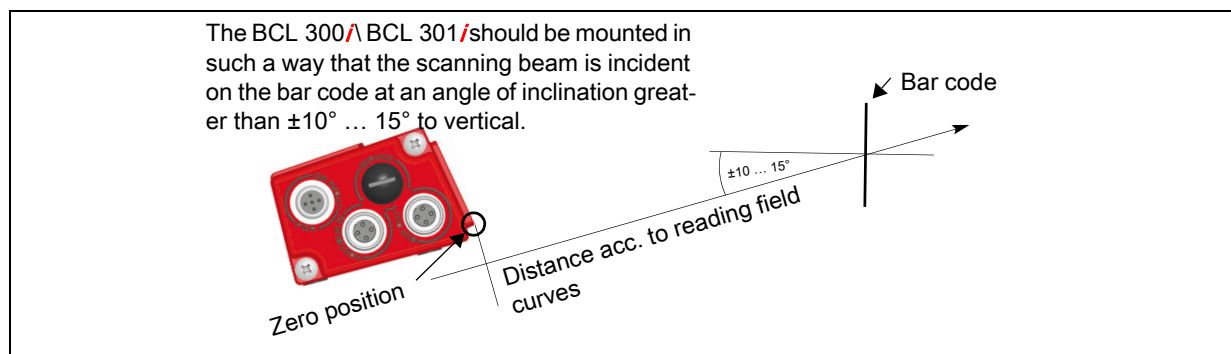


Figure 6.7: Total reflection – line scanner

6.3.3 Avoiding total reflection – deflecting mirror scanner

For the BCL 300 / BCL 301 / with **deflecting mirror**, the laser beam exits at an angle of 105° to the rear housing wall.

An angle of incidence of 15° of the laser to the label has already been integrated in the deflecting mirror so that the BCL 300 / BCL 301 / can be installed parallel to the bar code (rear housing wall).

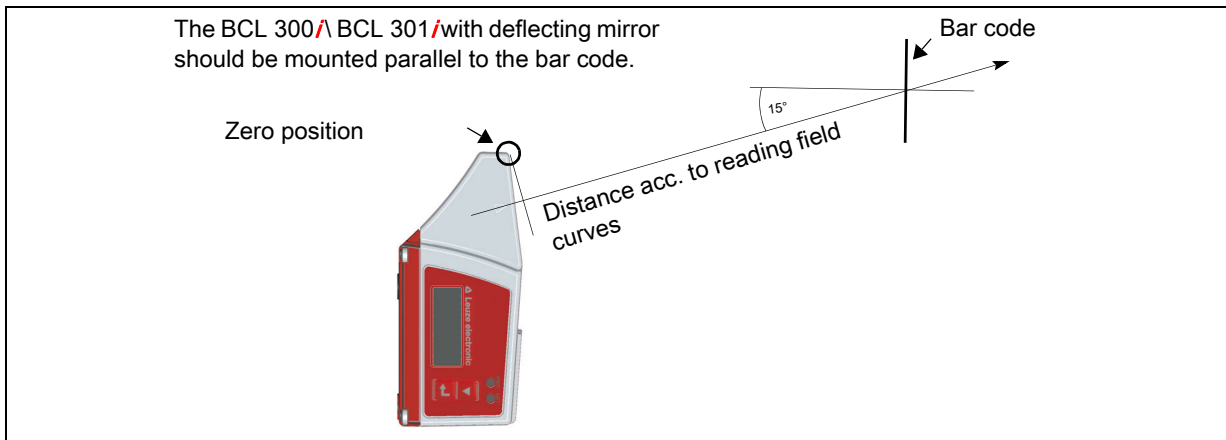


Figure 6.8: Total reflection – line scanner

6.3.4 Avoiding total reflection – oscillating-mirror scanner

For the BCL 300 / BCL 301 / with **oscillating mirror**, the laser beam exits at an **angle of 90° to vertical**.

For the BCL 300 / BCL 301 / with **oscillating mirror**, the **swivel range of $\pm 20^\circ$ ($\pm 12^\circ$ for devices with heating)** is to be taken into account.

This means that in order to be on the safe side and to avoid total reflection, the BCL 300 / BCL 301 / with oscillating mirror must be inclined upward or downward $20^\circ \dots 30^\circ$!

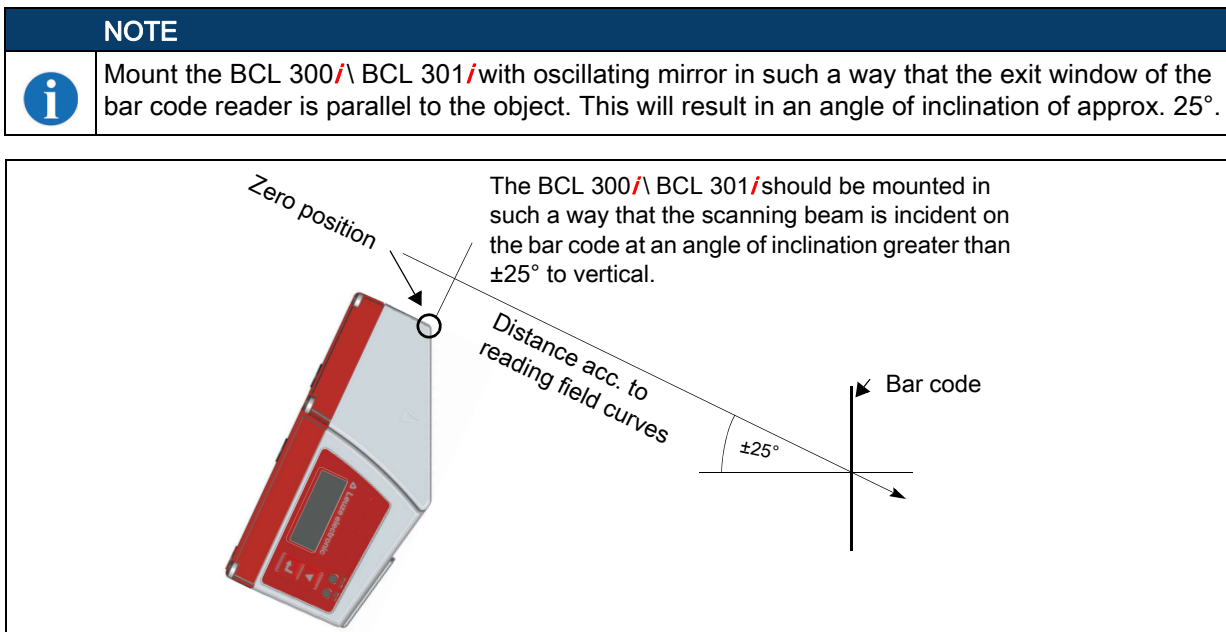


Figure 6.9: Total reflection – BCL 300 / BCL 301 / with oscillating-mirror scanner

6.3.5 Mounting location

☞ When choosing the mounting location, observe the following:

- Maintaining the required environmental conditions (temperature, humidity).
- Possible soiling of the reading window due to liquids, abrasion by boxes, or packaging material residues.
- Lowest possible chance of damage to the BCL 300 / BCL 301 / by mechanical collision or jammed parts.
- Possible extraneous light (no direct sunlight or sunlight reflected by the bar code).

6.3.6 Devices with integrated heating

↳ When mounting devices with integrated heating, also observe the following points:

- Mount the BCL 300/i \ BCL 301/i in a way which provides maximum thermal isolation, e.g. using rubber-bonded metal.
- Mount in such a way that the device is protected from draft and wind; mount additional shields if necessary.

NOTE



When installing the BCL 300/i \ BCL 301/i in a protective housing, it must be ensured that the scanning beam can exit the protective housing without obstruction.

6.3.7 Possible read angles between BCL 300/i \ BCL 301/i and bar code

The optimum alignment of the BCL 300/i \ BCL 301/i is accomplished when the scan line scans the bar code bars almost at a right angle (90°). All reading angles that are possible between the scan line and bar code must be taken account (Figure 6.10).

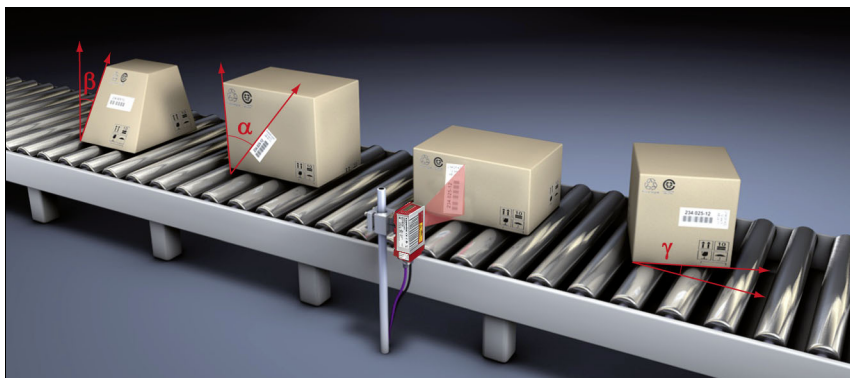


Figure 6.10: Reading angle for the line scanner

- α Azimuth angle (tilt)
 β Inclination angle (pitch)
 γ Angle of rotation (skew)

In order to avoid total reflection, the angle of rotation γ should be greater than 10°

6.4 Cleaning

↳ Clean the glass window of the BCL 300/i \ BCL 301/i with a soft cloth after mounting. Remove all packaging remains, e.g. carton fibers or styrofoam balls. In doing so, avoid leaving fingerprints on the front screen of the BCL 300/i \ BCL 301/i.

⚠ ATTENTION!



Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device.

7 Electrical connection



The bar code readers of the BCL 300/ series feature a modular connection concept with replaceable connection hoods and an external terminal box that covers all connection variants (M12 connectors, terminals, 3 m connection cables).

The additional Mini-B type USB interface is used for configuring the device.

The two product series BCL 300/ and BCL 301/ differ in their interfaces and in their function as stand-alone device or multiNet **slave**.

	HOST / BUS IN	BUS OUT
BCL 300/ (stand-alone scanner)	RS 232 / RS 422	–
BCL 301/ (multiNet plus slave)	RS 485	RS 485

Figure 7.1 shows the different connection variants.

NOTE	
	On delivery, the products are provided with a plastic protective cap on the side of the system plug or the system socket. Additional connection accessories can be found in Chapter 13.
⚠ ATTENTION!	
	The BCL 300/ does not fulfill degree of protection IP 65 until the connection hood has been screwed on. Minimum tightening torque of the housing connecting screw of the connection hood is 1.4 Nm!

Location of the electrical connections

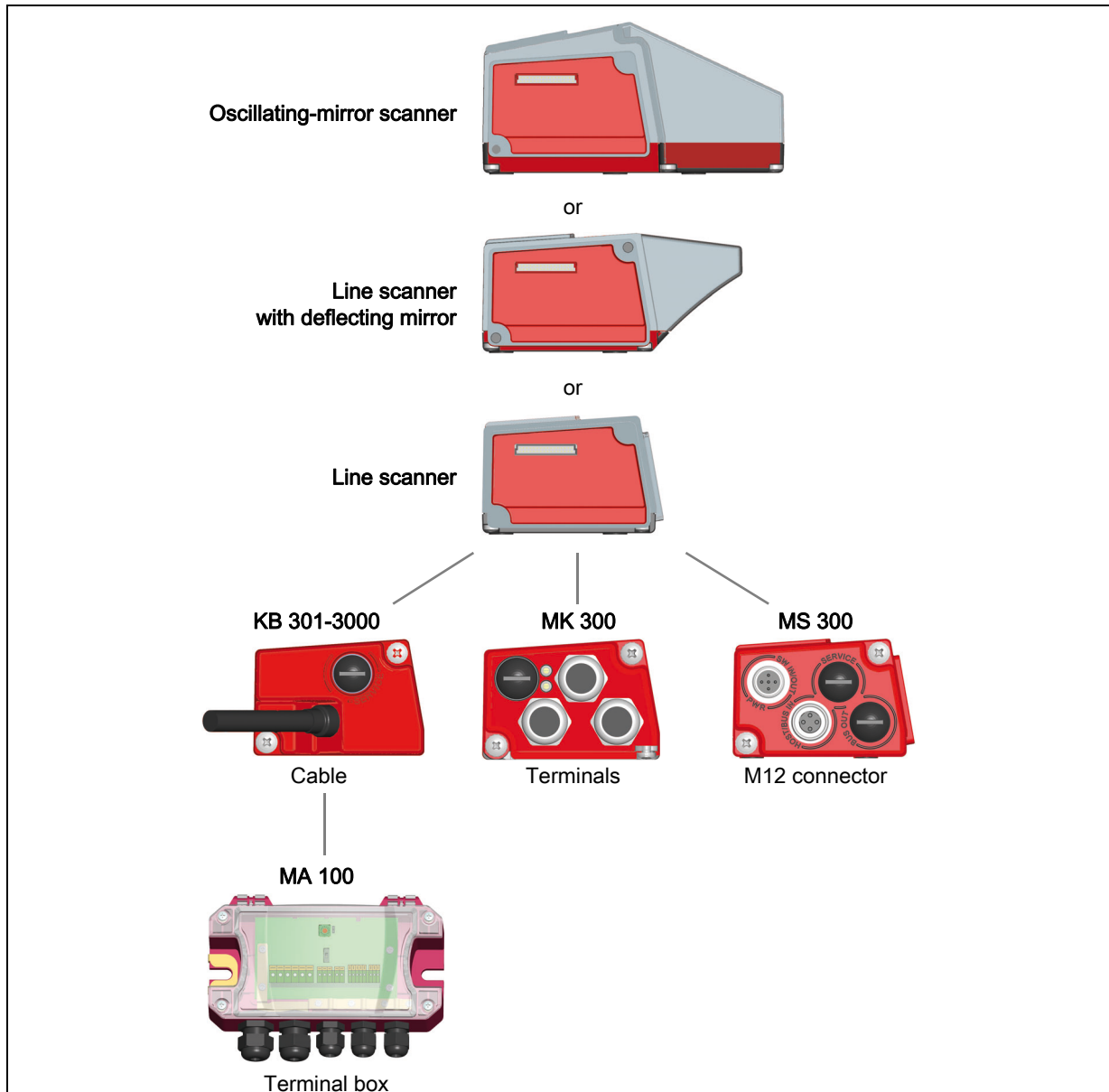


Figure 7.1: Location of the electrical connections

7.1 Safety notices for the electrical connection

⚠ ATTENTION!

Do not open the device yourself under any circumstances! There is otherwise a risk of uncontrolled emission of laser radiation from the device. The housing of the BCL 300/\ BCL 301/ contains no parts that need to be adjusted or maintained by the user.

Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.

Connection of the device and cleaning must only be carried out by a qualified electrician.

Ensure that the functional earth (FE) is connected correctly. Unimpaired operation is only guaranteed when the functional earth is connected properly.

If faults cannot be cleared, the device should be switched off and protected against accidental use.

⚠ ATTENTION!

For UL applications, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).



*The bar code readers of the BCL 300*i* series are designed in accordance with protection class III for supply by PELV (protective extra-low voltage with reliable disconnection).*

NOTE

Degree of protection IP 65 is not fulfilled until connectors or cable bushings are screwed on and caps are installed!

⚠ ATTENTION!

To ensure degree of protection IP 65 is fulfilled, the screws of the connection hood are tightened with a tightening torque of 1.4 Nm for connecting to the BCL.

7.2 BCL 300/-electrical connection

For the electrical connection of the BCL 300/-, 4 connection variants are available.
The **voltage supply** (18 ... 30VDC) is connected acc. to the connection type selected.
2 freely programmable switching inputs/outputs for individual adaptation to the respective application are also available here. Detailed information on this topic can be found in Chapter 7.4.1 and Chapter 7.4.3.

7.2.1 MS 300 connector hood with 2 integrated M12 connectors

The MS 300 hood with integrated connectors features two M12 connector plugs and a Mini-B type USB socket as a service interface. Parameter memory is integrated into the MS 300 which temporarily stores the settings of the BCL 300/- in the case of replacement and transmits them to a new device.

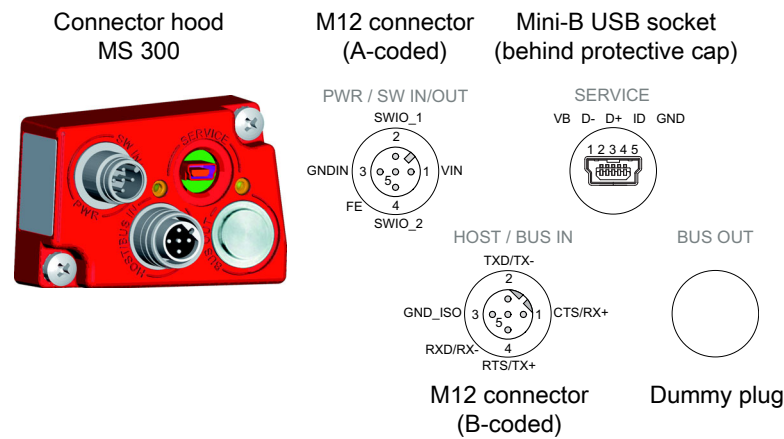





Figure 7.2: BCL 300/- MS 300 hood with integrated M12 connectors

NOTE	
	The shielding connection is done via the M12 connector housing.

NOTE	
	The integrated parameter memory for the simple replacement of the BCL 300/- is located in the MS 300.

NOTE	
	Dimensioned drawing on see chapter 5.3.6 "Dimensioned drawings of MS 3xx / MK 3xx connection hoods" on Page 42.

7.2.2 MK 300 terminal hood with spring-cage terminals

The MK 300 terminal hood makes it possible to connect the BCL 300/i directly and without additional connectors. The MK 300 features three cable lead-throughs in which the shielding connection for the interface cable is also located. The BCL 300/i is also to be configured when the MK 300 is in a closed state via a Mini-B type USB socket functioning as the service interface. Parameter memory is integrated into the MK 300 which temporarily stores the settings of the BCL 300/i in the case of replacement and transmits them to a new device.

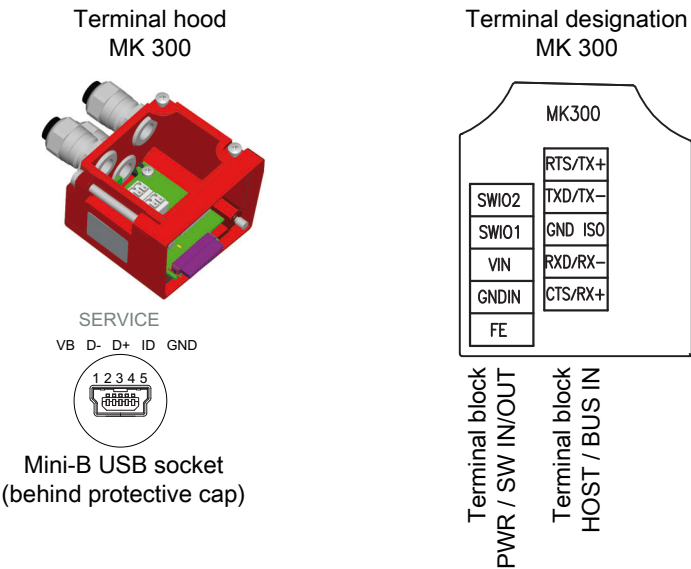



Figure 7.3: BCL 300/i - MK 300 terminal hood with spring-loaded terminals

NOTE	
	The integrated parameter memory for the simple replacement of the BCL 300/i is located in the MK 300.

Cable fabrication and shielding connection

Remove approx. 78 mm of the connection cable sheathing. 15 mm of sheath of the shielded line must be freely accessible.

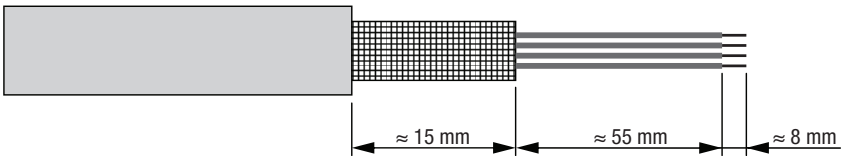



Figure 7.4: Cable fabrication for MK 300 terminal hood

The shield is automatically contacted when the cable is lead into the metal screw fitting and fastened when the cord grip is closed. Then lead the individual wires into the terminals according to the diagram. Wire end sleeves are not necessary.

NOTE	
	Dimensioned drawing on see chapter 5.3.6 "Dimensioned drawings of MS 3xx / MK 3xx connection hoods" on Page 42.

7.2.3 MA 100 terminal box and corresponding KB 301-3000 cable hood

The BCL 300/ is connected to the MA 100 external terminal box via the KB 301-3000 cable hood. If need be, this allows the connection of the BCL 300/ to be repositioned to a highly-accessible place. The USB service interface (Mini-B type socket) can be accessed through the KB 301-3000 cable hood.

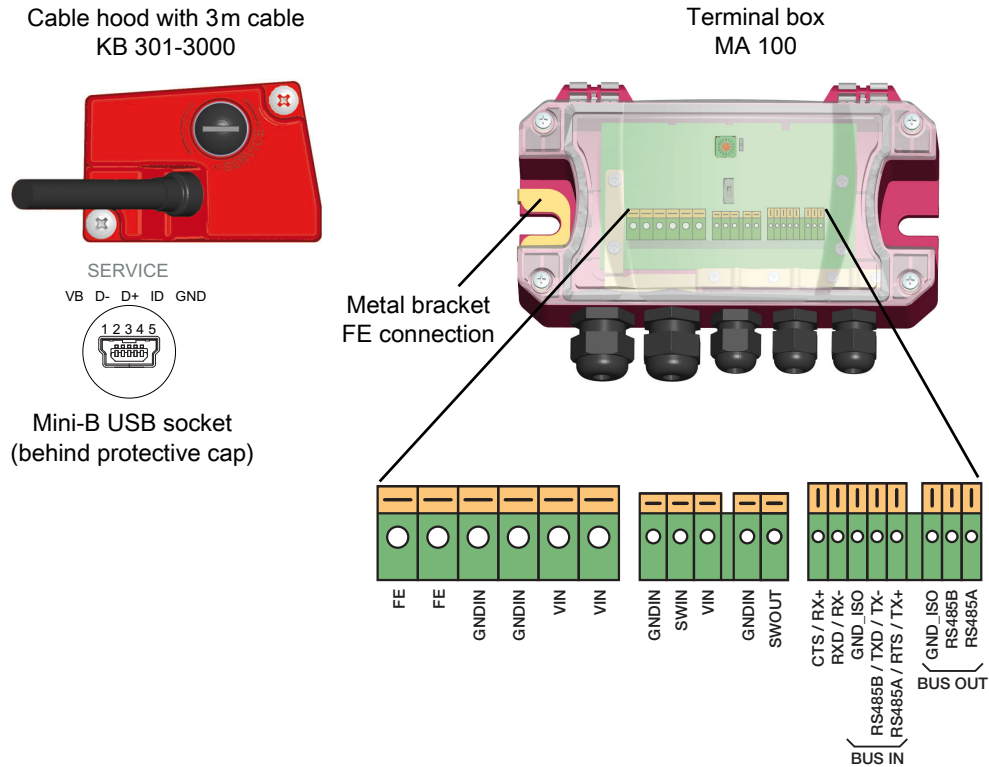




Figure 7.5: BCL 300/ - MA 100 terminal box with KB 301-3000 cable hood

NOTE	
	The left side of the housing of the MA 100 features a metal bracket for connecting functional earth FE to the installation surface (e.g. metallic equipment). The MA 100 contains a shielding terminal for the shielding connection of the KB 301-3000.
NOTE	
	Dimensioned drawing on see chapter 5.3.8 "Dimensioned drawing of MA 100 terminal box" on Page 45.

7.2.4 KB 301-3000 cable hood

With the KB 301-3000 cable hood, it is possible to directly connect the BCL 300/. To do this, remove both system plugs (JST) at the end of the cable. The length of the connection cable is 3m.

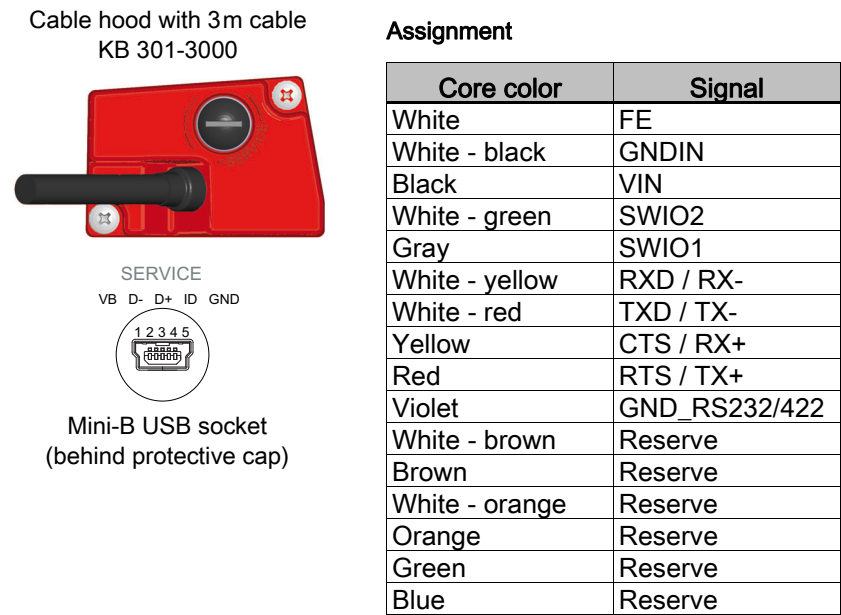


Figure 7.6: BCL 300/- KB 301-3000 cable hood

NOTE	
	A contact surface for the shielding connection is located on the cable end of the KB 301-3000.

NOTE	
	Dimensioned drawing on see chapter 5.3.7 "Dimensioned drawing of KB 301-3000 cable hood" on Page 44.

7.2.5 Stand-alone operation BCL 300/

During stand-alone operation of the BCL 300/, the host interface of the superior system is connected to HOST/BUS IN. Please make certain that the correct interface is used on the superior system. The standard setting of the BCL 300/for the host interface is RS 232.

7.3 BCL 301/- electrical connection

For the electrical connection of the BCL 301/-, 3 connection variants are available.

The **voltage supply** (18 ... 30VDC) is connected acc. to the connection type selected.

2 freely programmable switching inputs/outputs for individual adaptation to the respective application are also available here. Detailed information on this topic can be found in Chapter 7.4.1.

7.3.1 MS 301 connector hood with 3 integrated M12 connectors

The MS 301 hood with integrated connectors features three M12 connector plugs and a Mini-B type USB socket as a service interface. Parameter memory is integrated into the MS 301 which temporarily stores the settings of the BCL 301/- in the case of replacement and transmits them to a new device.

The address switch located in the MS 301 is used to set the multiNet address of the BCL 301/-. If the BCL 301/- is the last participant on the multiNet bus cable, the BUS OUT socket on the MS 301 must be fitted with a terminator plug (accessories).

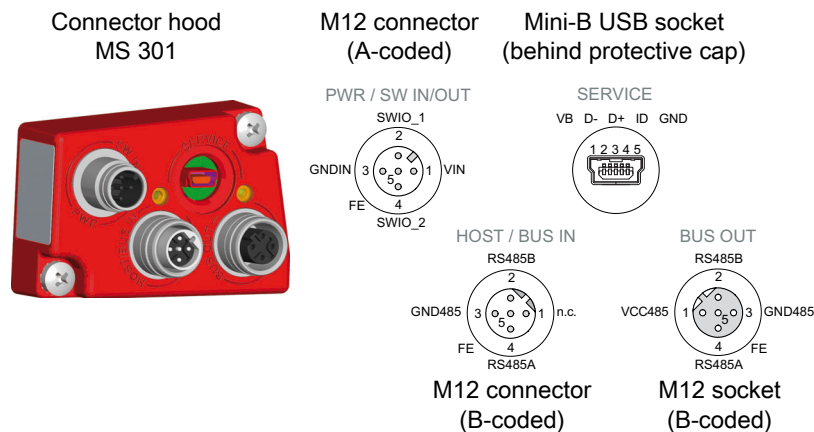






Figure 7.7: BCL 301/- MS 301 hood with integrated M12 connectors

NOTE	
	The shielding connection is done via the M12 connector housing.
NOTE	
	The integrated parameter memory for the simple replacement of the BCL 301/- is located in the MS 301.
NOTE	
	The bus is looped through the MS 301, i.e. the bus is not interrupted when the BCL 301/- is removed from the MS 301. The bus is terminated at BUS OUT via an external mounted terminating resistor (see chapter 13.5 "Accessory – Terminating resistor").
NOTE	
	Dimensioned drawing on see chapter 5.3.6 "Dimensioned drawings of MS 3xx / MK 3xx connection hoods" on Page 42.

7.3.2 MK 301 terminal hood with spring-cage terminals

The MK 301 terminal hood makes it possible to connect the BCL 301/- directly and without additional connectors. The MK 301 features three cable lead-throughs in which the shielding connection for the interface cable is also located. The BCL 301/- is also to be configured when the MK 301 is in a closed state via a Mini-B type USB socket functioning as the service interface. Parameter memory is integrated into the MK 301 which temporarily stores the settings of the BCL 301/- in the case of replacement and transmits them to a new device. Address setting as well as termination of the multiNet is done in the interior of the MK 301

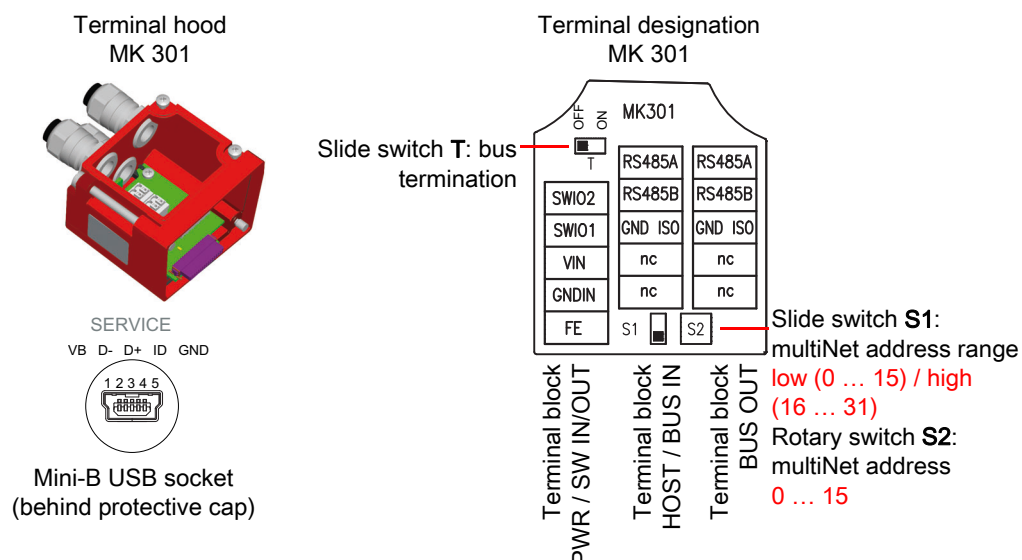


Figure 7.8: BCL 301/- MK 301 terminal hood with spring-loaded terminals

NOTE

The integrated parameter memory for the simple replacement of the BCL 301/- is located in the MK 301.

NOTE

The bus is looped through the MK 301, i.e. the bus is not interrupted when the BCL 301/- is removed from the MK 301. The bus is terminated via slide switch **T** in the MK 301. If the termination is activated (slide switch **T** in the **ON** position), the downstream bus is disconnected.

Cable fabrication and shielding connection

Remove approx. 78 mm of the connection cable sheathing. 15 mm of sheath of the shielded line must be freely accessible.

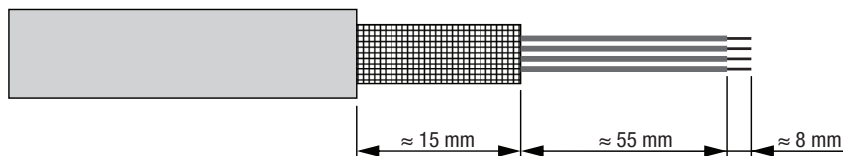


Figure 7.9: Cable fabrication for MK 301 terminal hood

The shield is automatically contacted when the cable is lead into the metal screw fitting and fastened when the cord grip is closed. Then lead the individual wires into the terminals according to the diagram. Wire end sleeves are not necessary.

NOTE

Dimensioned drawing on see chapter 5.3.6 "Dimensioned drawings of MS 3xx / MK 3xx connection hoods" on Page 42.

7.3.3 MA 100 terminal box and corresponding KB 301-3000 cable hood

The BCL 301/ is connected to the MA 100 external terminal box via the KB 301-3000 cable hood. If need be, this allows the connection of the BCL 301/ to be repositioned to a highly-accessible place. The USB service interface (Mini-B type socket) can be accessed through the KB 301-3000 cable hood.

The switches for setting the address and for multiNet termination are located in the terminal compartment of the MA 100.

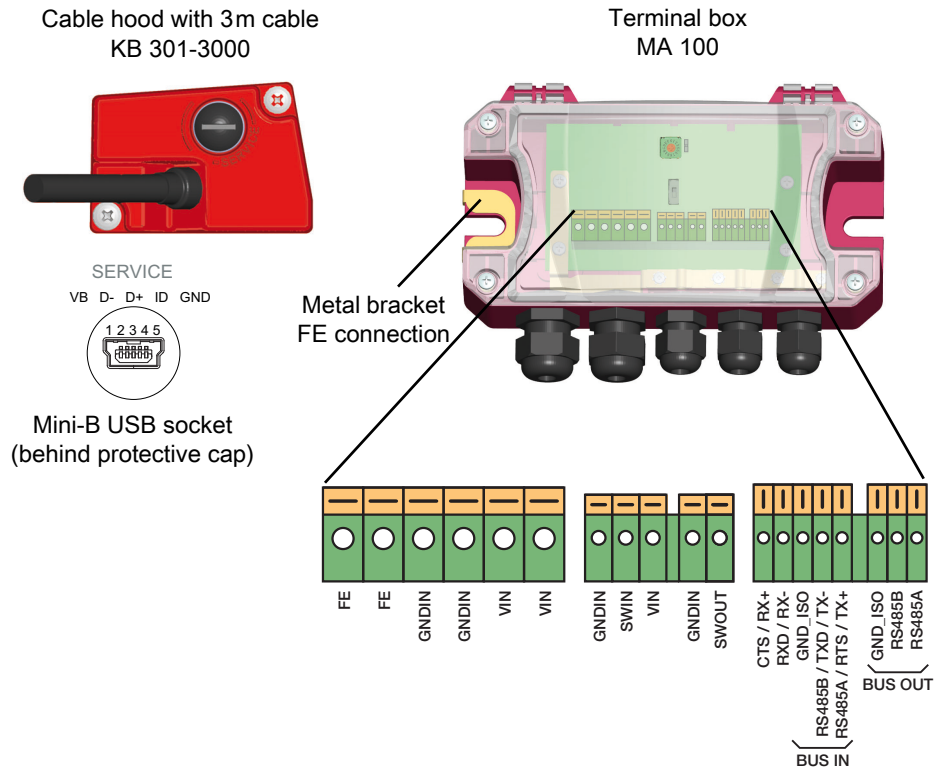






Figure 7.10: BCL 301/ - MA 100 terminal box with KB 301-3000 cable hood

NOTE	
	The left side of the housing of the MA 100 features a metal bracket for connecting functional earth FE to the installation surface (e.g. metallic equipment). The MA 100 contains a shielding terminal for the shielding connection of the KB 301-3000.
NOTE	
	The bus is looped through the MA 100, i.e. the bus is not interrupted when the BCL 301/ is removed from the KB 301-3000. The bus is terminated via slide switch T in the MA 100. If the termination is activated (slide switch T in the ON position), the downstream bus is disconnected.
NOTE	
	Dimensioned drawing on see chapter 5.3.8 "Dimensioned drawing of MA 100 terminal box" on Page 45.
NOTE	
	Due to the lack of the address switch, the KB 301-3000 cable hood connection variant is not possible on the BCL 301/ without the MA 100 terminal box, in contrast to the BCL 300/.

7.3.4 Network operation BCL 301/ in the Leuze multiNet plus

In Leuze multiNet plus network operation, the incoming bus is connected to **BUS IN** and the outgoing bus to **BUS OUT**. If the network address of the BCL 301/ is not 0, the device starts up in multiNet slave mode and attempts to make contact with a multiNet master. If **BUS OUT** is not used for the continuing connection to the next participant, **BUS OUT** must be terminated with a terminating resistor. For this reason, a termi-

nator plug is available for the MS 301 (see chapter 13.5 "Accessory – Terminating resistor"); in the MA 100 and the MK 301, termination is activated by a switch.

The device address is set in multiNet via the slide or rotary switch provided for this in the MA 100, MK 301 or MS 301.

7.4 Detailed description of the connections

Described in detail in the following are the individual connections and pin assignments.

7.4.1 PWR / SW IN/OUT - Voltage supply and switching input/output 1 and 2

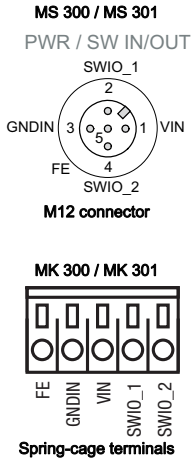

PWR / SW IN/OUT				
	Pin (M12)	Name (terminal)	Core color ¹⁾	Comment
	1	VIN	Black	Positive supply voltage +18 ... +30VDC
	2	SWIO_1	Gray	Configurable switching input/output 1
	3	GNDIN	White-black	Negative supply voltage 0VDC
	4	SWIO_2	White-green	Configurable switching input/output 2
	5	FE	White	Functional earth
	Thread	FE		Functional earth (housing)

Table 7.1: PWR / SW IN/OUT pin assignment

1) on the KB 301-3000

Supply voltage

⚠ ATTENTION!	
	For UL applications, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).



The bar code readers of the BCL 300/... series are designed in accordance with protection class III for supply by PELV (protective extra-low voltage with reliable disconnection).


Connecting the functional earth FE

☞ Ensure that the functional earth (FE) is connected correctly. Unimpaired operation is only guaranteed when the functional earth is connected properly. All electrical disturbances (EMC couplings) are discharged via the functional earth connection.

Switching input/output

The bar code readers of the BCL 300/series are equipped with two freely programmable, opto-decoupled switching inputs and outputs, **SWIO_1** and **SWIO_2**.

The switching inputs can be used to activate various internal functions of the BCL 300/\ BCL 301/ (decoding, autoConfig, ...). The switching outputs can be used to signal the state of the BCL 300/\ BCL 301/ and to implement external functions independent of the superior control.

NOTE	
	The respective function as input or output can be set with the aid of the webConfig configuration tool!

Described in the following is the external wiring for use as a switching input or output; the respective function assignments to the switching inputs/outputs can be found in Chapter 10.

Function as switching input

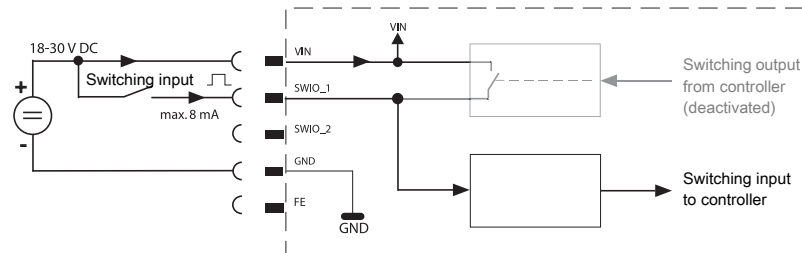


Figure 7.11: Switching input connection diagram SWIO_1 and SWIO_2

⚠ If you use a sensor with a standard M12 connector, please note the following:

- Pins 2 and 4 must not be operated as switching outputs if sensors which function as inputs are also connected to these pins.

If, for example, the inverted sensor output is connected to pin 2, and pin 2 of the bar code reader is, at the same time, configured as an output (and not as an input), the switching output malfunctions.

⚠ ATTENTION!	
⚠	The maximum input current must not exceed 8 mA!

Function as switching output

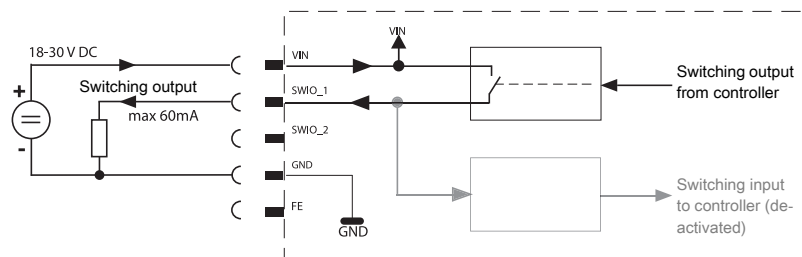


Figure 7.12: Switching output connection diagram SWIO_1 / SWIO_2

⚠ ATTENTION!	
⚠	Each configured switching output is short-circuit proof! Do not load the respective switching output of the BCL 300/\ BCL 301/ with more than 60mA at +18 ... +30VDC in normal operation!

NOTE	
i	<p>Both switching inputs/outputs SWIO_1 and SWIO_2 are configured by default in such a way that:</p> <ul style="list-style-type: none"> • Switching input SWIO_1 activates the reading gate. <p>Switching output SWIO_2 switches by default on "No Read".</p>

7.4.2 SERVICE – USB interface (Mini-B type)

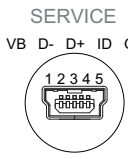

SERVICE – USB interface (Mini-B type)			
	Pin (USB Mini-B)	Name	Comment
	1	VB	Sense input
	2	D-	Data -
	3	D+	Data +
	4	ID	Not connected
	5	GND	Ground

Table 7.2: SERVICE pin assignment – Mini-B type USB interface

⚡ Ensure adequate shielding.

The entire interconnection cable must absolutely be shielded acc. to the USB specifications. Cable length must not exceed 3 m.

⚡ Use the Leuze specific **USB service cable** (see chapter 13 "Type overview and accessories") for the connection and use a service PC to configure.

NOTE	
	IP 65 is achieved only if the connectors and caps are screwed into place.

7.4.3 HOST / BUS IN for BCL 300/

The BCL 300/ makes either the RS 232 or RS 422 interface available as host interface. This is selected via the "webConfig" configuration software. The pin assignments change depending on the selected interface type, see Table 7.3 and Figure 7.13/Figure 7.14.

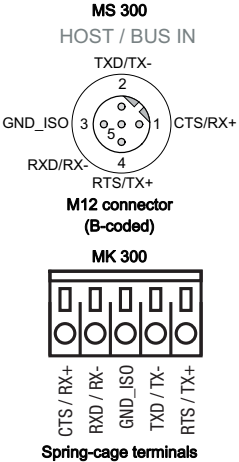
HOST / BUS IN (RS 232 / RS 422)				
	Pin (M12)	Name (terminal)	Core color ¹⁾	Comment
	1	CTS / RX+	Yellow	CTS signal (RS 232) / RX+ (RS 422)
	2	TXD / TX-	White-red	TXD signal (RS 232) / TX- (RS 422)
	3	GND_ISO	Violet	Reference potential 0V for RS 232
	4	RTS/TX+	Red	RTS signal (RS 232) / TX+ (RS 422)
	5	RXD/RX-	White-yellow	RXD signal (RS 232) / RX- (RS 422)
	FE via thread	FE via screw fitting		Functional earth (housing)

Table 7.3: Pin assignment HOST / BUS IN for BCL 300/

1) on the KB 301-3000

RS 232 interface

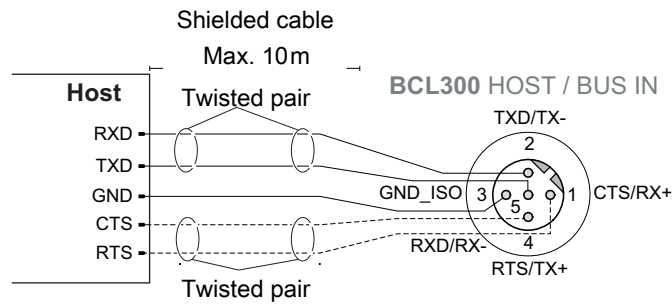


Figure 7.13: BCL 300/- Pin assignments - HOST / BUS IN as RS 232

NOTE

**Notice for connecting the RS 232 interface!**

Ensure adequate shielding. The entire interconnection cable must be shielded and earthed. Apply the shield on both sides.

The cables for RTS and CTS must only be connected if RTS/CTS hardware handshake is used.

RS 422 interface

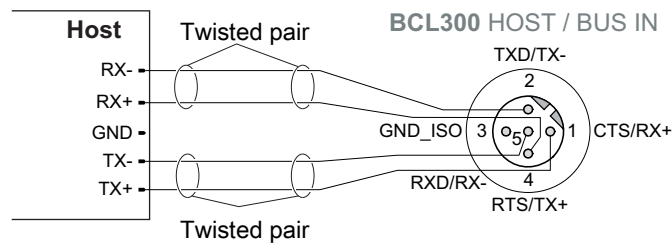


Figure 7.14: BCL 300/- Pin assignments - HOST / BUS IN as RS 422

NOTE

**Notice for connecting the RS 422 interface!**

Ensure adequate shielding. The entire interconnection cable must be shielded and earthed. The Rx+/Rx- and Tx+/Tx- wires must be stranded in pairs (Twisted Pair).

7.4.4 HOST / BUS IN for BCL 301/

The BCL 301/ makes available an RS 485 as HOST / BUS IN interface for the connection to the host system. This interface is looped through to the socket or the BUS OUT terminals to connect additional participants.

With its RS 485 interface, the BCL 301/ is suitable for use in the Leuze multiNet plus scanner network.

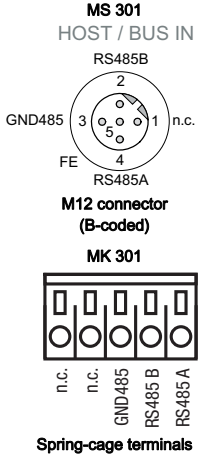
HOST / BUS IN RS 485 (5-pin connector, B-coded)			
	Pin (M12)	Name (terminal)	Comment
	1	n.c.	Not connected
	2	RS485 B	RS 485 B - signal line
	3	GND485	Reference ground RS 485 - potential equalization
	4	RS485 A	RS 485 A - signal line
	5	FE	Functional earth / shield
	FE via thread	FE via screw fitting	Functional earth (housing)

Table 7.4: Pin assignment HOST / BUS IN for BCL 301/

7.4.5 BUS OUT for the BCL 301/

The RS 485 interface on the BCL 301/ is looped through to the socket or the BUS OUT terminals to configure the Leuze multiNet plus network with additional participants.

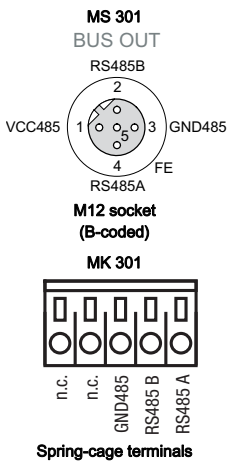

BUS OUT RS 485 (5-pin socket, B-coded)			
	Pin (M12)	Name (terminal)	Comment
	1	VCC485	+5 V DC for bus termination
	2	RS485 B	RS 485 B - signal line
	3	GND485	Reference ground RS 485 - potential equalization
	4	RS485 A	RS 485 A - signal line
	5	FE	Functional earth / shield
	FE via thread	FE via screw fitting	Functional earth (housing)

Table 7.5: Pin assignment BUS OUT for BCL 301/

NOTE




Ensure adequate shielding. The entire interconnection cable must be shielded and earthed. The signal lines must be stranded in pairs.

Termination of the RS 485 interface on the slave

On the last network device, the Leuze multiNet plus network (RS 485 interface) must be terminated via a terminating resistor network (see chapter 13 "Type overview and accessories") on the BUS OUT socket or via the activation of the termination via a slide switch in the MK 301 or the MA 100.

NOTE



The bus front on the bus master (MA 31 or BCL 500/) is automatically terminated.

7.5 Leuze multiNet plus

The Leuze multiNet plus is optimized for fast transmission of scanner data to a primary host computer. The multiNet plus consists physically of a two-wire RS 485 interface through which the multiNet plus software protocol is controlled.

This makes wiring the network easy and inexpensive as slaves are looped through to one another in parallel.

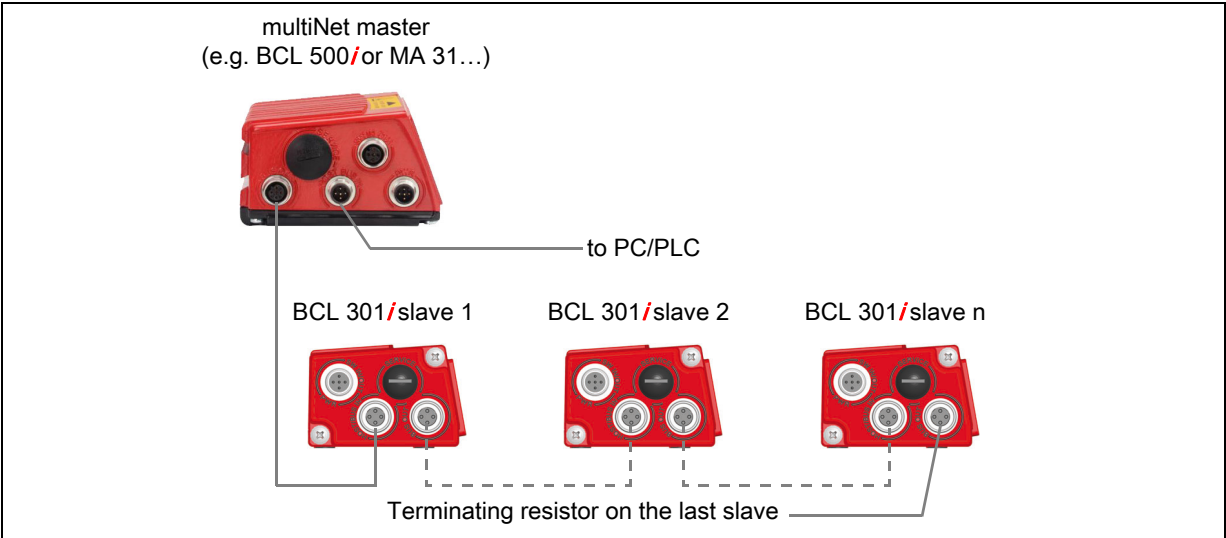


Figure 7.15: Leuze multiNet plus system topology

With the aid of a network master (e.g. BCL 500/), up to 31 bar code readers can be networked. For this purpose, the corresponding station address is assigned to every participating BCL 301/ via the address switch in the MS 301, MK 301 or MA 100. The devices are networked by connecting the individual RS 485 interfaces in parallel.

In the Leuze multiNet plus network, the individual network devices sequentially transfer their data to the network master when requested.

The master then transmits the data of all network devices via its host interface (either an RS 232 or RS 422) to a superior PLC control or to a computer, i.e. it "collects" the scanner data in the network and transmits it to an interface on the host computer. This reduces interface costs (CPs) and time spent programming the software.

7.5.1 Wiring the multiNet plus

Leuze multiNet plus connection hints

Shielded, twisted pair conductors should be used for the Leuze multiNet plus. This allows a total network length of up to 1200 m.

Recommended network cable (e.g. LiYCY 2x0.2mm²):

- Twisted pairs, shielded
- Cross section: min. 0.2mm²
- Copper resistance <100 Ω/km

⚡ When wiring the network, note the following points:

- The RS 485A and RS 485B cables are looped through in the network and must not in any case be misconnected; the Leuze multiNet plus network is otherwise not functional.
- Connect the shielding to the slaves on both sides with FE and loop it through.
- The maximum cable length in the network is 1200m.
- The termination is to be switched on at the last participant (MK 301/MA 100) or an external terminator plug is to be mounted (MS 301).

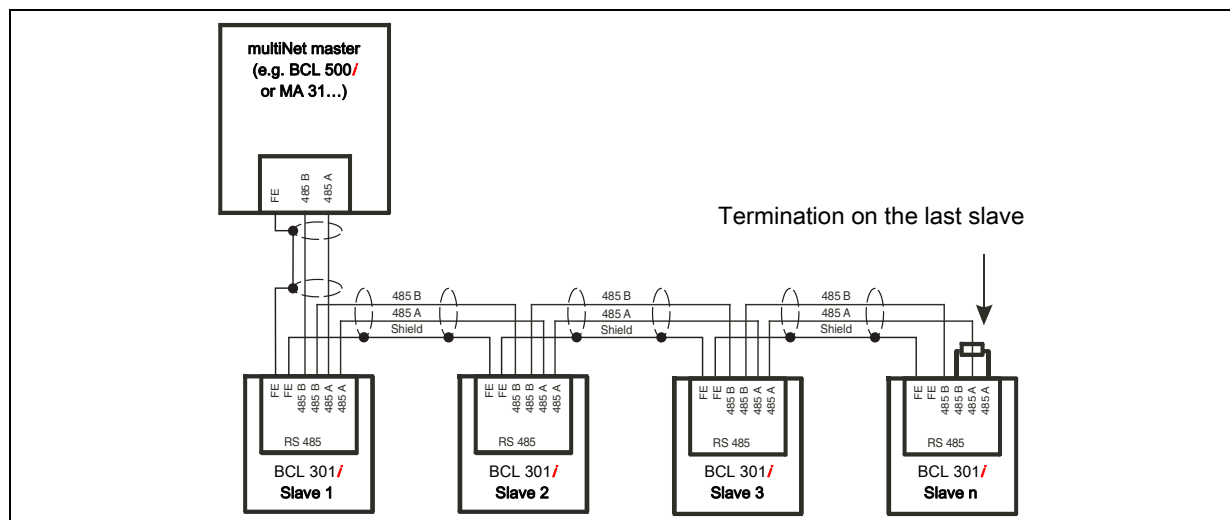


Figure 7.16: Leuze multiNet plus system topology

NOTE



Use the recommended connectors / sockets or the ready-made cables and terminating resistors (see chapter 13 "Type overview and accessories").

7.5.2 The BCL 301/*i* as network slave

The BCL 301/*i* bar code readers are specially designed for slave operation in a network. They transmit data to the multiNet master only after the master prompts it to do so and establish the continuing connection via the BUS OUT socket/terminal to the slaves which follow. Only a few parameters need to be set for slave operation (see chapter 10 "Commissioning and configuration"). Network commissioning can thus be performed in very little time.

The connection is performed as shown in Chapter 7.4.4 and Chapter 7.4.5.

Slave address

With the BCL 301/*i*, the network address, i.e. the corresponding station number of the slave, is set via the address switch in the MS 301, MK 301 or MA 100. The address which is set must be > 0 since the master always has address 0 (**Adr.00**).

Each network device with an address > 0 is thereby automatically informed that it is a slave in the Leuze multiNet plus with this address and that it is initialized and queried by the network master. No other settings are necessary for commissioning in the Leuze multiNet plus.

Other settings

The parameters necessary for the reading task, such as the code types to be read and the number of digits of the code, must be set. This is done with the help of the webConfig tool.

7.6 Cable lengths and shielding

🔗 Observe the following maximum cable lengths and shielding types:

Connection	Interface	Max. cable length	Shielding
BCL – service	USB	3m	Shielding absolutely necessary acc. to USB specifications
BCL – host	RS 232 RS 422 RS 485	10 m 1200 m 1200 m	Shielding absolutely required RS 422/485 conductors, stranded in pairs
Network from the first BCL to the last BCL	RS 485	1200 m	Shielding absolutely required RS 485 conductors, stranded in pairs
BCL – power supply unit		30m	Not necessary
Switching input		10 m	Not necessary
Switching output		10 m	Not necessary

Table 7.6: Cable lengths and shielding

8 Display elements and display

The BCL 300/\ BCL 301/ is available optionally with display, 2 control buttons and LEDs or with only 2 LEDs as display elements.

8.1 BCL 300/\ BCL 301/ LED indicators



Figure 8.1: BCL 300/\ BCL 301/- LED indicators

2 multicolor LEDs are used as the primary display instrument.

LED functions:

PWR LED



Off

Device OFF

- No supply voltage



Green, flashing

Device ok, initialization phase

- No bar code reading possible
- Voltage connected
- Self test runs for 0.25s after power up
- Initialization running



Green, continuous light

Device ok

- Bar code reading possible
- Self test successfully finished
- Device monitoring active



Green, briefly off - on

Good read, successful reading

- Bar code(s) successfully read



**Green, briefly off -
briefly red - on**

No read, reading not successful

- Bar code(s) not read



Orange, continuous light

Service mode

- Bar code reading possible
- Configuration via the USB service interface
- No data on the host interface



Red, flashing

Warning set

- Bar code reading possible
- Self test runs for 0.25s after power up
- Temporary operating fault

PWR



Red, continuous light

Device error

- No bar code reading possible

NET LED

NET



Off

No supply voltage,

- No communication possible

NET



Flashes green

Initialization

- Of interfaces (BCL 300/*stand-alone*)
- Of the network, slaves waiting for initialization by the master (BCL 301/*slave*)

NET



Green, continuous light

Operation ok

- Interfaces (BCL 300/*stand-alone*)
- Network, slaves were initialized by the master (BCL 301/*slave*)

NET



Flashes red

Communication error

- Network error after initialization by the master (BCL 301/*slave*)

NET



Red, continuous light

Network error

- Slave cannot transmit any more data to the master (BCL 301/*slave*)

8.2 BCL 300/\ BCL 301/ display



Figure 8.2: BCL 300/\ BCL 301/- Display

NOTE

The function of the LEDs is identical for the devices with and without display.

The optional display of the BCL 300/\ BCL 301/ has the following features:

- Monochromatic with background lighting (blue/white)
- Double line, 128 x 32 pixels
- Display language: English

The display is only used as a **display element**. Two buttons can control which values are displayed. In doing so, the upper line displays the selected function and the lower line displays the result.

The background lighting is activated by the push of any button and automatically deactivated after a defined point in time:

Display functions

The following functions can be displayed and activated:

- Reading result = result of reading process
- Decodequality = quality of decoding process
- BCL Info = device status/error code
- I/O Status = status of the inputs/outputs
- BCL Address = bus address of the BCL 301/
- Adjustmode = alignment mode
- Version = software and hardware version

After the voltage is switched off/on, the reading result is always displayed.

The display is controlled via the two control buttons:



ENTER

Activation/deactivation of the display change function








Down

Scroll through functions (downwards)

Example:

Representation of the BUS status on the display:

1. Press button  : Display flashes
2. Press button  : Display changes from read result to decoding quality
3. Press button  : Display changes from decoding quality to device status
4. Press button  : Display changes from device status to BUS status
5. Press button  : Bus status displayed, display stops flashing.

Description of the display functions

Reading result
88776655

- 1st line: **read result** display function
- 2nd line: code content of the bar code, e.g. **88776655**

Decoding quality
84

- 1st line: **decoding quality** display function
- 2nd line: decoding quality in percent, e.g. **84%**

BCL info
Error code 3201

- 1st line: **device status** display function
- 2nd line: error code, e.g. **Error code 3201**

I/O status
In = 0 Out = 1

- 1st line: input/output **status** display function
- 2nd line: state: 0 = inactive, 1 = active, e.g. **In=0, Out=1**

BCL address
25

- 1st line: **bus address** display function
- 2nd line: set address, e.g. **25**

Adjust mode
73

- 1st line: **alignment mode** display function
- 2nd line: decoding quality in percent, e.g. **73%**


Version
SW: xxxxx HW: xxx

- 1st line: **version** display function
- 2nd line: software and hardware version of the device

9 Leuze webConfig tool

With the **Leuze webConfig tool**, an operating-system independent, web-technology based, graphical user interface is available for configuring bar code readers of the BCL 300/i series.

Through the use of HTTP as communication protocol and by using only standard technologies on the client side (HTML, JavaScript and AJAX), which are supported by all commonly used, modern browsers (e.g. **Mozilla Firefox** beginning with Version 4.0 or **Internet Explorer** beginning with Version 8.0 or Microsoft **Edge**), it is possible to operate the **Leuze webConfig tool** on any internet-ready PC.

NOTE	
	<p>The webConfig tool is offered in 6 languages:</p> <ul style="list-style-type: none">• German• English• French• Italian• Spanish• Chinese

9.1 Connecting the SERVICE USB interface

The connection to the SERVICE USB interface of the BCL 300/i \ BCL 301/i is established via the PC-side USB interface using a standard USB cable with 1 type A connector and a Mini-B connector.

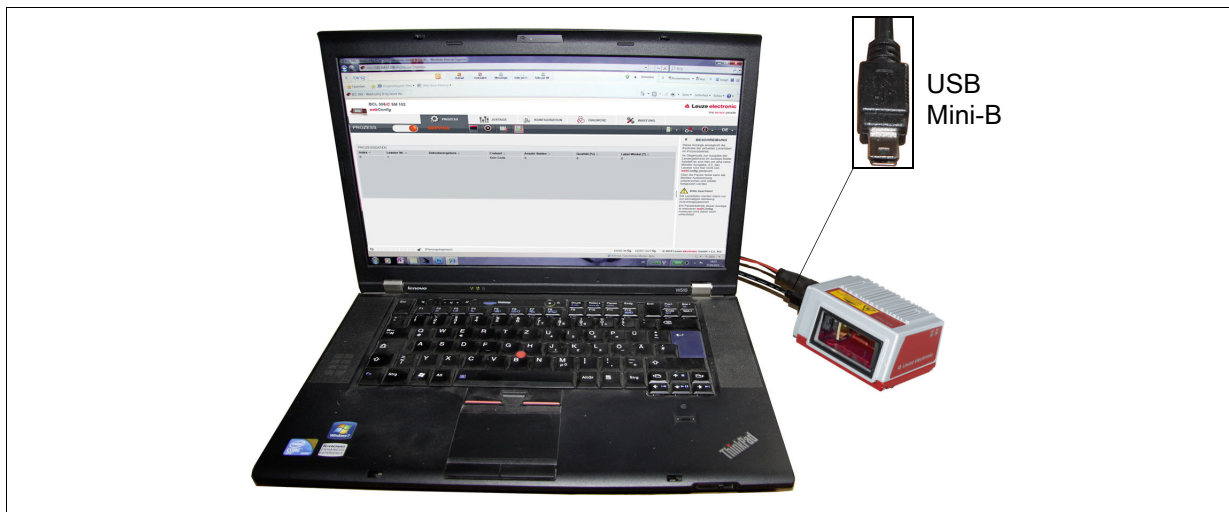


Figure 9.1: Connecting the SERVICE USB interface

9.2 Installing the required software

9.2.1 System requirements

Operating system:	Windows 2000 Windows XP (Home Edition, Professional) Windows Vista Windows 7 Windows 8/8.1 Windows 10
Computer:	PC with USB interface version 1.1 or higher
Graphics card:	Min. 1024 x 768 pixels or higher resolution
Required hard drive capacity:	Approx. 10MB

NOTE



It is recommended to update the operating system and the browser regularly and to install the current Windows service packs.

9.2.2 Installing the USB driver

NOTE



If you have already installed a USB driver for a BCL 5xx*i* on your computer, you don't have to install the USB driver for the BCL 300/*i* \ BCL 301/*i*. In this case, you can also start the webConfig tool of the BCL 300/*i* \ BCL 301/*i* by double-clicking on the BCL 5xx*i* icon.

In order for the BCL 300/*i* \ BCL 301/*i* to be automatically detected by the connected PC, the **USB driver** must be installed **once** on your PC. To do this, you must have **administrator privileges**.

Please proceed according to the following steps:

- ↳ Start your PC with administrator privileges and log on.
- ↳ Load the CD included in the delivery contents of your BCL 300/*i* \ BCL 301/*i* in the CD drive and start the setup.exe program.
- ↳ Alternatively, you can also download the setup program from the internet at www.leuze.com.
- ↳ Follow the instructions provided by the setup program.


Upon successful installation of the USB driver, an icon  with the name **Leuze Web Config** automatically appears on the desktop.

NOTE



If the installation failed, contact your network administrator: The settings of the firewall used may need to be adjusted.

9.3 Starting the webConfig tool

To start the **webConfig tool**, click the icon  with the name **Leuze Web Config** located on the desktop. Make certain that the BCL 300/*i* \ BCL 301/*i* is connected to the PC via the USB interface and that voltage is connected.

NOTE



If you have already installed a USB driver for a BCL 5xx*i* on your computer, you can also start the webConfig tool of the BCL 300/*i* \ BCL 301/*i* by double-clicking on the BCL 5xx*i* icon.

Alternatively, you can start the webConfig tool by starting the browser installed on your PC and entering the following IP address: **192.168.61.100**

This is the default Leuze service address for communication with bar code readers of the BCL 300/ and BCL 500/ series.

In both cases, the following start page appears on your PC.

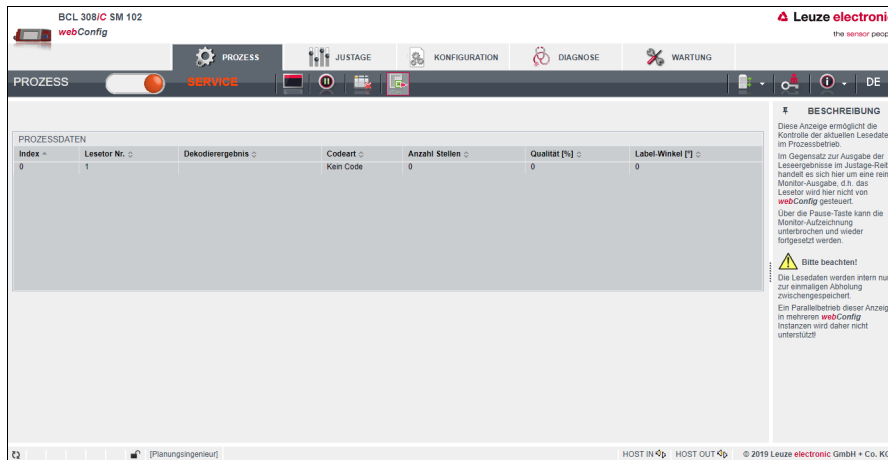



Figure 9.2: The start page of the webConfig tool

NOTE	
	<p>The webConfig tool is completely contained in the firmware of the BCL 300/ \ BCL 301/. Depending on firmware version, the start page may vary from that shown above.</p>

The individual parameters are – where useful – graphically displayed in order to better illustrate the meaning of the what are often perceived as abstract parameters.

The result is an easy-to-use and practically-oriented user interface!

9.4 Short description of the webConfig tool

The webConfig tool has 5 main menus:

- Process
with read information of the host interface of the connected BCL 300/ \ BCL 301/.
- Alignment
for manually starting read processes and for aligning the bar code reader. The results of the read processes are displayed immediately. As a result, this menu item can be used to determine the optimum installation location.
- Configuration
for adjusting decoding, for data formatting and output, switching inputs/outputs, communication parameters and interfaces, etc. ...
- Diagnostics
for event logging of warnings and errors
- Maintenance
for updating the firmware.

The user interface of the webConfig tool is largely self-explanatory.

9.4.1 Module overview in the Configuration menu

The adjustable parameters of the BCL 300/\ BCL 301/ are clustered in modules in the Configuration menu.

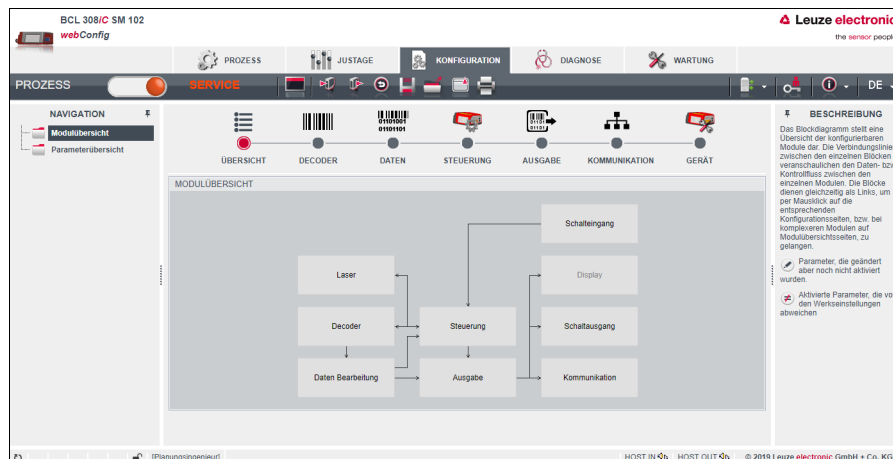


Figure 9.3: Module overview in the webConfig tool

NOTE



The webConfig tool is completely contained in the firmware of the BCL 300/\ BCL 301/. Depending on firmware version, the module overview may vary from that shown above.

The individual modules and their relationships to one another are graphically displayed in the module overview. The display is context sensitive, i.e. click a module to directly access the corresponding submenu.

Overview of the configurable modules

- Device:
Configuration of the **switching inputs and outputs**
- Decoder:
Configuration of the decoder table, such as **code type**, **number of digits**, etc.
- Control:
Configuration of **activation** and **deactivation**, e.g. **auto-activation**, **AutoReflAct**, etc.
- Data:
Configuration of **code content**, such as **filtering**, **segmentation of bar code data**, etc.
- Output:
Configuration of **data output**, **header**, **trailer**, **reference code**, etc.
- Communication:
Configuration of the **host interface** and the **service interface**
- Oscillating mirror:
Configuration of the **oscillating mirror settings**

NOTE



On the right side of the user interface of the webConfig tool, you will find a description of the individual modules and functions as a help text in the **Information** area.

During commissioning of the BCL 300/\ BCL 301/, it is recommended that the individual modules be configured in the order presented above. Further information on commissioning can be found in chapter "Commissioning and configuration" on page 90.

10 Commissioning and configuration





ATTENTION LASER!



Observe the safety notices in Chapter 2!

This chapter describes basic configuration steps which you can carry out via the webConfig tool.

Via the webConfig tool

The most convenient way to configure the BCL 300/ BCL 301/ is via the webConfig tool. To use the webConfig tool, you need to establish a USB connection between the BCL 300/ BCL 301/ and a PC/laptop.

NOTE



Notes on the use of the webConfig tool can be found in Chapter 9 "Leuze webConfig tool" on page 86.

10.1 BCL 300*i*

10.1.1 Measures to be performed prior to the initial commissioning

- ✚ Before commissioning, familiarize yourself with the operation and configuration of the BCL 300*i*.
- ✚ Before connecting the supply voltage, recheck all connections and ensure that they have been properly made.

The description of the electrical connections can be found in Chapter 7.

10.1.2 Starting the device

- ✚ Connect the 18 ... 30VDC supply voltage

The BCL 300*i* sends an 'S' to the interface as a start-up message and to announce that the device is ready.

The BCL 300*i* works in the standard setting (factory setting) as described below:

- Activation of the reading gate via SWIO_1, the scanning beam becomes visible
- If a bar code is detected, it is output via the RS 232 interface according to the following protocol:
`<STX><code data><CRT><LF>`
 (9600 Baud, 8 data bits, no parity, 1 stop bit)
- If the BCL 300*i* is equipped with a display, the read bar code content appears on this display.

NOTE



The BCL 300*i* can decode the following code types in the standard setting:

- **Code 128** Number of digits 4 ... 63
- **2/5 Interleaved** Number of digits 10
- **Code 39** Number of digits 4 ... 30
- **EAN 8 / 13** Number of digits 8 and 13
- **UPC** Number of digits 8
- **Codabar** Number of digits 4 ... 63
- **Code 93** Number of digits 4 ... 63
- **Code GS1 Data Bar OMNIDIRECTIONAL**
- **Code GS1 Data Bar LIMITED**
- **Code GS1 Data Bar EXPANDED**

Deviations from these settings must be set via the webConfig tool. See "Leuze webConfig tool" on page 86.

10.2 BCL 301/- multiNet plus Slave

10.2.1 Measures to be performed prior to the initial commissioning

- ✚ Before commissioning, familiarize yourself with the operation and configuration of the BCL 301/.
- ✚ Before connecting the supply voltage, recheck all connections and ensure that they have been properly made.

The description of the electrical connections can be found in Chapter 7.

10.2.2 Starting the device

- ✚ Via the address switch, activate the address assigned to the BCL 301/ in Leuze multiNet
- ✚ Connect the 18 ... 30VDC supply voltage

The BCL 301/ registers itself automatically in Leuze multiNet, then the LED **NET** lights up green. The BCL 301/ sends an 'S' via the interface to the master as a start-up message and to inform that the device is ready.

The BCL 301/ works in the standard setting (multiNet mode, factory setting) as described below:

- Activation of the reading gate via SWIO_1, the scanning beam becomes visible
- If a bar code is detected, it is sent to the master via Leuze multiNet.
- If the BCL 301/ is equipped with a display, the read bar code content appears on this display.

NOTE



The BCL 301/ can decode the following code types in the standard setting:

- **Code 128** Number of digits 4 ... 63
- **2/5 Interleaved** Number of digits 10
- **Code 39** Number of digits 4 ... 30
- **EAN 8 / 13** Number of digits 8 and 13
- **UPC** Number of digits 8
- **Codabar** Number of digits 4 ... 63
- **Code 93** Number of digits 4 ... 63
- **Code GS1 Data Bar OMNIDIRECTIONAL**
- **Code GS1 Data Bar LIMITED**
- **Code GS1 Data Bar EXPANDED**

Deviations from these settings must be set via the webConfig tool. See "Leuze webConfig tool" on page 86.

NOTE



Permissible values for the network address in the Leuze multiNet plus are 1 ... 31. Make certain that a different address is assigned to each multiNet plus participant.

From the device address > 0 set, the BCL 301/ detects that networking is required. It automatically switches to the Leuze multiNet plus network and waits for initialization by the master.

10.3 Additional settings for the BCL 300/ and the BCL 301/

After the basic configuration of the operating mode and the communication parameters, you need to carry out further settings via the webConfig tool:

- Decoding and processing the read data
- Control of the decoding
- Control of the switching outputs

10.3.1 Decoding and processing the read data

The BCL 300/ \ BCL 301/ offers the following options:

- Setting the number of labels to be decoded for each reading gate (0 ... 64). This is done via the Max. no. of labels parameter.
- Definition of up to 8 different code types. Labels that match one of the defined code types are decoded. Further parameters can be set for each code type:
 - The code type (symbology)
 - The Number of digits: either up to 5 different numbers of digits (e.g., 10, 12, 16, 20, 24), or a range (Interval mode) and up to three additional numbers of digits (e.g., 2 ... 10, 12, 16, 26)
 - The Reading reliability: the set value specifies how many times a label must be read and decoded with the same result before the result is accepted as valid.
 - Additional code type specific settings (in the webConfig tool only)
 - Check digit method used for decoding as well as the type of check digit transmission for the output of the read result. The two possibilities for the latter are Standard (corresponds to the standard for the selected code type/symbology) and not Standard.

👉 Define at least one code type with the desired settings.

- Via webConfig:
Configuration -> Decoder

Data processing via the webConfig tool

In the Data and Output submenus of the Configuration main menu, the webConfig tool provides extensive data processing options to adapt the functionality of the BCL 300/ \ BCL 301/ to the specific reading task:

- Data filtering and segmentation in the Data submenu:
 - Data filtering according to characteristics for handling identical bar code information
 - Data segmentation for differentiating between identifier and content of the read data
 - Data filtering according to content and/or identifier in order to suppress the output of bar codes with specific content/identifiers
 - Completeness inspection of the read data
- Sorting and formatting the output data in the Output submenu:
 - Configuration of up to 3 different sorting criteria. Sorting by physical data and content of the read bar codes.
 - Formatting of the data output for the HOST.
 - Formatting of the data output for the display.

10.3.2 Control of the decoding

In general, decoding is controlled via one or more of the configurable switching inputs/outputs. For this purpose, the respective connection to the SW IN/OUT and POWER interfaces must be configured as a switching input.

Via a switching input, you can:

- Start decoding
- Stop decoding
- Start decoding and then stop decoding after a configurable time period
- Read a reference code
- Start the automatic code type configuration (AutoConfig)

✚ Connect the required control devices (photoelectric sensor, proximity switch, etc.) as described in Chapter 7 to the BCL 300/**/** BCL 301**/**.

✚ Configure the connected switching inputs according to your requirements. To do this, first set the *I/O mode* to *Input* and then configure the switching behavior:

- Via webConfig:
Configuration > Device > Switching inputs/outputs

NOTE



Alternatively, one can also activate decoding via the online command '+' and deactivate it via the online command '-'. Further information on the online commands can be found in Chapter 11.

Advanced decoder control via the webConfig tool

The webConfig tool provides advanced functions, in particular for deactivating decoding. These may be accessed via the Control submenu of the Configuration main menu. You can:

- Activate decoding automatically (delayed)
- Stop decoding after a maximum reading gate time
- Stop decoding via the completeness mode, if:
 - The maximum number of bar codes to be decoded has been decoded
 - A positive reference code comparison has taken place.

10.3.3 Control of the switching outputs

By using the switching inputs/outputs of the BCL 300/**/** BCL 301**/**, external event-controlled functions can be implemented without assistance from the superior process control. For this purpose, the respective connection at the SW IN/OUT and POWER interfaces must be configured as a switching output.

A switching output can be activated:

- At the start/end of the reading gate
- Depending on the read result:
 - Reference code comparison positive/negative
 - Read result valid/invalid
- Depending on the state of the device:
 - Ready/not ready
 - Data transmission active/not active
 - Active/standby
 - Error/no error
- etc.

✚ As described in Chapter 7 of the manual, connect the required switching outputs.

✚ Configure the connected switching outputs according to your requirements. To do this, first set the *I/O mode* to *Output* and then configure the switching behavior:

- Via webConfig:
Configuration > Device > Switching inputs/outputs

10.4 Transmitting configuration data

Instead of going through the tedious task of configuring every parameter of the BCL 300/\ BCL 301/ individually, you can also conveniently transfer configuration data.

Configuration data can be transferred between two bar code readers BCL 300/\ BCL 301/ as follows

- Storage in a file and transfer using the webConfig tool

10.4.1 Via the webConfig tool

With the webConfig tool, you can store entire configurations of the BCL 300/\ BCL 301/ on data carriers and transfer them from these to the BCL 300/\ BCL 301/.

This storage of configuration data is especially useful if you want to store basic configurations which will require only minor changes.

In the webConfig tool, you store the configuration data via the buttons in the upper part of the middle window of all submenus of the Configuration main menu.

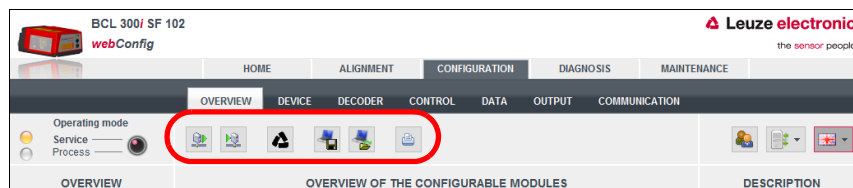


Figure 10.1: Storing configuration data in the webConfig tool

10.4.2 Replacing a defective BCL 300/\ BCL 301/

The MS 300/MS 301 hoods with integrated connectors and the MK 300/MK 301 terminal hoods feature an integrated parameter memory in which the configuration data is saved as a backup. If a defective BCL 300/\ BCL 301/ has to be replaced, proceed as follows:

- Disconnect the defective BCL 300/\ BCL 301/ from the voltage supply.
- Dismount the defective BCL 300/\ BCL 301/ and disconnect it from the hoods with integrated connectors/terminal hoods.
- Connect the new BCL 300/\ BCL 301/ to the connection hood and remount the unit.
- Recommission the new BCL 300/\ BCL 301/ (reconnect the voltage supply).

The configuration is now imported from the external parameter memory of the connection hood and the BCL 300/\ BCL 301/ is immediately operational without any further configuration.

11 Online commands

11.1 Overview of commands and parameters

Online commands can be used to send commands directly to the device for control and configuration. For this purpose, the BCL 300/i \ BCL 301/i must be connected to a host or service computer via the interface. The commands described can be sent either via the host or the service interface.

Online commands

With the commands, you can:

- control/decode.
- read/write/copy parameters.
- carry out an automatic configuration.
- teach-in/set reference codes.
- call up error messages.
- call up statistical device information.
- carry out a software reset in order to reinitialize the device.

Syntax

Online commands consist of one or two ASCII characters followed by command parameters.

No separation characters may be entered between the command and the command parameter(s). Both small and capitalized letters can be used.

Example:

Command '**CA**': autoConfig function

Parameter '+': Activation

Transmitted is: '**CA+**'

Notation

Commands, command parameters and returned data are enclosed between single quotation marks ' ' in the text of this manual.

Most online commands are acknowledged by the BCL 300/i \ BCL 301/i and any requested data returned. For commands that are not acknowledged, command execution can be observed or monitored directly on the device.

11.1.1 General online commands

Software version number

Command	'v'
Description	Requests device version information
Parameter	No
Acknowledgment	'BCL 300i SM 100 V 1.3.8 2008-02-15' The first line contains the device type of the BCL 300/i \ BCL 301/i, followed by the device version number and version date. (The data which is actually displayed may vary from the values given here.)

NOTE



This command returns the major release number of the software packet. This major release number also appears on the display during start-up. This command can be used to check whether the connected host or service computer is properly connected and configured. If you do not receive an acknowledgment, please check interface connections, protocol and service switches.

Software reset

Command	'H'
Description	Carries out a software reset. The device is restarted and reinitialized, leaving it in the same state as when the supply voltage is switched on.
Parameter	No
Acknowledgment	'S' (start signal)

Code recognition

Command	'CC'
Description	Detects an unknown bar code and outputs number of digits, code type, and code information to the interface, without storing the bar code in the parameter memory.
Parameter	No
Acknowledgment	<p>'xx yy zzzzzz'</p> <p>xx: Code type of the read code</p> <p>'01' 2/5 Interleaved</p> <p>'02' Code 39</p> <p>'03' Code 32</p> <p>'06' UPC (A, E)</p> <p>'07' EAN</p> <p>'08' Code 128, EAN 128</p> <p>'10' EAN Addendum</p> <p>'11' Codabar</p> <p>'12' Code 93</p> <p>'13' GS1 DataBar OMNIDIRECTIONAL</p> <p>'14' GS1 DataBar LIMITED</p> <p>'15' GS1 DataBar EXPANDED</p> <p>yy: Number of digits of the read code</p> <p>zzzzzz: Contents of the decoded label. A – appears if the label was not correctly read.</p>

autoConfig

Command	'CA'
Description	Activates or deactivates the 'autoConfig' function. Certain label reading parameters are programmed automatically in the setup by the labels which the BCL 300/\ BCL 301/ reads while the 'autoConfig' function is active.
Parameter	'+' Activates 'autoConfig' '/' Rejects the last code read '-' Deactivates 'autoConfig' and stores the decoded data in the current parameter set
Acknowledgment	'CSx' x Status '0' Valid 'CA' command '1' Invalid command '2' autoConfig could not be activated '3' autoConfig could not be deactivated '4' Result could not be deleted
Description	'xx yy zzzzzz' xx Number of digits of the read code yy Code type of the read code '01' 2/5 Interleaved '02' Code 39 '03' Code 32 '06' UPC (A, E) '07' EAN '08' Code 128, EAN 128 '10' EAN Addendum '11' Codabar '12' Code 93 '13' GS1 DataBar OMNIDIRECTIONAL '14' GS1 DataBar LIMITED '15' GS1 DataBar EXPANDED zzzzzz: Contents of the decoded label. A – appears if the label was not correctly read.

Alignment mode

Command	'JP'
Description	<p>This command simplifies mounting and alignment of the BCL 300// BCL 301//. After activating the function with 'JP+', the BCL 300// BCL 301// continuously supplies status information to the serial interfaces.</p> <p>With this online command, the scanner is set to terminate the decoding after 100 successfully decoded labels and output the status information. Subsequently, the read process is reactivated automatically.</p> <p>In addition to the output of the status information, the laser beam is used to display the reading quality. Depending on how many read results could be extracted, the duration of the laser's "OFF" time increases.</p> <p>If the reading quality is high, the laser beam flashes in brief, regular intervals. The worse the decoder decodes, the longer the pauses become during which the laser is switched off. The flashing intervals become more and more irregular because the laser may, in total, be active for longer to extract more labels. The duration of the pauses has been stepped in such a way that they can be distinguished by the eye.</p>
Parameter	<p>'+' : Starts the alignment mode.</p> <p>'-' : Ends the alignment mode.</p>
Acknowledgment	<p>'yyy_zzzzzz'</p> <p>yyy: Reading quality in %. A high process availability is ensured at read qualities > 75 %.</p> <p>zzzzzz: Bar code information.</p>

Manual definition of the reference code

Command	'RS'
Description	This command can be used to define a new reference code in the BCL 300/\ BCL 301/ by means of direct input via the serial interface. The data is saved in the parameter set according to your input under reference code 1 through 2 and stored in the working buffer for direct further processing.
Parameter	'RSyvxzzzzzzz' y, v, x and z are placeholders (variables) for the actual input. y Defined reference code no. '1' (Code 1) '2' (Code 2) v Storage location for reference code: '0' RAM+EEPROM, '3' RAM only xx Defined code type (see command 'CA') z Defined code information (1 ... 63 characters)
Acknowledgment	'RSx' x Status '0' Valid 'Rx' command '1' Invalid command '2' Insufficient memory for reference code '3' Reference code has not been saved '4' Reference code invalid
Example	Entry = 'RS130678654331' (Code 1 (1), RAM only (3), UPC (06), code information)

Reference code teach-in

Command	'RT'
Description	This command enables a reference code to be defined quickly by reading an example label.
Parameter	'RTy' y Function '1' Defines reference code 1 '2' Defines reference code 2 '+' Activates the definition of reference code 1 up to the value of Parameter no_of_labels '-' Ends the teach event
Acknowledgment	The BCL 300/\ BCL 301/ first responds with the command 'RS' and corresponding status (see command 'RS'). After a bar code has been read, it sends the result in the following format: 'RCyvxzzzzzz' y, v, x and z are placeholders (variables) for the actual input. y Defined reference code no. '1' (Code 1) '2' (Code 2) v Storage location for reference code '0' RAM+EEPROM, '3' RAM only xx Defined code type (see command 'CA') z Defined code information (1 ... 63 characters)

NOTE



With this function, only code types are recognized that are identified using the 'autoConfig' function or which were set in the set-up.

✎ After each reading via an 'RTy' command, explicitly switch off the function again since failure to do so will interfere with other commands as well as prevent execution of a new 'RTx' command.

Reading a reference code

Command	'RR'
Description	The command reads out the reference code defined in the BCL 300/ / BCL 301/ / . If no parameters are specified, all defined codes are output.
Parameter	<Reference code number> '1' ... '2' value range of reference codes 1 to 2
Acknowledgment	<p>If no reference codes are defined, the BCL 300// BCL 301// responds with the 'RS' command and corresponding status (see command RS). For valid codes, the output corresponds to the following format:</p> <p>RCyvxzzzzzz</p> <p>y, v, x and z are placeholders (variables) for the actual input.</p> <p>y Defined reference code no.</p> <p>'1' (Code 1)</p> <p>'2' (Code 2)</p> <p>v Storage location for reference code</p> <p>'0' RAM+EEPROM,</p> <p>'3' RAM only</p> <p>xx Defined code type (see command 'CA')</p> <p>z Defined code information (1 ... 63 characters)</p>

11.1.2 Online commands for system control

Activating sensor input

Command	'+'
Description	The command activates decoding. This command is used to activate the reading gate. It remains active until it is deactivated by one of the following criteria: <ul style="list-style-type: none"> • Deactivation by a manual command • Deactivation by a switching input • Deactivation upon reaching the specified read quality (equal scans) • Deactivation by timeout • Deactivation upon reaching a preset number of scans without information.
Parameter	No
Acknowledgment	None

Deactivating sensor input

Command	'-'
Description	The command activates decoding. This command can be used to deactivate the reading gate. Following deactivation, the read result is output. Because the reading gate was manually deactivated and, thus, no GoodRead criterion was met, a NoRead is output.
Parameter	No
Acknowledgment	None

11.1.3 Online commands for configuring the switching inputs/outputs

Activate switching output

Command	'OA'
Description	The switching outputs 1 and 2 can be activated with this command. The respective port must have been configured as a switching output. The logic state is output, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0V at the switching output).
Parameter	'OA<a> <a> Selected switching output [1, 2], unit (dimensionless)
Acknowledgment	None

Query the state of the switching outputs

Command	'OA'
Description	This command may be used to query the states of the switching inputs and outputs that are configured as a switching output and that have been set via commands. The logic state is output, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0V at the switching output).
Parameter	'OA?'
Acknowledgment	'OA S1=<a>;S2=<a>' <a> State of the switching outputs '0' Low '1' High 'I' Configuration as switching input 'P' Passive configuration

Set the state of the switching outputs

Command	'OA'
Description	This command is used to set the states of the switching inputs/outputs that are configured as a switching output. The logic state is specified, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0V at the switching output). The values of the switching inputs/outputs that are not configured as switching outputs are ignored. You may also use only a selection of the existing switching inputs/outputs as long as these are listed in ascending order.
Parameter	'OA [S1=<a>];S2=<a>' <a> State of the switching output '0' Low '1' High
Acknowledgment	'OA=<aa>' <aa> Status acknowledgment, unit (dimensionless) '00' Ok '01' Syntax error '02' Parameter error '03' Other error

Deactivate switching output

Command	'OD'
Description	The switching outputs 1 and 2 can be deactivated with this command. The respective port must have been configured as a switching output. The logic state is output, i.e., an inverted logic is taken into account (e.g., inverted logic and a state of High corresponds to a voltage of 0V at the switching output).
Parameter	'OD<a>' <a> Selected switching output [1, 2], unit (dimensionless)
Acknowledgment	None

Query the configuration of the switching inputs/outputs

Command	'OF'
Description	This command may be used to query the configuration of the switching inputs/outputs 1 and 2.
Parameter	'OF?'
Acknowledgment	'OF S1=<a>;S2=<a>' <a> Function of the switching input/ output, unit [dimensionless] 'I' Switching input 'O' Switching output 'P' Passive

Configure the switching inputs/ outputs

Command	'OF'
Description	This command may be used to configure the function of the switching inputs/outputs 1 and 2. You may also use only a selection of the existing switching inputs/outputs as long as these are listed in ascending order.
Parameter	'OF [S1=<a>][:S2=<a>]' <a> Function of the switching input/ output, unit [dimensionless] 'I' Switching input 'O' Switching output 'P' Passive
Acknowledgment	'OF=<bb>' <bb> Status acknowledgment '00' Ok '01' Syntax error '02' Parameter error '03' Other error

11.1.4 Online commands for the parameter set operations

NOTE



You can obtain detailed information on the parameter set of the bar code reader from Leuze on request.

Copying parameter set

Command	'PC'
Description	This command can only be used to copy parameter sets in their entirety. This can be used to replicate the three parameter sets default , permanent and operating parameters on the basis of one another. In addition, this command can also be used to restore the factory settings.
Parameter	<p>'PC<Source type><Target type>'</p> <p><Source type> Parameter data set that is to be copied, unit [dimensionless]</p> <p>'0' Parameter data set in permanent memory</p> <p>'2' Default or factory parameter set</p> <p>'3' Operating parameter data set in volatile memory</p> <p><Target type> Parameter set into which the data is to be copied, unit [dimensionless]</p> <p>'0' Parameter data set in permanent memory</p> <p>'3' Operating parameter data set in volatile memory</p> <p>Permissible combinations here include:</p> <p>'03' Copying the data set from the permanent memory to the operating parameter data set</p> <p>'30' Copying the operating parameter data set to the permanent parameter set memory</p> <p>'20' Copying the default parameters to the permanent memory and to the main memory</p>
Acknowledgment	<p>'PS=<aa>'</p> <p><aa> Status acknowledgment, unit [dimensionless]</p> <p>'00' Ok</p> <p>'01' Syntax error</p> <p>'02' Impermissible command length</p> <p>'03' Reserved</p> <p>'04' Reserved</p> <p>'05' Reserved</p> <p>'06' Impermissible combination, source type - target type</p>

Requesting parameter data set from BCL 300/\ BCL 301/

Command	'PR'
Description	The parameters of the BCL 300/\ BCL 301/ are grouped together in a parameter set and permanently stored in memory. There is one parameter set in permanent memory and one operating parameter set in volatile memory; in addition, there is a default parameter set (factory parameter set) for initialization. This command can be used to edit the first two parameter sets (in permanent and volatile memory). A check sum can be used for reliable parameter transfer.
Parameter	'PR<BCC type><PS type><Address><Data length>[<BCC>]' <BCC type> Check-digit function during transmission, unit [dimensionless] '0' Not used '3' BCC mode 3 <PS type> Memory from which the values are to be read, unit [dimensionless] '0' Parameter values stored in the flash memory '1' Reserved '2' Default values '3' Operating values in RAM <Address> Relative address of the data within the data set 'aaaa' Four-digit, unit [dimensionless] <Data length> Length of the parameter data to be transferred 'bbbb' Four-digit, unit [length in bytes] <BCC> Check sum calculated as specified under BCC type
Acknowledgment positive	PT<BCC type><PS type><Status><Start> <Address parameter value><Address+1 parameter value>... [;<Address><Address parameter value>][<BCC>] <BCC type> Check-digit function during transmission, unit [dimensionless] '0' Not used '3' BCC mode 3 <PS type> Memory from which the values are to be read, unit [dimensionless] '0' Parameter values stored in the flash memory '2' Default values '3' Operating values in RAM <Status> Mode of parameter processing, unit [dimensionless] '0' No further parameters '1' Additional parameters follow <Start> Relative address of the data within the data set, 'aaaa' Four-digit, unit [dimensionless] <P.value A.> Parameter value of the parameter stored at this address; the parameter set data 'bb' is converted from HEX format to a 2-byte ASCII-format for transfer. <BCC> Check sum calculated as specified under BCC type,
Acknowledgment negative	'PS=<aa>' Parameter reply: <aa> Status acknowledgment, unit [dimensionless] '01' Syntax error '02' Impermissible command length '03' Impermissible value for checksum type '04' Invalid check sum received '05' Impermissible number of data requested '06' Requested data does not (any longer) fit in the transmission buffer '07' Impermissible address value '08' Read access after end of data set '09' Impermissible QPF data set type

Determining parameter set difference to default parameters

Command	'PD'
Description	<p>This command outputs the difference between the default parameter set and the operating parameter set or the difference between the default parameter set and the permanent parameter set.</p> <p>Comment: The reply supplied by this command can e.g. be directly used for programming a device with factory settings, whereby this device receives the same configuration as the device on which the PD-sequence was executed.</p>
Parameter	<p>'PD<P.set1><P.set2>'</p> <p><P.set1> Parameter data set which is to be copied, unit [dimensionless] '0' Parameter data set in permanent memory '2' Default or factory parameter set</p> <p><P.set2> Parameter set to which the data is to be copied, unit [dimensionless] '0' Parameter data set in permanent memory '3' Operating parameter data set in volatile memory</p> <p>Permissible combinations here include: '20' Output of the parameter differences between the default and the permanently saved parameter set '23' Output of the parameter differences between the default parameter set and the operating parameter set saved in volatile memory '03' Output of the parameter differences between the permanent parameter set and the operating parameter set saved in volatile memory</p>
Acknowledgment positive	<p>PT<BCC><PS type><Status><Adr.><P.value adr.><P.valueAdr.+1>... [;<Adr.><P.value adr.>] <BCC> '0' No check digit '3' BCC mode 3 <PS type> '0' Values stored in flash memory '3' Operating values stored in RAM <Status> '0' No further parameters '1' Additional parameters follow <Adr.> Relative address of the data within the data set 'aaaa' Four-digit, unit [dimensionless] <P.value> Parameter value of the -bb- parameter stored at this address. The parameter set data is converted from HEX format to a 2-byte-ASCII format for transfer.</p>
Acknowledgment Negative	<p>'PS=<aa>' <aa> Status acknowledgment, unit [dimensionless] '0' No difference '1' Syntax error '2' Impermissible command length '6' Impermissible combination, parameter set 1 and parameter set 2 '8' Invalid parameter set</p>

Writing parameter set

Command	'PT'
Description	<p>The parameters of the BCL 300/\ BCL 301/ are grouped together in a parameter set and permanently stored in memory. There is one parameter set in permanent memory and one operating parameter set in volatile memory; in addition, there is a default parameter set (factory parameter set) for initialization. This command can be used to edit the first two parameter sets (in permanent and volatile memory). A check sum can be used for reliable parameter transfer.</p>
Parameter	<p>PT<BCC type><PS type><Status><Adr.><P.value adr.> <P.value adr+1>...[;<Adr.><P.value adr.>][<BCC>] <BCC type> Check-digit function during transfer, unit [dimensionless] '0' No check digit '3' BCC mode 3 <PS type> Memory from which the values are to be read, unit [dimensionless] '0' Parameter values stored in the flash memory '3' Operating values stored in RAM <Status> Mode of parameter processing, without function here, unit [dimensionless] '0' No reset after parameter change, no further parameters '1' No reset after parameter change, additional parameters follow '2' With reset after parameter change, no further parameters '6' Set parameters to factory settings, no further parameters '7' Set parameters to factory settings, lock all code types; the code-type setting must follow in the command! <Adr.> Relative address of the data within the data set, 'aaaa' Four-digit, unit [dimensionless] <P.value> Parameter value of the -bb- parameter stored at this address. The parameter set data is converted from HEX format to a 2-byte-ASCII format for transfer. <BCC> Check sum calculated as specified under BCC type</p>
Acknowledgment	<p>'PS=<aa>' Parameter reply: <aa> Status acknowledgment, unit [dimensionless] '01' Syntax error '02' Impermissible command length '03' Impermissible value for checksum type '04' Invalid check sum received '05' Impermissible data length '06' Invalid data (parameter limits violated) '07' Invalid start address '08' Invalid parameter set '09' Invalid parameter set type</p>

12 Diagnostics and troubleshooting

12.1 General causes of errors

Error	Possible error cause	Measures
Status LED PWR		
Off	<ul style="list-style-type: none"> No supply voltage connected to the device Hardware error 	<input type="checkbox"/> Check supply voltage <input type="checkbox"/> Send device to customer service
Red, flashing	<ul style="list-style-type: none"> Warning 	<input type="checkbox"/> Query diagnostic data and carry out the resulting measures
Red, continuous light	<ul style="list-style-type: none"> Error: no function possible 	<input type="checkbox"/> Internal device error, send in device
Orange, continuous light	<ul style="list-style-type: none"> Device in service mode 	<input type="checkbox"/> Reset service mode with webConfig tool
Status LED NET		
Off	<ul style="list-style-type: none"> No supply voltage connected to the device Hardware error 	<input type="checkbox"/> Check supply voltage <input type="checkbox"/> Send device to customer service
Red, flashing	<ul style="list-style-type: none"> Communication error With slave: network error With master: network error following initialization 	<input type="checkbox"/> Check interface <input type="checkbox"/> Check interface, addressing and el. connection of the slave <input type="checkbox"/> Check interface, addressing and el. connection of the slave
Red, continuous light	<ul style="list-style-type: none"> No communication Incorrect wiring Incorrect address 	<input type="checkbox"/> Check interface <input type="checkbox"/> Check wiring <input type="checkbox"/> Check addressing
Orange, flashing	<ul style="list-style-type: none"> Timeout -> Error on interface 	<input type="checkbox"/> Check interface wiring

Table 12.1: General causes of errors

12.2 Interface errors

Error	Possible error cause	Measures
No communication via USB service interface	<ul style="list-style-type: none"> Incorrect interconnection cable Connected BCL 300/\ BCL 301/ is not recognized 	<input type="checkbox"/> Check interconnection cable <input type="checkbox"/> Install USB driver
No communication via RS 232 / RS 422/ RS 485	<ul style="list-style-type: none"> Incorrect wiring Different baud rates Different protocol settings 	<input type="checkbox"/> Check wiring <input type="checkbox"/> Check baud rate <input type="checkbox"/> Check protocol settings
Sporadic errors on the RS 232 / RS 422 / RS 485 interface	<ul style="list-style-type: none"> Incorrect wiring Effects due to EMC Overall network expansion exceeded 	<input type="checkbox"/> Check wiring <ul style="list-style-type: none"> In particular, check wire shielding Check the cable used <input type="checkbox"/> Check shielding (shield covering in place up to the clamping point) <input type="checkbox"/> Check grounding concept and connection to functional earth (FE) <input type="checkbox"/> Avoid EMC coupling caused by power cables laid parallel to device lines. <input type="checkbox"/> Check max. network expansion as a function of the max. cable lengths

Table 12.2: Interface error

12.3 Service and support

Service hotline

You can find the contact information for the hotline in your country on our website www.leuze.com under **Contact & Support**.

Repair service and returns


Defective devices are repaired in our service centers competently and quickly. We offer you an extensive service packet to keep any system downtimes to a minimum. Our service center requires the following information:

- Your customer number
- Product description or part description
- Serial number and batch number
- Reason for requesting support together with a description

Please register the merchandise concerned. Simply register return of the merchandise on our website www.leuze.com under **Contact & Support > Repair Service & Returns**.

To ensure quick and easy processing of your request, we will send you a returns order with the returns address in digital form.

What to do should servicing be required?

NOTE	
	<p>Please use this chapter as a master copy should servicing be required.</p> <p>✍ Enter the contact information and fax this form together with your service order to the fax number given below.</p>

Customer data (please complete)

Device type:	
Serial number:	
Firmware:	
Display messages	
Status of LEDs:	
Error description	
Company:	
Contact person/department:	
Phone (direct dial):	
Fax:	
Street / no.:	
ZIP code / City:	
Country:	

Leuze Service fax number:

+49 7021 573 - 199

13 Type overview and accessories

13.1 Part number code

BCL	300	<i>i</i>	C	S	M	102	D	H	F		
									Customer-specific	P	Plastic exit window
										Fxxx	Cloud - feature with 3-digit number only in combination with with Industry 4.0/IoT (iC)
									Heating option	H	With heating
									Display option	D	With display, buttons and LEDs
									Beam exit	0	Perpendicular beam exit
										2	Front beam exit
									Optics	N	High Density (N = Near)
										M	Medium Density (M = Medium)
										F	Low Density (F = Far)
										L	Ultra Low Density (L = Long Range)
										J	Inkjet Optics
									Scanning principle	S	Single-line polygon wheel
										R1	Raster polygon wheel
										O	Oscillating mirror
										<i>i</i>	Integrated networks (basic netX)
										<i>C</i>	IoT / Industry 4.0 - connection
									Interface	00	RS232/422 interface
										01	RS485 interface
										04	PROFIBUS DP interface
										08	Ethernet interface
										38	EtherCAT interface
										48	PROFINET interface
										58	Ethernet/IP interface
										BCL	BarCodeLeser (bar code reader)

Table 13.1: BCL 300/\ BCL 301/part number code

13.2 BCL 300/

Stand-alone device with 1 x RS 232/RS 422 interface:

Type designation	Description	Part no.
Single line scanner with frontal beam exit		
BCL 300/S N 102	With N optics	50116226
BCL 300/S M 102	With M optics	50116220
BCL 300/S F 102	With F optics	50116208
BCL 300/S L 102	With L optics	50116214
BCL 300/S N 102 D	With N optics and display	50116225
BCL 300/S M 102 D	With M optics and display	50116219
BCL 300/S F 102 D	With F optics and display	50116207
BCL 300/S L 102 D	With L optics and display	50116213
BCL 300/S N 102 D H	With N optics, display and heating	50116224
BCL 300/S M 102 D H	With M optics, display and heating	50116218
BCL 300/S F 102 D H	With F optics, display and heating	50116206
BCL 300/S L 102 D H	With L optics, display and heating	50116212
Raster scanner with frontal beam exit		
BCL 300/R1 N 102	With N optics	50116202
BCL 300/R1 M 102	With M optics	50116198
BCL 300/R1 F 102	With F optics	50116194
BCL 300/R1 N 102 D	With N optics and display	50116201
BCL 300/R1 M 102 D	With M optics and display	50116197
BCL 300/R1 F 102 D	With F optics and display	50116193
Single line scanner with deflecting mirror		
BCL 300/S N 100	With N optics	50116223
BCL 300/S M 100	With M optics	50116217
BCL 300/S F 100	With F optics	50116205
BCL 300/S L 100	With L optics	50116211
BCL 300/S N 100 D	With N optics and display	50116222
BCL 300/S M 100 D	With M optics and display	50116216
BCL 300/S F 100 D	With F optics and display	50116204
BCL 300/S L 100 D	With L optics and display	50116210
BCL 300/S N 100 D H	With N optics, display and heating	50116221
BCL 300/S M 100 D H	With M optics, display and heating	50116215
BCL 300/S F 100 D H	With F optics, display and heating	50116203
BCL 300/S L 100 D H	With L optics, display and heating	50116209
Raster scanner with deflecting mirror		
BCL 300/R1 N 100	With N optics	50116200
BCL 300/R1 M 100	With M optics	50116196
BCL 300/R1 F 100	With F optics	50116192
BCL 300/R1 J 100	With J optics	50123508
BCL 300/R1 N 100 D	With N optics and display	50116199
BCL 300/R1 M 100 D	With M optics and display	50116195
BCL 300/R1 F 100 D	With F optics and display	50116191

Table 13.2: BCL 300/type overview

Type designation	Description	Part no.
Oscillating-mirror scanner		
BCL 300/O N 100	With N optics	50116188
BCL 300/O M 100	With M optics	50116185
BCL 300/O F 100	With F optics	50116179
BCL 300/O L 100	With L optics	50116182
BCL 300/O N 100 D	With N optics and display	50116189
BCL 300/O M 100 D	With M optics and display	50116186
BCL 300/O F 100 D	With F optics and display	50116180
BCL 300/O L 100 D	With L optics and display	50116183
BCL 300/O N 100 D H	With N optics, display and heating	50116190
BCL 300/O M 100 D H	With M optics, display and heating	50116187
BCL 300/O F 100 D H	With F optics, display and heating	50116181
BCL 300/O L 100 D H	With L optics, display and heating	50116184

Table 13.2: BCL 300/type overview

13.3 BCL 301/

multiNet plus slave with 1x RS 485 interface at 2x M12 B-coded connectors:

Type designation	Description	Part no.
Single line scanner with frontal beam exit		
BCL 301/S N 102	With N optics	50116319
BCL 301/S M 102	With M optics	50116313
BCL 301/S F 102	With F optics	50116301
BCL 301/S L 102	With L optics	50116307
BCL 301/S N 102 D	With N optics and display	50116318
BCL 301/S M 102 D	With M optics and display	50116312
BCL 301/S F 102 D	With F optics and display	50116300
BCL 301/S L 102 D	With L optics and display	50116306
BCL 301/S N 102 D H	With N optics, display and heating	50116317
BCL 301/S M 102 D H	With M optics, display and heating	50116311
BCL 301/S F 102 D H	With F optics, display and heating	50116299
BCL 301/S L 102 D H	With L optics, display and heating	50116305
Raster scanner with frontal beam exit		
BCL 301/R1 N 102	With N optics	50116295
BCL 301/R1 M 102	With M optics	50116291
BCL 301/R1 F 102	With F optics	50116287
BCL 301/R1 N 102 D	With N optics and display	50116294
BCL 301/R1 M 102 D	With M optics and display	50116290
BCL 301/R1 F 102 D	With F optics and display	50116286
Single line scanner with deflecting mirror		
BCL 301/S N 100	With N optics	50116316
BCL 301/S M 100	With M optics	50116308
BCL 301/S F 100	With F optics	50116298
BCL 301/S L 100	With L optics	50116304
BCL 301/S N 100 D	With N optics and display	50116315
BCL 301/S M 100 D	With M optics and display	50116310
BCL 301/S F 100 D	With F optics and display	50116297
BCL 301/S L 100 D	With L optics and display	50116303
BCL 301/S N 100 D H	With N optics, display and heating	50116314
BCL 301/S M 100 D H	With M optics, display and heating	50116309
BCL 301/S F 100 D H	With F optics, display and heating	50116296
BCL 301/S L 100 D H	With L optics, display and heating	50116302

Table 13.3: BCL 301/type overview

Type designation	Description	Part no.
Raster scanner with deflecting mirror		
BCL 301/R1 N 100	With N optics	50116293
BCL 301/R1 M 100	With M optics	50116289
BCL 301/R1 F 100	With F optics	50116285
BCL 301/R1 J 100	With J optics	50123507
BCL 301/R1 N 100 D	With N optics and display	50116292
BCL 301/R1 M 100 D	With M optics and display	50116288
BCL 301/R1 F 100 D	With F optics and display	50116284
Oscillating-mirror scanner		
BCL 301/O N 100	With N optics	50116281
BCL 301/O M 100	With M optics	50116278
BCL 301/O F 100	With F optics	50116272
BCL 301/O L 100	With L optics	50116275
BCL 301/O N 100 D	With N optics and display	50116282
BCL 301/O M 100 D	With M optics and display	50116279
BCL 301/O F 100 D	With F optics and display	50116273
BCL 301/O L 100 D	With L optics and display	50116276
BCL 301/O N 100 D H	With N optics, display and heating	50116283
BCL 301/O M 100 D H	With M optics, display and heating	50116280
BCL 301/O F 100 D H	With F optics, display and heating	50116274
BCL 301/O L 100 D H	With L optics, display and heating	50116277

Table 13.3: BCL 301/type overview

13.4 Connection hood / terminal box accessories

Type designation	Description	Part no.
MS 300	Connector hood for BCL 300/	50116468
MS 301	Connector hood for BCL 301/	50116469
MK 300	Terminal hood for BCL 300/	50116463
MK 301	Terminal hood for BCL 301/	50116464
KB 301-3000	Cable hood for BCL 300/\ BCL 301/, cable length 3m	50114571
MA 100	External terminal box for BCL 300/\ BCL 301/	50114369

Table 13.4: Connection hoods / terminal boxes for the BCL 300/\ BCL 301/

13.5 Accessory – Terminating resistor

Type designation	Description	Part no.
TS 02-4-SA M12	M12 connector with integrated terminating resistor for BUS OUT	50038539

Table 13.5: Terminating resistor for the BCL 301/

13.6 Accessories – Connectors

Type designation	Description	Part no.
KD 02-5-BA	M12 axial socket for HOST or BUS IN, shielded	50038538
KD 02-5-SA	M12 axial connector for BUS OUT, shielded	50038537
KD 095-5A	M12 axial socket for voltage supply, shielded	50020501

Table 13.6: Connectors for the BCL 300/\ BCL 301/

13.7 Accessories – USB cable

Type designation	Description	Part no.
KB USBA-USBminiB	USB service cable, 2 Type A and Mini-B type connector, length 1 m	50117011

Table 13.7: Service cable for the BCL 300/\ BCL 301/

13.8 Accessories – Mounting device

Type designation	Description	Part no.
BT 56	Mounting device for rod Ø 16 ... 20 mm	50027375
BT 56-1	Mounting device for rod Ø 12 ... 16 mm	50121435
BT 59	Mounting device for ITEM	50111224
BT 300 W	Mounting bracket	50121433
BT 300 - 1	Mounting bracket for rod	50121434

Table 13.8: Mounting devices for the BCL 300/\ BCL 301/

13.9 Accessory - Reflector for AutoReflAct

Type designation	Description	Part no.
Reflective tape no. 4 / 100 x 100 mm	Reflective tape as reflector for AutoReflAct operation	50106119

Table 13.9: Reflector for autoReflAct operation

14 Maintenance

14.1 General maintenance information

Usually, the BCL 300/i BCL 301/i bar code reader does not require any maintenance by the operator.

Cleaning

Clean glass surface with a damp sponge soaked in commercial cleaning detergent. Then rub it with a soft, clean, dry cloth.

NOTE



Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device. Use of improper cleaning agents can damage the optical window.

14.2 Repairs, servicing

Repairs to the device must only be carried out by the manufacturer.

☞ Contact your Leuze distributor or service organization should repairs be required.

The addresses can be found on the inside of the cover and on the back.

NOTE



When sending devices to Leuze for repair, please provide an accurate description of the error.

14.3 Disassembling, packing, disposing

Repacking

For later reuse, the device is to be packed so that it is protected.

NOTE



Electrical scrap is a special waste product! Observe the locally applicable regulations regarding disposal of the product.

15 Appendix

15.1 ASCII character set

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
NUL	0	00	0	ZERO	Zero
SOH	1	01	1	START OF HEADING	Start of heading
STX	2	02	2	START OF TEXT	Start of text characters
ETX	3	03	3	END OF TEXT	Last character of text
EOT	4	04	4	END OF TRANSMISS.	End of transmission
ENQ	5	05	5	ENQUIRY	Request for data trans.
ACK	6	06	6	ACKNOWLEDGE	Positive acknowledgment
BEL	7	07	7	BELL	Bell signal
BS	8	08	10	BACKSPACE	Backspace
HT	9	09	11	HORIZ. TABULATOR	Horizontal tabulator
LF	10	0A	12	LINE FEED	Line feed
VT	11	0B	13	VERT. TABULATOR	Vertical tabulator
FF	12	0C	14	FORM FEED	Form feed
CR	13	0D	15	CARRIAGE RETURN	Carriage return
SO	14	0E	16	SHIFT OUT	Shift out
SI	15	0F	17	SHIFT IN	Shift in
DLE	16	10	20	DATA LINK ESCAPE	Data link escape
DC1	17	11	21	DEVICE CONTROL 1	Device control character 1
DC2	18	12	22	DEVICE CONTROL 2	Device control character 2
DC3	19	13	23	DEVICE CONTROL 3	Device control character 3
DC4	20	14	24	DEVICE CONTROL 4	Device control character 4
NAK	21	15	25	NEG. ACKNOWLEDGE	Negative acknowledge
SYN	22	16	26	SYNCHRONOUS IDLE	Synchronization
ETB	23	17	27	EOF TRANSM. BLOCK	End of data transmission block
CAN	24	18	30	CANCEL	Invalid
EM	25	19	31	END OF MEDIUM	End of medium
SUB	26	1A	32	SUBSTITUTE	Substitution
ESC	27	1B	33	ESCAPE	Escape
FS	28	1C	34	FILE SEPARATOR	File separator
GS	29	1D	35	GROUP SEPARATOR	Group separator
RS	30	1E	36	RECORD SEPARATOR	Record separator

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
US	31	1F	37	UNIT SEPARATOR	Unit separator
SP	32	20	40	SPACE	Space
!	33	21	41	EXCLAMATION POINT	Exclamation point
"	34	22	42	QUOTATION MARK	Quotation mark
#	35	23	43	NUMBER SIGN	Number sign
\$	36	24	44	DOLLAR SIGN	Dollar sign
%	37	25	45	PERCENT SIGN	Percent sign
&	38	26	46	AMPERSAND	Ampersand
'	39	27	47	APOSTROPHE	Apostrophe
(	40	28	50	OPEN. PARENTHESIS	Open parenthesis
)	41	29	51	CLOS. PARENTHESIS	Closed parenthesis
*	42	2A	52	ASTERISK	Asterisk
+	43	2B	53	PLUS	Plus sign
,	44	2C	54	COMMA	Comma
-	45	2D	55	HYPHEN (MINUS)	Hyphen
.	46	2E	56	PERIOD (DECIMAL)	Period (decimal)
/	47	2F	57	SLANT	Slant
0	48	30	60	0	Number
1	49	31	61	1	Number
2	50	32	62	2	Number
3	51	33	63	3	Number
4	52	34	64	4	Number
5	53	35	65	5	Number
6	54	36	66	6	Number
7	55	37	67	7	Number
8	56	38	70	8	Number
9	57	39	71	9	Number
:	58	3A	72	COLON	Colon
;	59	3B	73	SEMICOLON	Semicolon
<	60	3C	74	LESS THAN	Less than
=	61	3D	75	EQUALS	Equals
>	62	3E	76	GREATER THAN	Greater than
?	63	3F	77	QUESTION MARK	Question mark
@	64	40	100	COMMERCIAL AT	Commercial AT

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
A	65	41	101	A	Capital letter
B	66	42	102	B	Capital letter
C	67	43	103	C	Capital letter
D	68	44	104	D	Capital letter
E	69	45	105	E	Capital letter
F	70	46	106	F	Capital letter
G	71	47	107	G	Capital letter
H	72	48	110	H	Capital letter
I	73	49	111	I	Capital letter
J	74	4A	112	J	Capital letter
K	75	4B	113	K	Capital letter
L	76	4C	114	L	Capital letter
M	77	4D	115	M	Capital letter
N	78	4E	116	N	Capital letter
O	79	4F	117	O	Capital letter
P	80	50	120	P	Capital letter
Q	81	51	121	Q	Capital letter
R	82	52	122	R	Capital letter
S	83	53	123	S	Capital letter
T	84	54	124	T	Capital letter
U	85	55	125	U	Capital letter
V	86	56	126	V	Capital letter
W	87	57	127	W	Capital letter
X	88	58	130	X	Capital letter
Y	89	59	131	Y	Capital letter
Z	90	5A	132	Z	Capital letter
[	91	5B	133	OPENING BRACKET	Opening bracket
\	92	5C	134	REVERSE SLANT	Reverse slant
]	93	5D	135	CLOSING BRACKET	Closing bracket
^	94	5E	136	CIRCUMFLEX	Circumflex
_	95	5F	137	UNDERSCORE	Underscore
`	96	60	140	GRAVE ACCENT	Grave accent
a	97	61	141	a	Lower case letter
b	98	62	142	b	Lower case letter
c	99	63	143	c	Lower case letter
d	100	64	144	d	Lower case letter
e	101	65	145	e	Lower case letter
f	102	66	146	f	Lower case letter
g	103	67	147	g	Lower case letter
h	104	68	150	h	Lower case letter
i	105	69	151	i	Lower case letter
j	106	6A	152	j	Lower case letter
k	107	6B	153	k	Lower case letter
l	108	6C	154	l	Lower case letter
m	109	6D	155	m	Lower case letter
n	110	6E	156	n	Lower case letter
o	111	6F	157	o	Lower case letter

ASCII	Dec.	Hex.	Oct.	Designation	Meaning
p	112	70	160	p	Lower case letter
q	113	71	161	q	Lower case letter
r	114	72	162	r	Lower case letter
s	115	73	163	s	Lower case letter
t	116	74	164	t	Lower case letter
u	117	75	165	u	Lower case letter
v	118	76	166	v	Lower case letter
w	119	77	167	w	Lower case letter
x	120	78	170	x	Lower case letter
y	121	79	171	y	Lower case letter
z	122	7A	172	z	Lower case letter
{	123	7B	173	OPENING BRACE	Opening brace
|	124	7C	174	VERTICAL LINE	Vertical line
}	125	7D	175	CLOSING BRACE	Closing brace
~	126	7E	176	TILDE	Tilde
DEL	127	7F	177	DELETE (RUBOUT)	Delete

15.2 Bar code samples

15.2.1 Module 0.3

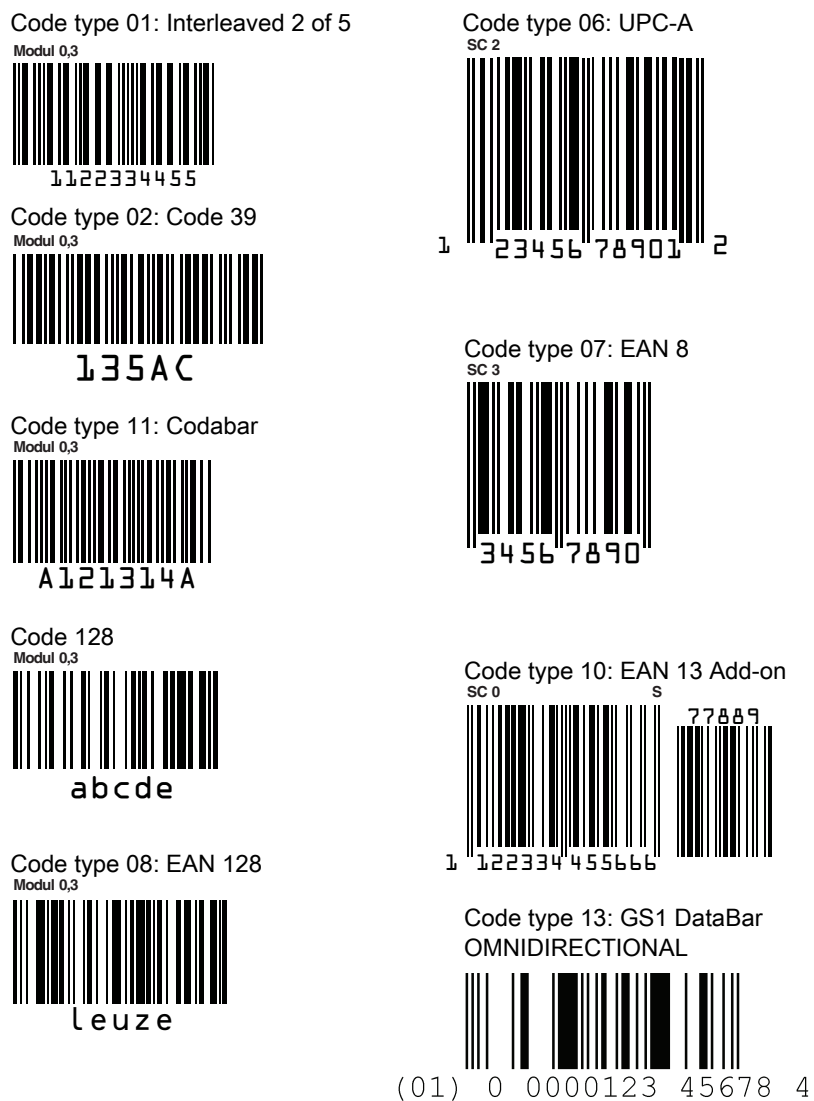


Figure 15.1: Bar code sample labels (module 0.3)

15.2.2 Module 0.5

Code type 01: Interleaved 2 of 5

Modul 0,5



Code type 02: Code 39

Modul 0,5



Code type 11: Codabar

Modul 0,5



Code 128

Modul 0,5



Code type 08: EAN 128

Modul 0,5



Code type 06: UPC-A

SC 4



Code type 07: EAN 8

SC 6



Code type 10: EAN 13 Add-on

SC 2



Figure 15.2: Bar code sample labels (module 0.5)